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General Manager and Engineer.
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September, 1945.

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CHIEF CONTENTS OF THIS ISSUE

Tribute to Engineers

A TRIBUTE to the electrical industry's preparedness for war was given by Sir JOHN ANDERSON at the Institution of Electrical Engineers last week, following Dr. P. DUNSHEATH'S presidential address on the achievements of the industry in the national effort during the past six years. Neither in the tribute nor in the address were named, for obvious reasons, every branch of electrical engineering but their authors said sufficient to leave without any doubt that but for the electrical industry the war with Germany would have covered a period of even greater anxiety, while the measure of time might reasonably have been longer.

Sir JOHN ANDERSON, as the Minister responsible for the national pool of equipment and spares in the early years of the war and before, knows better than most to what length the electrical industry had prepared itself against every emergency, and his remarks were therefore more factual than many which have been made in praise of the industry; for this reason, coupled with the fact that Sir JOHN is himself held in some esteem in scientific circles, his tribute to the achievements which Dr. DUNSHEATH described is all the more appreciated.

It has long been the opinion of many that the war-time history and experiences of the industry should be recorded in some official way so that those who follow in years to come may learn of its fight against the Luftwaffe, its preparation for the offensive which carried the war to its conclusion. So far as space considerations would allow, and as the information became free from censorship, THE ELECTRICIAN has already published many details of how the supply industry fared during the bombing of this country, of new defensive and offensive weapons, of protective measures taken and so on, but in Dr. DUNSHEATH'S presidential address is painted a word picture descriptive of the whole of the activities of the industry in one comprehensive review. It is an attempt which few would have willingly undertaken, and which when attempted few could have carried to such successful conclusion.

Falling as it does in the first year of peace since 1938, it is a foregone conclusion that Dr. DUNSHEATH'S term of office as president of the I.E.E. will carry with it the responsibility of making as widely known as possible the war-time experiences of the industry, but even if he says no more than is in his inaugural address he will have already met that responsibility to good effect. Further, in speaking of these experiences he can do so with personal assurance, in that his company was in the front rank of those organisations which made possible many of those military operations whose code

names have now become commonplace. The spirit of team-work which made these things possible is the same spirit which, if kept alive, will ensure the industry assuming at an early date the large-scale development which was so much in evidence before the war; it is a spirit which, made more prominent by the common purpose of war, has permeated the industry from its early days and which if now applied to meeting the needs of the public, to beating down the competition set-up by contemporary fuel interests, will lead to further highlights in the history of an industry already proud of its record.

Development of Jet Propulsion

THE subject of jet propulsion has become one for general discussion since THE ELECTRICIAN first published details in the issue of February 25, 1944, and the fuller history given by Air-Commodore FRANK WHITTLE in the James Clayton Lecture before the "Mechanicals" last Friday, is therefore timely. As has already been explained in this journal the electrical industry made a valuable contribution to this wholly British invention and for that reason, if for no other, its development is followed with interest. How near we were to losing the applications of jet propulsion will be appreciated from the abstract on p. 385 of the inventor's description of early struggles with engineering problems and difficulties of obtaining adequate financial backing, while even the Air Ministry itself was dubious of its future. The recording of the facts in the Clayton Lecture should dispel for all time all inferences that the gas turbine is not wholly British, for as we have said before, and as the inventor confirms, it was not until a working model of a jet propulsion engine was in September, 1941, shipped to the United States that that country made any appreciable headway.

Women's Electrical Exhibition

THE first exhibition to be held in this or any other country with a view to displaying the part played by women in the war in so far as the operation and manufacture of electrical apparatus are concerned, was opened at the Dorland Hall, London, yesterday, Thursday. The exhibition which will remain open until October 25, forms part of the 21st birthday celebrations of the E.A.W. and was promoted by the E.D.A. It is, however, not only a tribute to women's war work in the electrical field, for included in the exhibits are a number of prototype domestic appliances, a model dining-kitchen, a cooker with a four-heat super-speed plate, a time-switch operated washer and so on. The exhibition has behind it the goodwill of the Services, Government departments and the whole electrical industry and represents some small measure of the appreciation felt for the ideals for which the E.A.W. was formed. The foundations of universal electrical understanding on the part of women, laid by the direct and indirect educational work of this pioneer women's organisation, were the structure upon which were built the achievements in electrical operation on the part of women during the war.

A Southern Railway Example

THE Southern Railway has already shown its liking for things electrical and its latest demonstration in this regard is in a coach of the future, in which supplementary heating is provided by electric panels in the coach floors. From the brief description given elsewhere it will be appreciated that the coach is of the corridor type and among its appointments is a form of lighting fitting new to the Southern. The rolling stock of this railway has had a hard task to perform during the last six years, especially in the weeks immediately preceding D-Day, and the new coach which is being displayed at the railway's termini and chief stations is a suggested design for replacements. The reactions of the public to underfloor heating is not yet known, but following the experiences made by the Northmet in 1941, with similar heating in air-raid shelters, we should imagine that the Southern has nothing to fear save an increase in its popularity as a travelling medium.

Industrial Design Display

BEFORE the British Industries Fair again becomes the shop window of all that is best in Britain, it is the Government's intention by accepting a proposal of the Council of Industrial Design, to stage in the summer of next year, an exhibition of design in all the main range of consumer goods, including heating, lighting, cooking and all domestic

appliances. The display will not be so vast as a commercial exhibition or trade fair, and space will not be sold; it is, however, intended to make the exhibit representative of all the prototype designs which manufacturers have for too long been unable to show the public. In making these details known, the President of the Board of Trade, Sir STAFFORD CRIPPS, made it clear that acceptance of the proposal does not necessarily mean that industry is likely to get all the materials it wants, for "no goods will be excluded on the ground that they are not yet on general sale or in quantity production"—inferring that neither the materials nor the labour for mass manufacture may be available even next summer. The director of the Council of Industrial Design, Mr. S. C. LESLIE, is, however, hopeful, and is now engaged in working out detailed arrangements for publication at an early date. The electrical industry is naturally, interested, for there are already available many appliances and designs which are even now sufficiently important to warrant wide display.

A Swedish Experiment

THE transmission of power from the north of Sweden to the south and centre of the country is carried out by 250 kV overhead lines carrying 50 cycles a.c. The increasing demand for power, however, is giving rise to the need for a transmission system of greater capacity and the possibilities are being examined of using high-tension d.c. To this end the A.S.E.A. Co., and the Swedish Board of Waterfalls, on August 27, tried the experiment of passing a current at 2 000 V through the sea from Gullmaren on the Swedish west coast to Gisslehamn north of Stockholm in the Baltic, adistance of 1 100 km. measured along the coast. Two iron electrodes, 75 m. long were used, one in Gullmar Fiord and another off Grisslehamn. A current at 2 000 V was transmitted from Gullmar Fiord by overhead line across country to Grisslehamn (350 miles), and the purpose of the experiment was to try to ascertain how on the return route the current would pass between the two electrodes. The Navy had laid magnetic mines in order to see whether the current would affect them, while the effect on marine animals was also investigated. The experiment is said to have been successful; a number of hermit crabs placed in the vicinity of the electrode in Gullmar Fiord were unharmed; while the current had no effect on the magnetic mines laid in its path.

Electricity in Italy

THOUGH the war must have destroyed or damaged much of the electrical generation and distribution system in Italy, the northern part of the country where most of the hydro-electric developments are located has, apparently, escaped serious demolition, in that there is so much power available that surplus supplies are being exported to the south. Less free from trouble, however, is the country's railway system, for whereas before the Germans took possession of the rolling stock, there were in operation 2 000 electric locomotives, there are now only 400. In a country where railway electrification plays so large a part in the transport network, and where the shortage of coal is limiting the use of steam locomotives, the loss of 1 600 electrical traction units is having a crippling effect upon the industrial recovery.

Radio Industry and the Services

THE close collaboration between the radio industry and the Services during the war was one of the vital factors in the defeat of the enemy, and, according to a statement by Air Vice-Marshal Sir VICTOR TAIT, Director-General of Signals at the Air Ministry, that useful association is likely to be continued. He informed the members of the British Institution of Radio Engineers on October 5 that a plan was being formulated by the Services to make a long-term contract with the radio industry to undertake development work. Thus the industry would enjoy Government patronage and support, if only to a limited extent, and also the benefit of some of the fruits of the work of the research establishments of the Services which might be applied to civilian uses. As Sir VICTOR aptly remarked, a vigorous development section of the industry is essential if British radio is to maintain the lead in the introduction of new and advanced techniques which it established in the war. He also expressed the belief that if we successfully develop radio weapons they will act as a strong deterrent to aggression.

Southern Post-War Coach

Plastic Heater Panels in Compartment Floor

THE first of the Southern Railway's post-war passenger coaches which are being built for use between Waterloo, Bournemouth and the West of England, and will, in due course, be extended to other services, has been inspected by an interested public at Waterloo and Victoria stations, where it has been on view.

View of corridor of S. R. post-war coach, showing type of lighting installed in the compartments

Several new features are incorporated in the coach which provides for four first and three third class compartments, accommodating 48 passengers. Outside doors to the compartments have been eliminated, giving an unobscured view on one side through large windows. To avoid congestion at stations, intermediate doorways are provided between third and first class sections, in addition to doors at each end of the corridor. The length of the vehicle is 64 ft. 6 in., against 59 ft. 0 in. pre-war, and it is 3 in. wider than a pre-war coach. By careful attention to detailed design the weight is not correspondingly increased.

Diffused electric lighting is fitted in compartments and in one compartment there are electrically heated foot warming panels under the floor rug to supplement the general steam heating. These are to be installed in all compartments.

A ventilation air duct has been provided in the upper part of the corridor partition with which roof torpedo extractors are connected, an air grille being fitted in each compartment over the corridor doorway. Compartment corridor doors have interlocking brushes to prevent draughts; sliding glass shutter ventilators are fitted to fixed outside windows of the compartments and corridor. The outside doors and corridor sliding doors have spring balanced drop windows. The electric heater floor panels are by Reinforced Plastics, Ltd., and the heater wires are interwoven in a plastic, the finished element being moulded and completely encased in insulating material resulting in a thin, flat, light and flexible panel which is claimed to be non-inflammable, damp-proof, foolproof and non-corrodible. The panels being hard and glossy, do not require painting, and the heating wires not only fulfil their primary function, but considerably increase the mechanical strength of the panel. The panels are so constructed that in the unlikely event of an element breaking there will, it is claimed, be no danger of fire or overheating and only a reduction of the heating effect. The heating elements, woven into an almost indestructible rock-hard insulated bonding, do not exceed "black" heat and this makes the life of the panel almost everlasting.

The panels used in the demonstration coach have a wattage of 180-200 and the temperature is thermostatically controlled.

TELEVISION PLANS

The decision announced in Parliament on Tuesday that television would be resumed at Alexandra Palace next spring will be implemented with the least possible delay. The transmitter at the palace is undamaged, but a certain amount of reconversion from war purposes is necessary. It is hoped that before the end of the year, tests for industry will be possible. At first, these will be of still patterns only. The date for the re-opening of the public service will be settled in consultation with the advisory committee. The extension to the provinces will be pressed on as staffing and materials allow, but the time-table will again be the subject of a recommendation by the advisory committee. The B.B.C.'s intention is that the resumed service shall at the earliest possible moment once again achieve that high degree of reliability and consistently good entertainment to which the Hankey Committee referred when speaking of the system in operation before the war from Alexandra Palace.

Institution of Electrical Engineers

Opening of Session—Sir John Anderson on Industry's Achievements

THE opening meeting of the 1945-46 session of the Institution of Electrical Engineers was held on October 4, when the retiring president, Sir Harry Railing, who was in the Chair, presented the premiums and awards for the previous Session.

Following the presentations, and at the invitation of Sir Harry, Dr. P. Dunsheath then delivered his Presidential Address, an abstract of which is given in p. 370.

Mr. P. V. Hunter, proposing a vote of thanks to Dr. Dunsheath at the end of the reading, said it had been apparent for some months that an attempt should be made to give a picture of the achievements of electrical engineers in the war. Personally, he had thought that the painting of such a picture would have taken some years to complete, but was agreeably surprised that during the short time that had been available since Dr. Dunsheath's nomination as President, he had been able to cover the subject in his Presidential Address. He knew of no one else in the electrical industry who would have had the courage to attempt it. The Address would be looked back upon in the years to come as an inspiration.

The President, before calling on Mr. Haldane to second the vote of thanks, asked Sir John Anderson to speak.

Pre-war Preparations

In response to this request Sir John Anderson said he, with the rest of the audience, had been fascinated by Dr. Dunsheath's account of the contribution made by the electrical industry of this country towards the prosecution and winning of the war. As a member of the Government for a year before the war and throughout the war with Germany, he had many opportunities of following the course of events and, indeed, he was primarily responsible, as Lord Privy Seal, for the preparatory work that was undertaken before the actual outbreak of war. Later on, as Lord President of the Council, he had special responsibility for the supervision of the scientific effort of the nation so far as it concerned the responsibility of the Government, but despite the fact that he knew in some detail what was being done from time to time in the electrical field, he had no conception, until he listened to the Address and the very fascinating account Dr. Dunsheath had given of the various developments in their proper sequence, of the magnitude or even of the crucial importance of that contribution in winning the war. Speaking with some knowledge, Sir John said there was going to be just as great need in the years immediately ahead for the qualities of initiative, resource, courage and energy

Sir Harry Railing

Sir John Anderson

that were displayed during the war. We had to recover our position among the nations, having sacrificed almost everything for the purpose of winning the war. We could do it, but we could only do it by putting forth every effort and by mobilising all the resources in skill and technical knowledge that, as Dr. Dunsheath had shown, served the country so well during the critical years of the war.

Mr. T. G. N. Haldane, seconding the vote of thanks, said that Dr. Dunsheath could have chosen no more appropriate subject for his Address and no more appropriate person could have given it. It was an Address of outstanding merit and gave a very clear picture of the progress and, above all, the adaptability, of engineers during the past six years. All that had come about under the stimulus of war was, in his view, the result of team work directed to a common purpose. Not the least important aspect of the Address was that it immediately raised the fundamental question of—the war having passed—how were we to find a similar common purpose, and the team spirit which would enable us to convert our swords into ploughshares?

The vote of thanks was cordially given.

Sir Stanley Angwin, proposing a vote of thanks to Sir Harry Railing for his services as President during the past year, said he did so in order to assure Sir Harry that he had accomplished a great task and had tackled a job and done it well. His Presidential Address a year ago gave a foretaste of the qualities which Sir Harry had brought to bear in the Chair, qualities which were based on his authority and ex-

perience as an engineer and as a great industrialist. In addition, Sir Harry was a great humanitarian, and possessed that personal touch which meant so much in the relationship of engineering and matters in general.

Mr. V. Z. de Ferranti, who seconded, said he naturally had a great sympathy with a brother industrialist, for though he had a very hard task to perform, he was open to criticism from every side. It was clear that the institution had been privileged to have such a man as Sir Harry Railing as president, and he had commanded the affection of all members.

Sir Harry Railing, in reply, expressed his indebtedness to the Past-President, the Vice-Presidents and members of Council during his term of office and specially thanked the Secretary and his staff, without whose help no President could do his work. They had carried the burden during the war years cheerfully, efficiently and enthusiastically, and it was a burden the extent of which very few were aware. He himself had been thanked, but it was he who should thank the members. The greatest privilege in life was to serve and it had been his privilege to serve the institution in that year which saw the end of the war. It was his earnest hope that during the year of office of the new President, when tasks of peace would have to be dealt with, there would be the same co-operation and the same common purpose as there had been during the past.

I.E.E. Presidential Address

Review of Electrical Engineers' War-Time Achievements

SOME of the contributions of British electrical engineers to the successful outcome of the war were surveyed by the president, Dr. P. Dunsheath, in his inaugural address to the I.E.E. on October 4. Those contributions, he said, were so varied and extensive that it was only possible in the time at his disposal to emphasise the more outstanding. In the first place, the maintenance and extension of the various essential home services by the electrical engineer had played a vital part in the conduct of the war. Electricity entered into every sphere of modern warfare, particularly in the production of munitions and in 1939 the vast and immediate expansion in the manufacture of war supplies involved the supply undertakings in extensive development.

Dr. P. Dunsheath

Hundreds of factories with individual loads up to 50 000 kW, as well as barracks, encampments, searchlight stations and aerodromes sprang up all over the country. The heavy bombing attacks on this country caused less damage to supply installations than had been anticipated. In all cases, equipment supplied from the national pool made a great contribution to the effecting of temporary repairs, so that services could be resumed within a few days. The total loss of generating-station output capacity in the country due to enemy action at the end of any month never exceeded 266 000 kW, much of which was out of commission for short periods only.*

For strategic reasons it became necessary early in the war to effect a major transfer of munitions works to the west, and this, together with a reduction of load in the south-east, due to evacuation and other reasons, involved a serious redistribution of electric power load. From the beginning of the war to the end of 1943, an additional 544 miles of 132 kV line were erected, together with 123 miles for lower voltages. This change in load distribution resulted in heavy transfers of energy between areas, and consequently imposed a very onerous task on the national control organisation. For instance, between the beginning of the war and 1944, the South-West England and South Wales area changed over from an export of 7 000 kW to an import of 244 000 kW, whilst South-East England changed over from an import of 96 000 kW to an export of 292 000 kW.

During the five years from Jan. 1, 1939, to Dec. 31, 1944, new generating sets in individual sizes up to 60 000 kW in 73 different power stations provided a total additional capacity of 3 896 000 kW, along with boiler capacity for over 49 million lb. of steam per hour. The concentration of the manufacturing industry of the country on munitions made it necessary to curtail very materially the normal plant extension programmes. Towards the end of the war the generating plant was barely sufficient to meet the requirements. During

* THE ELECTRICIAN, May 11, 1945, p. 418.

the war period the installation of new generating plant was attended by many difficulties due to shortage of labour and material, yet there were a number of examples of rapid construction of new power stations which constituted a triumph for British engineering.

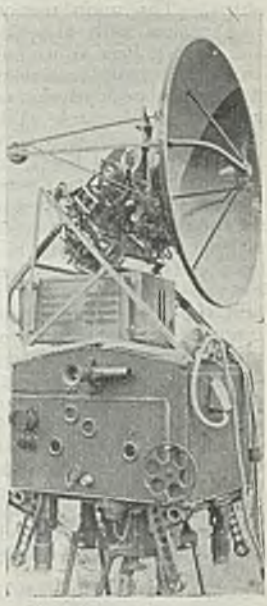
In addition to the problems, already reviewed, which faced the electrical engineer responsible for power supply he had the difficulties of securing adequate supplies of suitable coal and labour for maintenance, so that there could be no question that the successful operation of a system of public supply stations with an output in 1944 of over 38 000 million kWh, with an increase since 1939 of nearly 12 000 million kWh, was an outstanding performance. This increase in output of 45 per cent. was achieved notwithstanding a reduction of 27 per cent. in the personnel of electricity undertakings.

As the supply of electric power for industrial purposes was a prime war-time necessity, so was the maintenance and extension of communications between different parts of the country and overseas. In this field the British Post Office provided a vast private-circuit network for the operational, meteorological and administrative traffic of the fighting and allied Services, and enlarged its peace-time trunk system to reduce delays in priority traffic concerned mainly with the supply of munitions. The number of long-distance private telephone circuits over 25 miles in length in use for war purposes reached a peak in August, 1944, of 9 300, or one-and-a-half times the size of the whole pre-war public trunk system, while on the telegraph side the corresponding increase was four times.

Glaxo, the latest development in A.A. fire control radar

To meet the enormous expansion in the land services, the underground trunk telephone plant was also increased from 6 million miles of single wire in September, 1939, to nearly 11 million in April, 1945, i.e., almost doubled. In addition to the permanent systems a number of emergency routes were set up following the fall of France, to provide service in the event of invasion or of widespread damage to main routes. Much progress was made during the war in the equipment used on audio, carrier and coaxial systems.

On the radio side, the British Post Office contributed in many ways to the prosecution of the war. During the Battle of France in 1940, high-power long-wave transmitting stations in this country were successfully used to interfere with radio messages sent out by German Army headquarters to forward headquarters and tanks, thus reducing Allied losses considerably and permitting a longer time for a more orderly retreat. The advantage of short-wave radio was largely exploited by the British Post Office during the war.



Cupid, the unit developed for searching and following the V1 flying bomb

In order to cause confusion to the enemy flying over this country, the Post Office in 1940-41 picked up navigation signals sent out by the enemy and re-radiated them from comparatively low-power transmitters situated in this country. During air-raid "alerts," to prevent broadcasting transmitters being used by the enemy as navigational aids, each broadcasting system had two or three "spoiling" stations operating simultaneously. Crystals having identical performances controlled the oscillators of this family of stations so that they transmitted on precisely the same wavelength.

Many disasters due to enemy action overtook the Post Office during the war years. An example was the incident of May 10,

1941, when a high-explosive bomb on the Old Bailey severed 18 audio cables, 6 carrier cables and 4 coaxial cables, interrupting 5 200 working circuits, mainly long-distance.

No description of war-time telecommunications would be complete without some reference to submarine cables and cable ships. The main responsibility for communication with the Continent rested on the British Post Office submarine-cable network, the maintenance of which depended at the outbreak of war on two small repair ships, the Monarch (1 150 tons) and the Alert (940 tons), with a rather larger vessel, the Ariel (1 500 tons), under construction. A fourth, the Iris, was ordered immediately and commissioned eight months later. In the course of their work, cable ships were sitting targets for hours at a time, and it was not surprising that casualties were heavy. After the Alert and the Iris had laid the first submarine cable to the Normandy beach-head two days after the initial landing, the former was sunk with all hands on February 24, 1945, while repairing the Anglo-Belgian cable off Broadstairs, and finally the Monarch was lost on April 16, 1945. Prior to D-Day, in addition to maintenance and repair work, this fleet laid, at different points around the coast, eight major cable schemes totalling 375 nautical miles, and, since D-Day, a total of 559 nautical miles between this country and the Continent.

The war period had brought extensive activity in the design and manufacture of cables of all kinds. In communication cables for land use very little development work had been involved in the audio-frequency range. Improvement was, however, called for in the design and manufacture of coaxial cable transmitting frequencies from 60 kc/s to 2 Mc/s, in which a pair consisted of a central solid conductor and an outer tubular conductor. Between 1939 and 1945 over 400 main audio cables of various lengths and sizes were installed by the Post Office, 36 12-channel carrier cables (28 being wholly or partially equipped for 288 telephone circuits) and five coaxial schemes were brought into service.

Submarine Cable Communications

Throughout the war the Allies' communications, with their navies, armies and air forces, as well as the carrying of enormous quantities of Press traffic and personal messages for Forces overseas, had depended largely on the British Empire network. A secret telegraph network for the Services was provided mainly by the submarine cable system, a network of 155 000 nautical miles, which suffered many vicissitudes due to enemy action and other causes. The complete cutting of all five cables between Gibraltar and Malta was the only case, however, of cables being cut at sea by the enemy, although the capture of Malaya resulted in the loss of one cable route to Australia. Many hundreds of repairs to cables had to be carried out during the war, and some thousands of miles of enemy cable were used to strengthen the network.

The enormous quantities of Press traffic, etc., were mainly cleared on wireless circuits, the number of which was increased by about 50 per cent. during the war; and on this long-distance service an outstanding war-time technical development was the improvement of continuity by the extension of relay working. Another remarkable development in British electrical engineering enterprise during the war in connection with this Empire system had been the rapid development of wireless transmission of photographs, drawings, etc. Although the whole of the London photo-telegraph apparatus was lost during the " Blitz " in May, 1941, 2 000 facsimiles were being exchanged monthly over direct circuits between London and the principal cities of the world.

Broadcasting Developments

A telecommunication service which had played an important part in our war effort was that of broadcasting. In spite of all the war-time difficulties, the listening audience at home actually increased, from under 9 million licences in 1939 to close on 10 million at the present time. To-day, as the result of the war-time efforts of our electrical engineers, this country possessed the world's largest long-wave broadcasting station, capable of delivering to the aerials a power of 800 kW, as well as the world's largest short-wave broadcasting station, at which there were 12 transmitters, each capable of delivering a power of 100 kW to the directional beam aerials, of which there were 51. To improve home reception during the " Blitz " and to provide for local broadcasting in the event of the interruption of communications by invasion, the B.B.C. built and operated 64 small broadcasting stations. These were finally closed on July 28, 1945, when the B.B.C. changed over to the first instalment of peace-time broadcasting. All these transmitters were synchronised on one wavelength, an outstanding technical achievement.

Dr. Dunsheath went on to deal with the contribution of electrical engineers in the production of " Operation Pluto,* the destruction of magnetic mines,** the metadyne system for gun control, radar,*** the de-

* " Operation Pluto " was described in THE ELECTRICIAN, p. 461, May 25, 1944.

** THE ELECTRICIAN, p. 482, June 1, 1944.

*** THE ELECTRICIAN, August 17, p. 156, and August 24, p. 183.

velopment and production of electronic valves and cathode-ray tubes, and the development of wireless technique. He also referred to the extensive co-operation which was built up between the Services and the electrical industry for the purpose of solving the many problems of design and production which continually arose, and to the valuable war-time function fulfilled by the well-established research organisations of the large electrical manufacturers in this country.

Illumination Problems

Many illumination problems, he said, claimed the attention of the electrical engineer; for instance, the development of the highest-power searchlight in the world so far constructed, giving 1 000 million c.p., was no mean achievement, and with it went a protracted study of photometric properties of the atmosphere by means of instruments sent up to 30 000 ft. As the result of these experiments, bomber crews were briefed with a proper knowledge of the important effects of haze and night sky illumination.

Electric heating with sensitive thermostatic control provided an answer to the freezing up of sirens in cold weather, and some of them were modified to utter an alternative kind of howl as an intimation of an imminent raid. Special war-time electrical requirements typified by generators for " degaussing " equipment and instruments for aircraft were legion, but also there had been many ways in which the electrical engineer had helped the war effort in unusual directions. The application of vacuum technique developed in valve manufacture gave the solution for the freeze-drying of penicillin.

Among the manufacturing processes which had been developed by the electrical engineer for the conduct of the war, should be mentioned high frequency heating, in which the technique of radio at frequencies up to megacycles per sec. had been applied to the heating of metals by induction and of non-conductors (such as thick plywood for propeller blades) by dielectric loss.

The recent dramatic revelation of the progress made secretly during the war years in the release of atomic energy must make a strong appeal to the imagination of all electrical engineers. In the first place, without detracting in any way from the wonderful achievements of the physicists in this epoch-making development, it might be stated that the contribution of the electrical engineer had been of great consequence.

On a theoretical computation, one ounce of matter transformed entirely into heat energy would convert a million tons of water into steam. If the whole of the matter were converted it would only require a mass of 1 lb. to generate over 10 000 million kWh at 100 per cent. efficiency.

Dr. Dunsheath mentioned that the cyclotron was a remarkable development of the mass spectrograph of J. J. Thomson and Aston, invented at Cambridge 30 years ago.

He added that it was gratifying to know that during the last few months the research programme had been extended in three of the large electrical engineering laboratories in this country, where problems were now being solved for the Government. It was not to be lightly anticipated that the great success achieved so rapidly in releasing atomic energy would open up at once a new practical source of power, as there were many difficulties still to be overcome. Recently, however, it had been found possible to control a chain reaction generating heat continuously from nuclear energy, and it was practically certain that this work would quickly advance to the stage of providing energy for the electrical industry. Let them hope that this offspring of war might thus be tamed to peaceful uses and that the electrical engineer would be able to contribute still further by making atomic energy available as a boon to mankind.

FUTURE OF ELECTRICITY

Mr. Shinwell announced in the House of Commons on Tuesday that he hoped to make a statement in the very near future concerning Government policy on the future of the gas and electricity supply industries.

Colonel Thornton-Kemsley (C., Kincardine and Western) asked if Mr. Shinwell was aware that electric power companies had set aside £100 000 000 sterling for post-war expansion, but that the Government's proposals for nationalisation in the industry had created an uncertainty unfavourable to industrial expansion, and what steps he proposed to take to ensure that cheap electric power was made available at the earliest possible date in all rural areas.

Mr. Shinwell replied that he was aware many electricity supply undertakings had prepared schemes for post-war development, and in considering the organisation of the industry he would not overlook those schemes nor the necessity of improving electricity supplies in rural areas.

It is interesting to note that extensive plans for rural electrification have been drawn up by the Incorporated Association of Electric Power Companies. They have informed the National Farmers' Union, with whom there is to be a standing liaison committee, that they are to start at once to extend their services. The association agrees to minimise and wherever possible to avoid capital contributions by farmers towards the cost of carrying the supply to out-of-way areas.

Time Study

By JOHN W. HENDRY, F.R.Econ.S., F.I.F.M.

RECENTLY there has been evidence of a growing appreciation of time and motion study as a contributory factor to the resolving of industry's many problems. The impact of the war has brought about a demand for more accurate data on work-

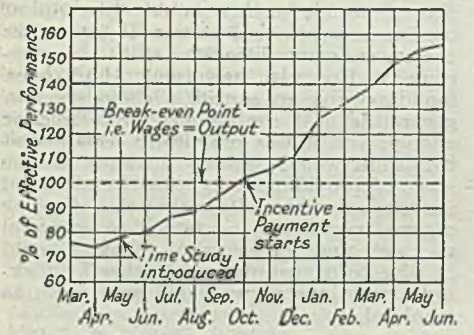


Fig. 1.—Operator efficiency

performance than that furnished by the traditional system of rate-fixing.

Further, the piece-work system has had its faults exposed and the recent trade disputes, together with the not so occasional fantastic bonus payments, have revealed the weakness of basing payment of results on arbitrary standards.

With the war over, and the contracts with the sole purchaser, i.e., the Government, coming to an end, the implacable battle between cost price and selling price is about to commence.

Cost control and all that it implies will prove to be the dominant factor in the industrial economics post-war era; high wages will probably be the keynote of labour's demands, and this may not be a bad thing, providing that high wages mean high output, which in turn means low unit cost.

It is in this connection that time study and its corollary, motion study, can be of most assistance.

High wages and low costs demand two early requirements; they are: (a) Each wage earner produces a measured effective return for wages paid. (b) A critical analysis is made of each job-task to find the " one best way."

Time study by its measurement of effective human endeavour ensures a fair return for the wages paid—fair, that is, to both employer and employee; also by its analytical breakdown of the work-task, it spotlights inefficiencies.

Motion study and economy, working on the inefficiencies revealed by time study, corrects and reduces fatigue-causing elements.

By the application of time study measurement an equitable distribution of incentive bonus is possible, and further, because of its factual reliability, ensures that once the target is set, incentive schemes can be installed with safety.

Its main contribution, however, lies in the fact that the overall efficiency is pulled up to a measured level before the incentive award becomes operative. (See Fig. 1.)

Pre-war, it was considered that the average operator efficiency, all other factors being equal, was only 75 per cent. of that of the Americans, certainly the average day work rate was approximately this figure as compared with time rate (or bonus received). During the war the position has worsened, the influx of women, the introduction of dilutees, outworkers, etc., have all depressed our total efficiency still further.

Time study by its qualifying system of rating ensures a raising of this standard. It would be unreasonable to set a target that only the best operator could reach and obviously unmoral to restrict earnings, because of the profit motive alone. Wages must be paid for a standard of workmanship, quality and quantity, that will compare no less favourably than with any other organisation, firm, trade or industry. In order to accomplish this, an average must be taken. Time study measures the work done by an average operator, under average conditions, exhibiting an average degree of skill and working at an average speed. If the operator being studied is above the average, he is rated high, if below, rated low, and thus a " norm " is produced, to which allowances are added for fatigue, relaxation and personal needs; this, then, results in a target in hours, units, or a combination of both, to conform to the costing system.

Detecting the " Square Peg "

Because the " norm " is based, therefore, on average, it follows that the abnormal worker receives more in the form of incentive, whilst the sub-normal remains static. This, of course, provides a basis for comparison and the expensive " square peg " can be easily discerned and the appropriate measures taken to correct the condition.

Reference to Fig. 1 shows how the measured efficiency before the incentive was applied was 76 per cent. This means

that to reach an output of 100 per cent. to compete on output with a firm which uses time study, an *extra* 31.5 per cent. of labour is required.

Assuming an average labour rate of 2s. plus 100 per cent. overheads, output of 100 then costs:

Rate 2/-
O.H. 2/-

4/- plus 31.5 per cent. (to compensate for the inefficiency ratio) = 5/3d.

But at the other end of the scale the efficiency is 156 per cent., so the 100 to be attained, only requires 64 per cent.:

2/- wage rate.
2/- O.H.

4/- @ 64 per cent. = 2/6¾d.

to which amount should be added the incentive payment of 2/- @ 56 per cent. = 1/1½d.

1/1½d. plus 2/6¾ = 3/8¼d., or a saving of 1/6¾d. per labour hour.

It will be observed that the greatest saving is in the overhead charge; this is due to the phenomenon of greater output for the same cost, thus reducing the cost per unit.

It is reliably assumed that only 5 per cent. of British industry uses time study, so, according to this figure, the total of 95 per cent. or 10 000 000 employables are not accurately measured.

Following this assumption through, it may be stated with some justification that only 5 per cent. of the 245 000 employing agents just do not know what their labour should be costing them.

Electrical News from India

From Our Own Correspondent

IF the necessary plant and equipment arrive in Ceylon within two years from now, as is anticipated, it should be possible to supply current from the Ceylon Hydro-Electric Scheme in 1948, states the Minister of Communications and Works, Mr. J. L. Kotalawala, in his observations on the supplementary estimate placed before the State Council in connection with the increased cost of the scheme as a result of the war.

According to revised quotations, an additional sum of approximately Rs. 9 500 000 is required for the scheme. About 65 per cent. of the civil and engineering work has been completed up to date.

Contracts for pipe lines, electrical and mechanical work were placed with British firms in 1939, but the contracts have been held in suspense owing to the war. In May last year a note was sent to the Secretary of State for the Colonies stressing the importance of the early construction of the scheme for the general economic development of the country; it was also pointed out that the existing generating plant is fast nearing the end of its useful life, and that a new source of supply would have to be secured within the next five years. A request was, therefore, made to the Secretary of State for the earliest possible allocation to the contractors concerned of all materials needed for the manufacture of equipment.

The original estimate of the cost of the whole hydro-electric scheme (including a sum of Rs. 145 313 spent on extensions at Watawala where the scheme is located) was Rs. 19 080 111, and this was to be charged against the 1937 Public Works Loan. There is no balance now available on the vote provided to meet the increased cost of the scheme, and though the money is not required immediately, it will be needed two years hence when, on the delivery of the machinery and equipment, payments will begin to fall due. The funds already released for the scheme—Rs. 15 000 000—will be sufficient to meet actual commitments for the next year.

On the suggestion of the Municipal Commissioner, Mr. M. G. Punniacotty, the Municipal Council of Calicut, South India, has decided to negotiate with the West Coast Electric Supply Corporation for acquiring the right of distribution, and authorised the Chairman of the Council, Rao Bahadur K. V. Suryanarayana Ayyar, and two other members of the Council to meet the management of the supply corporation in this connection.

The Administration Report of the South Indian State of Mysore, for 1933-44, states that the total outlay on the civil engineering works relating to the Jog power scheme in Mysore up to the end of June, 1944, was Rs. 15 280 000; the outlay incurred on the electrical portion of the scheme was Rs. 1 394 361.

The total expenditure incurred under hydro-electric works amounted to Rs. 677 497. Some of the larger construction works had to be suspended for want of necessary materials.

The Dewan of Mysore, Mr. N. Madhava Rau, in the course of his Budget speech in the Mysore Representative Assembly, re-

ferred to hydro-electric development in the State, and said that in spite of various difficulties and set-backs, very good progress has been made on the construction of the Jog works. The outlay on civil works is about Rs. 17 900 000, against a provision of Rs. 26 400 000 in the revised estimate. The Karagal anicut, the forebay and the materials track have been completed, while work on the main dam and the power canal and the erection of penstocks is progressing satisfactorily.

The generating capacity of the station during the first stage will be 48 000 kW; but provision has been made for increasing the capacity to 120 000 kW. If the whole of this power is to be profitably utilised it will be necessary to remodel and extend the transmission system and to establish a number of new transformer and substations. The probable cost of these extensions is Rs. 5 crores, which is to be spent over a period of years. The total capital investment on the State's electrical undertakings will thus have risen to about Rs. 16 crores. Details and specifications for the new schemes are being worked out and the cost is to be spread over five years.

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

Birkenhead Electricity Committee has appointed **Mr. J. Anwyl,** now assistant, as consumers' engineer.

Rotherham Electricity Committee has appointed **Mr. R. S. Atkinson** as power station superintendent.

Mr. Charles Caryll Baker, late chairman of the Kalgoorlie Electric Tramways, Ltd., left £26 509 (net £26 442).

The Sheffield Electricity Committee has recommended the appointment of **Mr. I. D. Campbell,** generation engineer to the Hull Corporation, as deputy general manager.

Mr. A. N. Duffett, resident construction engineer at Rotherham, has been appointed deputy borough electrical engineer of Blackburn.

The York Electricity Committee reports that **Mr. E. J. Nichols,** the city electrical engineer, will retire on reaching the age of 65 next February.

Mr. T. W. Dent, supervisor in the telegraph office at the L.N.E.R. Central Station, Newcastle-on-Tyne, has retired after 45 years' railway service.

Councillor P. Brady has been elected vice-chairman of South Shields Electricity Committee in succession to the late Alderman G. H. Linney.

Colonel Walter MacFarlane, head of Walter MacFarlane and Co., Ltd., has been nominated Deacon-Convenor of the Trades House of Glasgow.

The Battersea Electricity Committee recommends the appointment of **Mr. John Richard Jones,** chief electrical engineer at Hammersmith, as general manager and engineer.

Mr. J. G. W. Pawlyn has joined the board of Ransomes Sims and Jefferies, Ltd. He is chairman. Mr. Frank Ayton and Mr. Henry Deck are managing directors.

The Ministry of Fuel and Power has agreed to release **Mr. William Jones,** Regional Controller, Wales, and has appointed **Mr. Howell Owen** as his successor.

Mr. W. J. Allum, secretary of the Reading branch of the E.T.U., and **Mr. F. Taylor,** assistant secretary, are standing as Labour candidates at the forthcoming municipal elections in Reading.

Sergt. Arnold Watson, nephew of Mr. A. Goward, Accrington borough electrical engineer, who was taken prisoner at Hong Kong, has cabled that he is safe in Allied hands.

Mr. William John Wood, an apprentice electrical engineer with the British Thomson-Houston Co., Ltd., has been admitted a Freeman of Berwick, members of the family having been Freemen of the town for centuries.

Mr. James Carson has been elected a director of Stewarts and Lloyds, Ltd., and appointed assistant general managing director in charge of tube production to take the place of **Mr. A. G. Stewart,** now chairman and general managing director.

Flt.-Lieut. John Metcalf has been awarded the Air Force Cross; he was awarded the D.F.M. when a flight-sergeant. He was also mentioned in despatches for operations in Egypt and Libya. Until early in 1940 he was employed by the Automatic Telephone and Electric Co., Ltd.

At a farewell gathering in the Stockport electricity showrooms, of employees of the undertaking and members of the Electriciay Committee, **Mr. G. H. Oldroyd,** who has retired from the position of electrical engineer after 38 years' service, was presented with a wallet containing bank notes. The gift was handed to him by the Mayor.

On his retirement after 48 years' service, **Mr. Samuel Carlisle,** deputy general manager of the Belfast transport department, was the recipient of a token of the esteem and regard in which he is held by his colleagues and staff, at a social party pre-

sided over by **Lt.-Colonel R. L. M'Creery,** general manager and engineer, who was recently demobilised.

Mrs. W. H. Seymour has relinquished the chairmanship of the Blackburn Electrical Association for Women on health grounds. She had been in office for eight years.

Sir Edward Wilshaw, chairman, and the directors of Cable and Wireless entertained at luncheon on October 3 at Electra House, Victoria Embankment, W.C.2, members of the staffs of the telegraph and Press censorships who have been attached to the company's London telegraph station.

Mr. Bentley Jones has joined E. K. Cole, Ltd., as assistant radio sales manager. He was for twelve years with the E.M.I. group of companies and immediately prior to the war was sales manager of H.M.V. household appliances. He joins E. K. Cole from I.C.I., Ltd., where he has been engaged since 1939.

It is announced by A. Reyrolle and Co., Ltd., that **Sir Claude D. Gibb** has been appointed deputy chairman of the company, Sir Claude recently relinquished his appointment in the Ministry of Supply, and is chairman and managing director of C. A. Parsons, and Co., Ltd.. **Mr. George Wansbrough** who is chairman of A. Reyrolle and Co., Ltd., is a member of the Development Areas Treasury Advisory Committee, recently appointed to advise the Treasury in giving financial assistance to industry under the Distribution of Industry Act, 1945. **Mr. Andrew J. Bowron,** who has been superintendent of the Royal Ordnance Factory at Llanishen, Cardiff, was released at the end of September by the Ministry of Supply to take up the position of production manager at the Hebburn works.

Mr. A. J. Bowron

Sir Clive Baillieu, president of the Federation of British Industries, has returned from Paris, where he, with a party of British industrialists, has been having conversations with leading French industrialists. Among those who accompanied Sir Clive was **Mr. F. C. Holroyde,** president of the B.E.A.M.A.

A paper on "Operation Pluto," prepared by **Mr. F. Shaw,** of Siemens Brothers and Co., Ltd., was read before the members of the London Centre of the Institute of Traffic Administration at Alliance Hall, Palmer Street, Westminster, last night, October 11. Special reference was made to the design and manufacture of the Hais cable.

Mr. Kenneth R. Evans has been appointed manager of the education department of Metropolitan-Vickers Electrical Co., Ltd. He was educated at Denstone College, Staffordshire, and Sidney Sussex College, Cambridge, and secured second class honours, Natural Science Tripos, in 1920, having returned to Cambridge to complete degree studies after four and a half years' service with the Lancashire Fusiliers (3rd Salford Pals Battalion), in which he held the rank of captain. Subsequently Mr. Evans was admitted a corporate member of the I.Mech.E. and the I.E.E. and also the Institute of Labour Management. He went to the Metropolitan-Vickers Electrical Co., in 1920, and assisted Sir Arthur P. M. Fleming in his work as director and manager of the education department. He now succeeds Sir Arthur Fleming, who was the first manager when the department was formed more than thirty years ago.

Mr. K. R. Evans

Mr. J. Bloome has relinquished his services with Johnson and Phillips, Ltd., after twenty years in their transformer and switchgear departments, to take up the appointment of general manager to London Transformer Products, Ltd. Mr. Bloome received his engineering training with the Metropolitan-Vickers Electrical Co., Ltd. and at Royal Technical College of Salford.

Mr. William Dixon, the new chairman of the North-Eastern Centre of the I.E.E., served his apprenticeship with C. A. Parsons and Co., Ltd., and joined Messrs. Merz and McLellan, consulting engineers, in 1911, becoming a partner in 1937. He was closely connected with the construction of the County of London Electric Supply Co.'s Barking power station, and the building of the Littlebrook power station for the Kent Electric Power Co.

At the October meeting of the Coventry Electric Club **Mr. R. Court** delivered a lecture on "Flame-proof gear and installations." The author gave a brief historical survey at the gradual increase in safety due to the improvements in design of flameproof apparatus from the original "gas-tight" type, to the present day Buxton certified gear, including the main details of design of up-to-date equipment. The meeting was well attended and an in-

teresting discussion followed. **Mr. F. W. Godden** was in the chair.

Mr. G. K. Palmer has been appointed assistant managing director of Brush Coachwork, Ltd. Mr. Palmer's first appointment was with the Harrow Electric Light and Power Co. During the 1914-18 war he held commissioned rank in the Royal Engineers and the R.F.C. and was mentioned in despatches. In 1920 Mr. Palmer joined the Birmingham and Midland Motor Omnibus Co. and was appointed assistant chief engineer in 1921; in 1931 he left to join Crosville Motor Services, Ltd., and in 1939 was appointed acting chief engineer, which position he has left to join Brush Coachwork, Ltd.

Mr. T. H. Windibank, the works director at the Chelmsford factory of Crompton Parkinson Ltd., when addressing students and visitors at the firm's occupational training scheme prize-giving on September 25, emphasised that the Crompton Parkinson training scheme was designed to give equal opportunity to all boys regardless of their parents' wealth or social position. He stressed that any boy with the necessary ability could rise to be works manager; in fact, his training would be directed to that end. He said there were 153 boys in eight classes. During the past year, two students had been promoted to student apprenticeships, three had been taken from the works to be trained as draughtsmen, and one had gone to the research laboratory. He hoped that before long the Crompton Parkinson scheme would be further developed. **Mr. B. Hallows Garside,** general manager of the Chelmsford works, presented certificates of training to students who had completed their period of tuition in the occupational training scheme.

The London Passenger Transport Board announce that **Mr. J. H. Parker,** the chief electrical engineer, is retiring on the grounds of ill-health, and **Mr. P. Croom-Johnson,** chief civil engineer, is to be chief engineer responsible for both civil and electrical engineering departments. **Mr. G. F. Sinclair,** chief engineer (trams and trolley 'buses) is to be deputy general manager (road services).

Mr. P. Croom-Johnson

Mr. J. H. Parker has had 15½ years' service with the Board and the London County Council. In 1904, after a technical education followed by practical experience in electrical engineering, Mr. Parker was appointed by the Greenock Corporation as power station superintendent. He then became deputy electrical engineer of Croydon Corporation. From 1925 to 1930, Mr. Parker was borough electrical engineer and traffic manager for the West Hartlepool Corporation, and was responsible for the conversion of the West Hartlepool tramways to trolleybus operation. In 1930, he was appointed by the London County Council as electrical engineer of the tramways department. In 1933, on the formation of the Board, Mr. Parker was responsible to Mr. J. H. Millen, the then chief electrical engineer, for the electrical supply and equipment of the tram and trolley 'bus systems. In 1937, he was appointed electrical engineer (distribution), and on February 1, 1939, became a principal officer and chief electrical engineer, following the retirement of Mr. J. H. Millen, and later he assumed direct responsibility for all new works in the department.

With reference to the death of Mr. J. Y. Fletcher, recorded in THE ELECTRICIAN of September 28, Mr. W. H. Williams writes: May I add a personal tribute to what has already been written in remembrance of James Young Fletcher. I had the privilege and pleasure of being intimately associated with him for nigh on thirty years, and am proud to have enjoyed his friendship. His life's work for the G.E.C. and for the electric lamp and lighting industry has been spoken of, and is well known. It will long be remembered. "J.Y.", as he was familiarly known, was a man of dynamic energy and determination, wonderful at getting things done, a great leader. He was a man of many parts—a great student of the Turf (he could name from memory the sires for generations of all prominent racehorses); he loved "Diana"—that was the name of his yacht; farming absorbed him; he was greatly interested in the theatre and was a regular "first-nighter." A great personality, but with it all, a very human man, always ready to help; how much no one will ever know, for it was always done so very quietly. A real man, and a much loved friend has passed and has left a gap that never will be filled. No-one will attempt that.

Obituary

Mr. Alexander Buchanan Selkirk, of D. B. Selkirk and Co., medical electricians, Glasgow.

Emeritus Professor William John Goudie, who occupied the James Watt Chair of the Theory of Practice of Heat Engines at the University of Glasgow from 1921 until he retired in 1938. He was born at Girvan in 1868. During the 1914-18 war he was engaged on research work for the Air Board.

Transportable Power Units

Special Equipment Designed and Manufactured for U.S.S.R.

IN the April 20, 1945, issue of THE ELECTRICIAN reference was made to the mobile power stations supplied by the Metropolitan-Vickers Electrical Co., Ltd., for service in the U.S.S.R. A somewhat similar development is a transportable turbo-generator set designed and manufactured by the same company to the instructions of the Ministry of Supply, also for the U.S.S.R. This unit consists of a 500 kW turbo-alternator with condenser and auxiliaries in one transportable assembly and, separately, a switch cubicle, and a case of loose items and spare parts. The main assembly is self-contained and is provided with skids to facilitate its disposal near a suitable steam and cooling water supply.

A complete set is shown in Fig. 1, where, with its foundation structure, it is being hoisted by crane. This structure is of fabricated mild steel plate and though light, is extremely rigid and free from resonant vibration.

The turbo-set itself is a small derivative of the company's self-contained turbine, in which the condenser is integral with the turbine exhaust casing. It is of the single-cylinder h.p. impulse type, operating at 6 500 r.p.m. with stop valve steam conditions of 214 lb./sq.in.g. 518° F. The l.p. end is supported on a transverse beam and the h.p. end is carried by the gear box. There are six rotor wheels of which the first three are forged

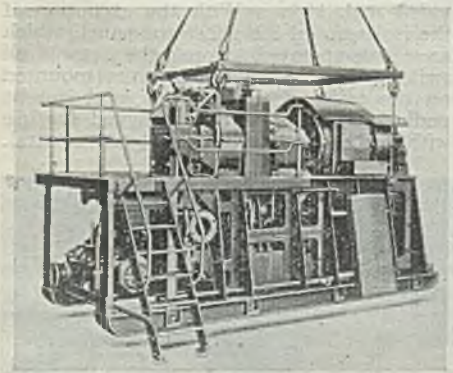


Fig. 1.—Complete transportable power unit being hoisted

solid with the shaft; the remaining three are separate, being pressed on and keyed. The first wheel carries a velocity compounded stage, and the other five single impulse type stages. The steam chest, integral with the top half of the h.p. end of the cylinder, is equipped with two automatically - operated governor valves controlled by an oil relay system. These valves control the admission of steam to two nozzle groups, one of which deals with loads up to approximately 350 kW, while the other and smaller group deals with

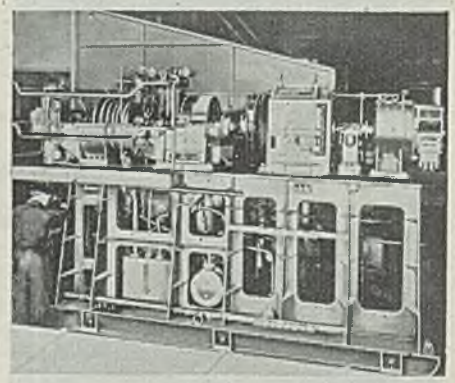


Fig. 2.—Side view of unit nearing completion

loads up to the maximum rating. On the steam chest a selective device is incorporated to enable efficient running to be obtained at partial loads, by permitting the smaller groups of nozzles to be first brought into use.

The condenser is of the surface type, of 450 sq. ft. cooling area and is arranged axially beneath the turbine. Fabricated construction has been used for the condenser shell and the associated bottom half-casing of the low pressure end of the turbine cylinder. The c.m.r. is based on a vacuum of 27.5 in.Hg. and a supply of 935 gal. per min. of circulating water at 68° F. The main circulating water pump is of the vertical type, mechanically-driven from the main turbine shaft and mounted on the same spindle as the condensate extraction pump, which is of the centrifugal type. Air is removed from the condensate by a two-stage steam-operated air ejector, provided with inter- and after-coolers. The main feed passes through these coolers and thus the latent heat of the ejector operating steam is conserved. In order to give an extra discharge head of 49.0 feet to the circulating pump, a horizontal motor-driven booster pump is fitted into the cooling water discharge line from the condenser.

Transmission to the 1 000 r.p.m. alternator is effected through double-helical single-reduction gears of ratio 6.5 to 1. A flexible quill drive is used to couple the turbine spindle and the gear pinion A claw type coupling engages the pinion on the remote side, from a flexible shaft,

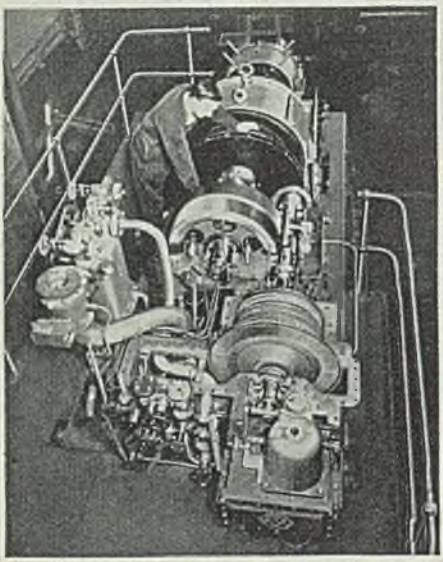


Fig. 3.—View from above of the set illustrated in Fig. 2

which is coupled to the turbine spindle and passes through the hollow pinion. The gear wheel in turn is connected to the alternator shaft by a solid type registered coupling. The gear case is fabricated from mild steel plate and is split horizontally about its centre.

The alternator is rated to give 500 kW (625 kVA at 0.8 p.f.), 400 V, three-phase, 50 cycles at 1 000 r.p.m. It is of the salient pole, rotating field type, with six poles on the rotor. Ventilation is provided by a fan mounted on the rotor, air being drawn into the machine at the exciter end and expelled at the turbine end. To prevent falling water entering the end bells, a canopy is fitted. The stator yoke is made of cast-iron with internal ribs machined and key-waved to carry the one-piece circular stampings constituting the stator core. The stator winding is of diamond pattern with coils insulated with class B insulation and formed before insertion in the open slots. The completed stator winding is vacuum dried and then impregnated with bitumen compound under pressure.

The magnet wheel with its shaft and solid half-coupling is turned from a single forging. Robust field coils of copper strap, bent on edge and insulated with class B insulation, are fitted on to laminated poles which are then secured by bolts to the magnet wheel. A shaft extension is spigotted and bolted to the end of the magnet wheel remote from the coupling end. On this extension is turned the journal for the bearing and the seating for the exciter armature, which is overhung.

Like the alternator, the exciter has protected type enclosure, and is fitted with a canopy. It is a standard shunt wound d.c. machine equipped with interpoles and with small cumulative stability windings to give stability in operation over a wide range of voltage. The exciter is controlled by a field rheostat and for fine adjustment by an automatic voltage regulator. A direct-on starter is included to operate the booster pump motor.

The switchgear is contained in a sheet steel cubicle type indoor switchboard, and is mounted separately from the turbo-assembly. The cubicle consists of four panels arranged for controlling the generator, the exciter and four feeders. There is, in addition, a small synchronising panel mounted on the hinged bracket outside the cubicle. The framework is robust and is constructed to allow for slinging from a crane and levering into position. The main doors are at the rear and are provided with locks. With the exception of the isolators on the generator panel, which are pole-operated from the rear, all switches are operated by levers mounted on the front of the cubicles, and can be padlocked. The gear is designed for use with either earthed or insulated neutral.

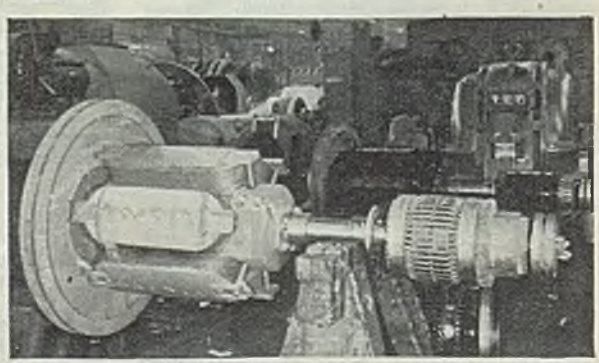


Fig. 4.—Rotor of 500 kW alternator for transportable unit

The busbars are sufficient in capacity for two 500 kW equipments and the switchboard is so arranged that it can be paralleled with a similar set of cubicles placed alongside. The generator control cubicle carries the circuit-breaker, instruments and their associated details. The circuit-breaker is of the 1 000 A (per phase) BL2 type fitted with three overcurrent and one unrestricted earth-fault releases, each with a shunted time-lag fuse and mechanical "on" and "off" indicator. The meters comprise ammeter type SL, power factor meter type FC, watt-meter type FC, and watt-hour meter type NEL, with their requisite current transformers. The exciter control cubicle includes the shunt field rheostat, the carbon pile type VP voltage regulator, instruments and a series of knife switches with fuses. The regulator is provided with power factor compensation, which can be switched out at will, and the regulator itself can similarly be cut out when desired. The switchgear for the station auxiliaries—circulating water booster pump, forced draught fan, lighting and two spare auxiliary feeders—is also carried on the exciter control panel. Each main feeder cubicle carries two complete feeder circuits of 125 kW capacity. The equipment consists of knife switches with fuses, ammeters with their current transformers, and neutral links.

If it is desired, the power unit can at once or at a later date be mounted permanently on concrete foundations, and thereby become an ordinary power house plant. The power sets and their switchboards have been so arranged that two units can be run in parallel.

Progress of Lighting

Presidential Address Before The Illuminating Engineering Society

IN his presidential address at the opening meeting of the Illuminating Engineering Society, on Tuesday, Mr. H. C. Weston pointed out that the society commenced its first peace-time session after six years with a membership of more than twice the pre-war strength. The history of lighting might have been very different but for the effects of wars in Europe centuries ago. One of these effects was the disruption of the civilisations of ancient Greece and Rome, followed as it was by centuries of cultural stagnation and retrogression. The Greeks had remarkable street lighting, for example, in ancient Antioch, but it was only in modern times that this amenity had been a feature of our own cities and, even now, there was much room for its improvement.

In the writings of the Roman poet, Lucretius—who described the atomic theory of matter formulated by Greek philosophers—occurred what was probably the earliest description of glare. Yet, two thousand years after the death of Lucretius, glare remained one of the most common faults of lighting. Every effort should be made to eliminate it and rules of practice for its avoidance were features of the new I.E.S. Code which was about to be issued.

There had been a steady rise, during the past 25 years, in the values of illumination recommended for good lighting. That rise had been facilitated by the falling running cost of artificial lighting, and had naturally been encouraged by the lighting industry. But the upward trend of recommended standards of illumination was justified by accumulating evidence of the effects of conditions of lighting upon human efficiency.

Personal efficiency was one of the indices of health and though there was no single and simple method of measuring the latter, if it was found that better lighting improved our efficiency it was because our health was improved.

It was a great mistake to suppose that the meagre values of illumination available with artificial lighting in "the good old days" were adequate for comfort, health and efficiency. Most of the fine work done by our forefathers was done in daylight, and some of the old craft guilds prohibited night work because it was likely to result in bad craftsmanship.

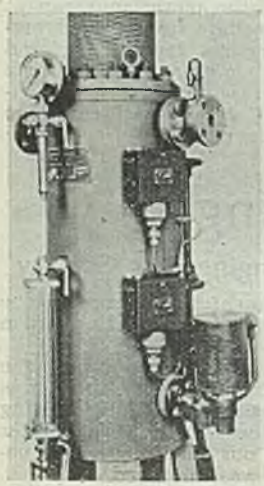
The new fluorescent lighting, which had proved such a boon in our war factories, and in other places where war service had to be done without any daylight, had not altogether escaped adverse criticism. Much of this was misconceived, and some was due to installation faults and neglect of maintenance. No satisfactory evidence that it had any ill-effects upon the eyes had yet been brought forward.

Bad or indifferent lighting was still widespread. It was responsible for much discomfort, strain, irritability and loss of efficiency. Just because they were commonplace, these supposedly minor ill-effects of improper lighting were important. There was no need to look beyond them to find justification for our interest in the advancement of the science and art of lighting, and for the efforts of the Illuminating Engineering Society to secure better lighting in every field.

Electrode Steam Boilers

Some of the Advantages Claimed for Use in Textile Work

NOTABLE progress is being made with electrode heating of steam boilers, using a.c., which, for many smaller establishments in the textile industries, including special laundries, has a number of advantages compared with gaseous, liquid, or solid fuel firing. For many applications, when current is available at a reasonable price, say 0.30-0.60d. per unit, electric steam generation is no more expensive than by fuel in net annual cost, and in some cases it is cheaper.



Typical electrode steam boiler

Amongst the advantages are simplicity and very small size of apparatus, since no flues or special ventilation are necessary, so that such boilers can easily be placed alongside the steam-using equipment. Another feature is extreme flexibility of operation, as well as easy and convenient automatic control, so that the boilers can be started up from cold in a few minutes, the change-over in the rate of steam production to steam pressure being rapid.

In hosiery and knitwear establishments, for example, the electrode boiler is particularly suitable for presses. It is usually operated at about 40-60 lb. per sq. in., either intermittently or continuously. Often a battery of such presses is used, the varying demands for steam being supplied easily and efficiently without waste of steam and heat. These electrode boilers are equally suitable for general purpose presses in the clothing trade, as well as special presses for sleeves, collars and vests. Another use is in modern cap-making and shirt factories, where steam is required generally at 15-30 lb. per sq. in. for blocking and pressing irons. In weaving mills, where warps and tapes, after passing through the sizing bath with pressure rollers, are dried continuously on steam-heated drums, the electrode boiler is found to be particularly convenient, being situated close to the drier and under direct control of the operators of the sizing plant.

Prominent in this field are Bastian and Allen, Ltd., whose standard electrode steam boilers, vertical and cylindrical in shape, of solid drawn steel, are available in sizes within the range of 25-1 000 kW, taking a.c. at 346-440 V 3-phase, 50 cycles, and evaporating 75-3 000 lb. of water per hour. Approximately the performance is 3 lb. evaporation per kWh, within the range of, say, 2.85-3.30, according to the inlet temperature of the feed-water and the steam pressure. The latter is up to 120 lb. per sq. in. gauge (250 lb. test pressure). The boiler has a dished bottom and a bolted flat top cover, being carried on four channel iron legs, whilst the electrodes are made of cast-iron plate wrapped round to form a circle, three in number (one for each phase) dipping into the water, and suspended from the cover supported in heavy porcelain bushings. The boiler is insulated with 2 in. magnesia-asbestos blocks in an outer casing of planished steel with stainless steel bands and screws.

Simple in Operation

The overall dimensions for the 30-1 000 kW range are 42¼ in. x 98 in. high and 19 in. x 40 in. diameter, with a maximum evaporation of 100-3 350 lb. per hour. Complete equipment of mountings and auxiliaries is provided, the feed pump being of the single-acting drum type direct-coupled to a totally-enclosed electric motor through enclosed oil-immersion gear, the size of the motor being ½ H.P. for the 30 kW boiler, and up to 1¼ H.P. for the 1 000 kW boiler. The control panel wall mounting has a 6 in. dial ammeter, automatic and adjustable load control relay, motor starter for the feed pump, overload protection and a set of fuses.

Operation is simple, merely necessitating the use of the starting or stopping switch and the regulating handle to the steam pressure required. Included in other advantages are no labour, a very high thermal efficiency, about 98 per cent. safety, and negligible trouble with scale.

House Wiring Delay.—At a meeting of Brackley R.D.C. it was stated that 26 houses at Aston-le-Walls had been wired for electricity in the early part of the war, but they could not be proceeded with owing to restrictions. The Clerk stated that he had written to the Electricity Commissioners, but so far no reply had been received.

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.

North of Scotland Hydro-electric Board, October 15.—Supply, delivery and erection of 132 000 V transmission lines. Specification from Mr. T. Lawrie, 16, Rothesay Terrace, Edinburgh, 3; deposit, £5 5s.

Stone (Staffs.) Electricity Department, October 15.—Supplies of underground main and overhead line materials. Particulars from Mr. C. Scholefield, 56, High Street, Stone, Staffs.

Cumnock and Holmhead T.C., October 15.—Electrical work in connection with the erection of 20 Swedish timber houses. Applications to the Town Clerk, Cumnock, Ayrshire.

Inverkeithing T.C., October 18.—Electrical work in connection with the erection of 48 houses at Hillfield. Applications to the Town Clerk, Inverkeithing.

Alloa T.C., October 24.—Electrical work in connection with the erection of 20 Swedish timber houses at Hutton Park. Specifications from the Burgh Architect, Municipal Buildings, Alloa.

Hackney B.C., October 26.—Supply and delivery of six 500 kVA transformers. Specification from the Borough Electrical Engineer, 18/24, Lower Clapton Road, E.5.

Manchester Electricity Department, October 26.—Supply, delivery and erection of ventilating plants for No. 2 boiler house, Stuart Street generating station (Spec. No. 839). Particulars from Mr. R. A. S. Thwaites, Electricity Department, Town Hall, Manchester; deposit £1 1s.

Sheffield Electricity Department, November 5.—Supply and delivery of one 20 MVA, 33/11 kV, 3-phase, double-wound, self-cooled transformer. Contract No. 706. Specification from Mr. John R. Struthers, Commercial Street, Sheffield; deposit, £2 2s.

North of Scotland Hydro-electric Board, November 6.—Supply, delivery and erection of 11 000 V distribution lines in connection with Distribution Scheme No. 2. Specification from Mr. T. Lawrie, 16, Rothesay Terrace, Edinburgh, 3; 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.

News in Brief

X-ray Installation.—The Bradford Health Committee is to provide new X-ray plant for Grassington Sanatorium.

Supply to Farmers.—The Nelson Electricity Committee is providing supplies of electricity to agriculturalists in the Roughlea area. Nine farmers desire such a service up to date.

Blackburn Sales Department.—The Corporation has agreed to the establishment of a sales and development section of the electricity undertaking.

Liverpool Savings Week.—Thanksgiving Savings Week investments included: Automatic Telephone and Electric Co., Ltd., £100 000; Cable and Wireless, Ltd., £50 000; Liverpool Overhead Railway Co., £12 000; British Insulated Callender's Cables, Ltd., £10 000; Radiovim, Ltd., £1 000.

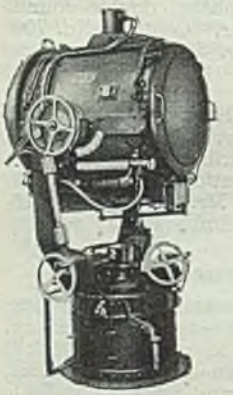
Clinic Heating.—The Stretford Welfare Committee has asked the Borough Engineer to report as to the practicability of the installation of tubular heaters, or some other form of electric radiators for providing alternative heating at Trafford Park clinic.

Exchange of Officials.—The City Electrical Engineer of Melbourne, Australia, has sent a letter to the Liverpool Electric Power and Lighting Committee suggesting an exchange of officials. The Committee passed a resolution proposing that two members of the electrical engineering staff from Melbourne should visit Liverpool to gain experience and that all necessary facilities be granted. Consideration as to whether personnel from Liverpool should visit Melbourne for the same purpose was postponed.

Manufacturers' War Record

Searchlight Equipment for the Services

FOR the last forty years the London Electric Firm, of Croydon, have been making searchlights of every description, including the largest and the smallest in the world, and their war-time activities included the design and manufacture of searchlights of a novel pattern for a special Service requirement. These equipments were fitted with the firm's well-known high intensity lamp, which has proved its efficiency in many applications over a number of years, and the generating plant, automatic control gear and cabling were also supplied.



A modern naval searchlight

Among other war contracts executed was one for cable winding drums, with enclosed slip rings and brushes in medium sizes, and large units for dealing with heavy cables for use in connection with sinking pumps for clearing water from mine shafts, and so on. The drums were fitted with junction boxes for sealing in the 3-phase, or other supply cables, and the collector rings remained stationary while the brushes rotated. Heavy worm and spur gearing for hand winding was used, and a hand brake was available for holding the load.

A phenomenal number of hand winches were supplied to several Service departments by the firm, who commenced the manufacture of earlier types nearly half-a-century ago. These were required for multifarious purposes, including the raising and lowering of aerials in the field, for portable tools in aerodromes, racks for workmen's clothes and a number of special uses.

Distance control, which has been one of the firm's specialities for many years, has been further developed during the war years by the provision of turning gears for aerials, and accessory apparatus of precision order for radio work.

The manufacture of the company's well-known raising and lowering gear for lighting fittings has been continued, chiefly for war factories and other essential services, including obstruction lights on chimneys and masts fitted at heights difficult of access, sometimes as much as 240 ft. It is essential to have a ready means of lowering these lanterns for cleaning and maintenance purposes.

Workers-at-War Exhibition

SEVERAL electrical companies are participating in the "Workers-at-War" Exhibition which was opened by Mr. George Isaacs, the Minister of Labour and National Service, at Greenwich Town Hall, on Saturday, October 6. It has been organised by an industrial committee representing all the prominent firms in the borough, and the exhibits are typical examples of their war-time products, or pictorial records of workers engaged on manufacturing processes. Johnson and Phillips, Ltd., show pictures illustrating bomb damage caused to their premises in September, 1940, and March, 1945; of one of the electric transformers built for the U.S.S.R.; girls engaged on braiding cables for the Air Ministry and the Admiralty, and stranding fine wires; the extruding of the lead alloy pipe for "Operation Pluto," special machinery used for laying the Hais cable, and the cable ship "Holdfast" alongside the J. and P. wharf; and other war-time activities. Siemens Brothers and Co., Ltd., display specimen sections depicting the development of the Hais cable in three stages—the prototype, the two-inch pipe and the three-inch pipe that was finally adopted for "Operation Pluto"—as well as the special coupling designed by the company for joining sections of the cable. There are also on the stand specimens of various types of power cables made for the fighting services, aerodromes, factories and docks; and a wide range of tele-communications equipment, including a waterproof portable telephone set developed by the company for jungle warfare, an electro-magnet telephone transmitter fitted into an airman's helmet, a telephone transmitter for use in a gas mask, a head receiver and an electro-magnetic throat transmitter used by Commandos and others; various types of electric relays, and so on.

The Anchor Insulating Co., Ltd., show samples of insulating materials used for war purposes; Brooks Crystals, Ltd., demonstrate the production of crystals

used in radar equipment; the Delta Metal Co., Ltd., exhibit a range of metals used in radio equipment, aircraft instruments, range finders, etc.; at the stand of J. Stone and Co., Ltd., are, among other products, a generator exciter as used on searchlight equipment, and castings for the Whittle jet engine; Saxonia Electric Wire Co., Ltd., in addition to numerous types of insulated electric wires and cables made during the war, show a penicillin tank electrically heated, using Insuglass heater wire; G. A. Harvey and Co. (London), Ltd., display photographs of their perforated mild steel cable plates used for various applications in warships and submarines, depth charge cases and a 600-lb. A.S. bomb, as well as transformer tanks; the Anglo-Swedish Electric Welding Co., Ltd., have pictures of war-time welding repairs, sample welds and so on; the Telegraph Construction and Maintenance Co., Ltd., have on their stand samples of their cables, and demonstrate the respective characteristics of their products, Mumetal, Radiometal and Rhometal, and also Telecothene sleevings and mouldings, all of which had war-time applications in relation to telecommunications and radar. Sofnol Ltd. exhibit illustrates the prevention of scaling in boiler tubes, etc., and the removal of scale from pipes by Sof-N-it. The exhibition closes tomorrow, Saturday.

Jet Propulsion

Electrical Industry's Association with British Development

IN THE ELECTRICIAN of February 25, 1944, some particulars were given of the development of jet propulsion as far as it interested the electrical industry, and for this reason the remarks of Air-Commodore Frank Whittle, when he delivered the first James Clayton Lecture before the Institution of Mechanical Engineers, in London, on October 5, are of special significance.

Air-Commodore Whittle first started thinking about the use of jet-propulsion for aircraft in 1928. He applied for his first patent in January, 1930. His specification was submitted to the Air Ministry, but was turned down on the ground that the practical difficulties in the way of development were too great. During 1930 he tried to interest various firms in the scheme, but met with no success.

In May, 1935, he was approached by two ex-R.A.F. officers, Messrs. R. D. Williams and J. C. B. Tinling, who suggested that they should try to get development started. Though the original patent had been allowed to lapse through failure to pay the renewal fee, the three decided to co-operate.

They eventually succeeded in coming to an arrangement with a firm of investment bankers, which led to the formation of Power Jets, Ltd., in March, 1936. The initial sum subscribed was £2 000, and, said Air-Commodore Whittle, " with this we cheerfully went ahead." The President of the Air Council was a party to the agreement, which resulted in the formation of Power Jets, and the Air Ministry was a shareholder from the start.

Power Jets placed an order for the manufacture of the engine with the British Thomson-Houston Co., Ltd., in June, 1936. Its specifications were beyond all previous engineering experience in each of the major components. Testing of the engine started on April 12, 1937.

After the first series of tests the Air Ministry placed contracts with Power Jets for further research running, but the work was still regarded as " long-term " research.

Air-Commodore Whittle described the early difficulties with a series of progressively better engines, most of which eventually broke down after test running. In the summer of 1939 the Air Ministry ceased to regard the development as a matter of long-term research. Power Jets received a contract for an engine which could be flown, and a short time later a contract was placed with the Gloster Aircraft Company for an experimental airframe, known as the E28/39, which became the prototype of the Meteor. In April, 1941, a Whittle engine was installed and the aircraft left the ground for the first time.

Evidence from Germany had shown that the Germans started practical work on jet-propulsion gas turbines about the same time as ourselves—in 1936—but they succeeded in flying with this system a few days before the war. However, the engine they used was of a type subsequently abandoned, and successful flight trials with the new type did not take place until some time after the British flight trials in May, 1941.

The British engine with which the flight trials of the E28/39 were carried out was the obvious parent of a successful series of British and American engines.

Jet propulsion was only one way of using the gas turbine in aircraft propulsion, and the gas turbine was the only one of five systems of jet propulsion developed during the war. It has already been used successfully in locomotives in Switzerland, and it may reach some prominence in the field of marine propulsion.

School Buildings for Scotland

Planning Committee's Electric Heating Recommendations

THE report of the Committee on School Buildings for Scotland, No. 21, of the Post-war Building Studies (Stationery Office, 1s. net) has just been published. Among those who gave evidence were Mr. E. B. Doughty (Glasgow electricity department), Mr. M. W. Hime (district engineer, E.L.M.A., Glasgow), Mr. G. B. Miles (senior education engineer, Central Council for School Broadcasting), Mr. W. F. Mitchell (consulting electrical engineer, Edinburgh) and Mr. G. V. Downer (consulting electrical engineer, London).

Cost and Efficiency

In the appendix dealing with heating and ventilation of schools, the Committee state that the choice of a heating system should be governed by two main considerations, cost and efficiency, the cost being considered in relation both to initial and to maintenance expenditure. The systems most suitable for schools were low-pressure hot-water heating and electrical heating. For the former the source of heat might be electricity, using either thermal storage or electrode boilers. Heating by means of electrical energy was practicable; the various appliances and fittings were robust and maintenance costs were low, but the running costs were higher than for fuel-fired boilers with low-pressure hot-water systems. The choice of the indirect or direct method would be determined by economic factors. With the former where electrical energy was used to heat water in boilers or circulators, these might be situated in any convenient position, as no provision was required for flues, storage of fuel, or removal of ashes; the boilers were simple, compact and robust, but they operated on a.c. systems only. Opinions differed as to the economic value of thermal storage systems since, owing to day-to-day fluctuation in the weather, more hot water might be accumulated than was required. Systems without storage were cheaper to instal, but the cost of the electrical energy required serious consideration.

For a system where electrical energy was applied directly to the heaters in the various rooms, several types of unit were available. Tubular heaters were robust, and the majority of manufacturers would guarantee a life equivalent to five years' continuous use. They were easily installed and could be readily adjusted if structural alterations were necessary. They were usually loaded at 60 W per foot and attained a surface temperature of 120°F. above the ambient, or approximately 200°F., but guards were necessary to prevent accidents. Room temperatures could be raised rapidly, as the tubes reached the maximum temperature in about 20 minutes after switching on. Conversely, loss of heat was rapid. Convection heaters were robust and could be loaded fairly high to give quick results. The air was warmed and emitted at fair velocity, with the result that convection currents were set up. The placing of these heaters, therefore, required careful consideration. There were two types of panel heaters—high temperature at 450°F. and low temperature at 120-150°F.—and these should be guarded, unless beyond reach. Electric radiators were used chiefly for staff rooms. Electric hot-water radiators had been marketed for several years, and recently oil-filled radiators had been introduced, but neither of these types could yet be said to be popular.

Temperature Control

All electrically-heated systems were specially suitable for temperature control. The economical running of the direct method of electrical heating depended to a great extent on the attendant's ability to estimate the time necessary for pre-heating in the early morning hours. Regulation of the early morning switching by means of time switches had been attempted, and further developments would doubtless produce a satisfactory type of fitting.

The electric current for projection devices in classrooms, the report recommends, should be obtained from a power point with an independent switch. The equipment should consist of a three-pin, 15 A socket with an iron-clad switch-fuse alongside. A ready-wired spare fuse holder should be provided. All this apparatus should be enclosed in a lock-fast box fixed in a suitable position on the back wall opposite the centre line of the screen. A second similar supply point might be provided at a convenient position adjacent to the chalkboard.

Dealing with the wiring of schools for broadcast reception, the report states that in a large school a centrally installed receiver with loud-speaker circuits to the several rooms was most satisfactory. If possible, the set should be accommodated in a separate room where it would be protected from unauthorised interference. This room, which need not exceed about 8 ft. sq., should not be too near the main switch room.

Electricity Supply

Salford.—The Light Heat and Power Co. is seeking sanction to borrow £3 000 for meters.

Poplar (London).—The Electricity Committee is seeking sanction to borrow £1 000 for meter testing equipment.

Rotherham.—The Electricity Committee is to provide supply to housing sites at a cost of £3 077.

Wallasey.—The supply for the Mariners Homes and to the Manor Road area is to be provided by the Electricity Committee at a cost of £16 190.

Birkenhead.—Sanction to borrow £2 173 for supply to temporary bungalows and £66 600 for the power station site, is being sought by the Electricity Committee.

Birkenhead.—The Electricity Committee is to provide supply to permanent housing estates at a cost of £41 716, and to temporary bungalows at a cost of £2 425.

Witney (Oxon.).—The U.D.C. has asked the Electricity Committee to submit a scheme for the provision of electrical appliances, including cookers, for houses on the Hailey Road housing site.

Hull. — The Electricity Committee is seeking sanction to borrow £50 000 to finance the resumption of the cooker hiring scheme and £25 000 for the water heating schemes.

Ilford.—The Housing Committee has arranged for the electricity department to provide mains and services to temporary houses on the Forest Road estate at a cost of £5 986.

Blackpool.—The Finance Committee has arranged to allocate £8 113 from the profits of the electricity undertaking and £25 000 from the transport undertaking to the relief of the rates.

Hove.—The Electricity Committee is seeking sanction to borrow £105 225 for the completion of the change-over scheme and to utilise £30 000 from the reserve fund for changing consumers appliances.

Manchester.—The Electricity Committee is seeking sanction to borrow £10 000 for corporation distributing stations plant, £10 000 for consumers' distributing stations plant, and £18 000 for feeder mains.

London.—The L.C.C. Education Committee is to renew the electrical installation at St. Olave's and St. Saviour's grammar school, Southwark, at a cost of £1 288, and instal an electric cooking range at Westminster technical institute at £640.

Rotherham.—Terms have been arranged for the supply to Mexborough U.D.C., and the Electricity Committee reports that feeders and switchgear will be required from the Carlisle Street sub-station involving a cost of about £6 478.

Southport.—The Electricity Committee recommends that subject to the approval of the Commissioners, the cost of changing-over consumers' apparatus in the Birkdale area from d.c. to a.c., and any other work incidental, be met from the surplus revenue of the undertaking.

Coventry.—Sanction is being sought by the Electricity Committee to borrow £8 123 for additional plant at Longford power station, £41 305 for the provision of supply to a new factory, and permission to utilise £10 000 from surplus revenue for services and meters.

Rotherham.—The Electricity Committee is seeking sanction to borrow £22 650 for switchgear, cables and overhead lines for the supply to Newton Chambers, and Co., Ltd., and proposes to utilise £3 500 surplus revenue for provision of supply to John Brown and Co., Ltd., at Aldwarke Colliery.

Hackney (London).—The Electricity Committee has had under consideration the question of the charge of 1s. 6d. for fuse replacements on consumers' premises. The Committee understands that there is a difficulty in collecting this small charge, and is of opinion that a return should be made to the pre-war basis of no payment for this service. The revenue involved is approximately £150 per annum.

Darwen.—The annual returns of the electricity undertaking show units sold (15 552 064) were double the output of the last pre-war year. Gross income was £80 082, cost of current purchased was £44 881 and other expenses £21 206, leaving a gross profit of £13 995. After adding interest and grants of £879, and deducting loan charges and income tax of £12 768 the net profit was £2 106.

Wallasey.—The Electricity Committee has decided that the hire purchase by consumers of any electrical apparatus be allowed for periods not exceeding six years, and to apply for sanction to borrow £10 000 for apparatus for hire purchase, and £5 000 for mains and services in connection therewith. Sanction is also to be sought for a loan of £7 000 for supplies to housing estates.

Guildford.—At a meeting of the Housing Committee the Borough Engineer reported that the net cost of buying a cooker, washboiler, immersion heater, and electric fire in new houses on the Stoke Hill estate would be £27 10s. 3d. per house, adding that quotations for refrigerators were not at present available. The simple hire per annum based on the average life of 10 years would amount to £3 1s. 10d. The Committee recommended that appliances be

purchased outright and that the electricity department be asked to provide free maintenance throughout the life of the appliances.

Sunderland.—The annual report of the electricity undertaking for the year ended March 31, 1945, the fiftieth year of operating, shows that the total units sold numbered 93 543 775 as compared with 93 698 575 last year, a decrease of 154 800. The revenue for the year from the sale of electricity was £385 126, as compared with £365 059 in 1944, an increase of £20 067. The working costs were £286 119 (£272 219), an increase of £13 900. The net trading surplus is £40 887 (£42 276), a decrease of £1 389. The sum of £20 631 is transferred to the development and renewal fund. The average price per unit sold was .988d. (.937d.), and the average cost per unit sold, .907d. (.948d.). Apparatus on hire for 1945 was as follows: Cookers, 4 041 (3 991), wash-boilers, 837 (832); water-heaters, 371 (368); fires, 882 (882); kettles, 3 470 (3 477); irons, 13 093 (13 094). In 1945, consumers numbered 27 798, compared with 27 394 in the previous year.

Tummel-Garry Scheme.—At a recent meeting of the local authorities' Hydro-Electric General Committee the County Clerk indicated that it was probable that the Perth and Kinross C.C. would put down in Parliament a motion for the annulment of the Order in regard to the Tummel-Garry hydro-electric scheme. The Council, Mr. Marshall said, had been very disappointed by the decision to carry through the scheme. This was the only proper course open to them now, and he asked for the support of all local authorities representative of the Committee if such a motion should be passed. Asking that the name of Aberdeen T.C. be dissociated with any motion to have the scheme annulled, Mr. A. Gardiner, city electrical engineer, Aberdeen, said he could confirm that there was a desperate shortage of electricity throughout the country. He was afraid there was a tendency to forget the proper name of the authority that had been set up. It was the North of Scotland Hydro-Electric Board, not the Highlands Board.

Stoke-on-Trent.—The report of the general manager of the electricity undertaking, Mr. T. Lockett, shows that the revenue for the year was £717 656, compared with £686 862 in the previous year, an increase of £30 794. The expenditure at £717 456, compared with £662 746, showed an increase of £54 710. The increased cost of bulk supply was £44 963, out of the total increase in expenditure. Income tax amounted to £37 741, compared with £24 441 in the previous year, and the increase of £13 300 was the second largest increase in expenditure. The net effect of the charges in income and expenditure had been to reduce the profit from £24 116 in 1943-44 to £200 last year. This is the lowest figure since 1927. Units purchased totalled 186 546 427, compared with 187 540 743, a reduction of 994 316. Of these units 173 649 945 were sold, compared with 173 256 604, an increase of 393 341, so that the efficiency of distribution rose from 92.4 per cent. to 93.1 per cent. A decrease of 7 million units sold to other authorities had been offset by an increase of 7 millions in the units sold to ordinary consumers. The maximum load of 44 660 kW was the highest recorded in the history of the undertaking.

West Ham (London).—In the report of the engineer and manager, Mr. J. W. J. Townley, for the year ended March 31, 1945, the total sale of electricity is given as 136 533 897 units, as compared with 135 175 727 for 1944. The decrease in sales, as compared with 1939/40, amounts to approximately 20¼ million units. The gross revenue (including sales department) for the year was £785 908, total expenses, £618 839, leaving a gross profit of £167 068. The net surplus for the year amounted to £5 202. The number of consumers at the end of the year was 39 420, as compared with 40 503 at March, 1944, and over 56 000 at the outbreak of war. Approximately 1¼ miles of mains have been laid for essential services during the year, bringing the total mileage of cable laid to 535 miles. The total units generated during the year was 111 592 150, and the maximum load on the generating station was 59 400 kW. Further damage was suffered by the undertaking due to flying and rocket bomb attacks. Approximately 118 ft. in length of the main building, the main stores, with a large proportion of the stock, and outbuildings were completely destroyed. The destruction included the transformer station, the meter test department, and general workshops with nearly all their equipment, including instruments and machine tools. Over 2 000 services were disconnected from badly damaged or destroyed premises, bringing the total to nearly 12 000 since the commencement of enemy air attacks. A draft scheme for the construction of what is, substantially, a new generating station at Canning Town was submitted to the Central Electricity Board early in the year, and, as a result, they issued a further direction for the installation of a 30 000 kW turbo-alternator and four boilers, with all necessary auxiliary plant, additional to the unit included in the direction issued in 1943. This will form one third (60 000 kW) of the ultimate capacity of 180 000 kW.

Industrial Information

Public Address at Holiday Camp.—The public address equipment at Butlin's holiday camp at Filey, Yorks, described in our last issue, was installed by Tannoy Products (Guy R. Fountain, Ltd.).

Factory Extension.—Philips (Blackburn Works), Ltd., are to develop their works at Whitebirk, Blackburn, and a start is to be made on a site of 70 000 sq. ft. The Board of Trade has granted a licence for the work to proceed.

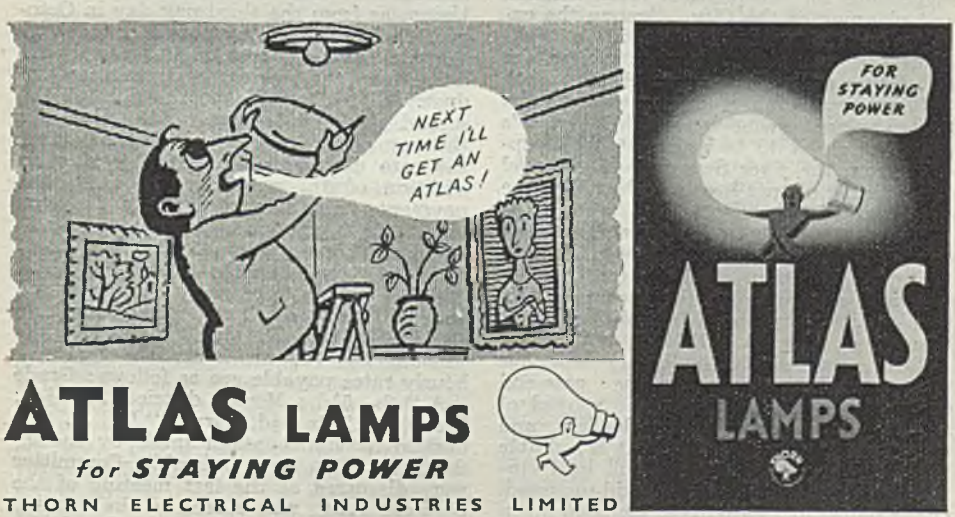
Fuel Efficiency.—The recovery of waste heat from flue gases is the subject of Fuel Efficiency Bulletin No. 42 issued by the Ministry of Fuel and Power. Among other matters, it deals with recuperation and regeneration, and waste heat boilers and their application to specific industries.

Electric Boiling Rings.—The Central Price Regulation Committee has approved the following prices, exclusive of purchase tax, for the I.K.W. electric boiling ring, complete with flex, manufactured by the Lonsdale and Company (Electric), Ltd.: Manufacturers' selling price, 8s. 6d.; wholesale, 10s. 7½d.; retail, 14s. 2½d.

Expansion Programme.—C. A. Parsons and Co., Ltd., announce a programme of expansion involving the expenditure over the next few years of over one million pounds. Sir Claude D. Gibb, chairman, states that the board has ordered equipment costing a quarter of a million pounds and has sanctioned purchases for a further £150 000. There would be ample work for the next four or five years and they intended to press vigorously for export trade.

Northampton Polytechnic.—The syllabus for the 1945-46 session, which began on October 1, includes courses in general electrical engineering, radio engineering, electrical installations, electric cable jointing, telephony, telegraphy, radio communications, illuminating engineering, instrument making, and arc welding. Evening classes not represented in the scheduled courses will cover, among others, the following subjects: vacuum technology, X-ray technology, electronics, applied accoustics, non-linear problems in electrical engineering, and the cathode-ray tube and its applications.

Atlas Lamp Publicity.—An intensive advertising campaign is now being launched for Atlas lamps, in which all the leading national newspapers as well as the large-circulation weeklies, and many provincial papers, supplemented by certain weekly newspapers in selected localities will be used to the fullest extent. The already extensive chain of permanent road sites and bulletin boards in key positions throughout the country is being expanded. In addition, Atlas advertising is appearing on many of the main line railway stations and the London Underground system. Although under the prevailing conditions material is somewhat restricted, Atlas lamp retailers still have the benefit of a window



An example of the Atlas lamp advertising drawings, and a poster

dressing service designed to tie up with the Press and outdoor campaign. The new Atlas advertising campaign is a development of the well-known theme of the " little man carrying the lamp," (a modern conception of the classical figure of Atlas carrying the globe), and a new slogan " For Staying Power " is being adopted. The new Atlas poster is attractively designed in compelling colours, and in the Press advertising the " Staying power " theme is being emphasised by a series of striking drawings of a semi-humorous nature. Sales aids for Atlas retailers include the plastic counter model, cinema slides, window bills, price lists, etc.

New Manufacturers' Association.—Membership of the newly-formed Electronic Manufacturers' Association is open to all manufacturers of complete electronic apparatus having factories within Great Britain and Northern Ireland and in other parts of the British Empire to which it may be decided to extend the association, and also to all manufacturers of parts and accessories within the same territories.

Coventry Exhibition.—In celebration of the six-hundredth anniversary of the incorporation of the city a " Coventry of the Future " exhibition opened at the Drill Hall on October 8, and will conclude on October 15. The object is to illustrate to the people of Coventry some proposals and suggestions for the physical reconstruction and planning of the City. Among the exhibits in the housing section is an " all-electric " example of kitchen design for the future. In the section dealing with public services are demonstrated, the Severn water scheme by which the City's water supply is to be augmented by supplies from the river Severn, and a model of a possible district heating scheme for the central area of the city.

Electrical Mining Equipment. — The General Electric Co., Ltd., showed a representative selection of flameproof mining electrical apparatus at the recent exhibition organised by the South Midland sub-branch of the A.M.E.M.E., at Moira Colliery, near Burton-on-Trent. The display included an automatic gate-end switch (type F.M.U.2), for the control of motors driving coal cutters, loaders, and conveyors at the coal face. It is suitable for voltages up to 600 and full load currents up to 80 A and is skid-mounted. Other flameproof switchgear included a h.t. oil circuit-breaker (type F.H.2), having a breaking capacity of 25 mVA at 3.3 kV. Another exhibit was a portable mining sub-station, a self-contained unit, comprising a transformer, with flameproof h.t. isolator, l.t. circuit-breaker, and flit type cable boxes. This type of sub-station is available up to 250 kVA, with primary and secondary voltages up to 6.6 kV and 660 V, respectively. To facilitate transport the unit has very low overall dimensions, while in sizes up to 200 kVA the oil content is below 50 gall. Of interest, also, was the

The G.E.C. display at the Moira Colliery exhibition

flameproof lighting transformer designed to give a 110 V supply for the illumination of underground roads, haulage houses and crossings. Other exhibits included flameproof accessories. On a separate stand G.E.C. electric welding equipment was demonstrated.

Notes for Contractors.— In accordance with an agreement made between the National Federated Electrical Association and the Electrical Trades Union, as from the third pay day in October, 1945, for the pay period covered by that pay day, the cost of living (war) addition for the electrical contracting industry is to be 5½d. per hour until the second pay day in April 1946, when for the pay period covered by that pay day, the rate declared is to be subject to an addition of 1d. per hour, the resultant payments being: to labour over 21 years of age, 6½d. per hour, between 18 and 21 4½d. per hour, under 18 2d. per hour. For the three months from the third pay day in October, 1945, covered by the cost of living (war) addition declaration, which has increased the amount by ½d. an hour, the inclusive hourly rates payable are as follows: Grade " A," 2s. 5½d.; Mersey district, 2s. 3½d.; Grade " B," 2s. 2½d.; Grade " C," 2s. 1½d. Certain recommendations made by the industry's Joint Apprenticeship Committee were discussed at the last meeting of the National J.I.C. who agreed to the wording of two certificates of training. One is for use by employees when category II boys either leave their employer prior to the completion of training, or complete their training, and the other is a certificate to be issued by the N.J.I.C., upon request, to ex-category II boys, who have completed their training.

Toronto Hydro-Electric System

Commissioners Thirty-fourth Annual Report

THE thirty-fourth annual report of Toronto Electric Commissioners shows that the operations of the hydro-electric system for 1944 resulted in a gross income of $13 599 960.78. The cost of electric current and expenses of operation and management amounted to $9 950 169.82, leaving a surplus of income on the operating account of $3 649 790.96. After deducting $2 514 099.14 for interest, depreciation, taxes, sinking funds, debenture retirals and exchange on debt charges, the net income carried to reserve for stabilisation of rates was $1 135 691.82. The net funded debt as at December 31, 1944, less sinking funds in the city treasurer's hands and accrued, amounted to $3 572 323.02, all of which will be paid at maturity by the annual retirals of serial debentures, and by the operations of the sinking fund applicable to the long-term debentures. The fixed assets of the system with respect to the distribution plant in Toronto amounted to $40 657 481.35. Current assets amounted to $10 607 992.74, whereas current liabilities, including amounts due to the city treasurer but not yet payable, amounted to $948 529.23.

Reduction in Rates

The total number of kW hrs. sold during the year was 1 371 645 482, as against 1 311 901 982 in 1943, and the annual peak load was 393 920 H.P., compared with 393 920 H.P. in 1943. The electrical energy purchased from the Hydro-Electric Power Commission of Ontario during 1944 cost $7 308 446.49, or 53.7 per cent. of the gross income, against $7 579 430.60 for the preceding year, or 58.0 per cent. of the gross income of that year. The governing rate for the year was $22.60 per H.P. per annum. The monthly bills, as rendered, were paid for at this rate. After the close of the year's operation, the Provincial Commission advised that the cost of power supplied during the year was $716 501.97 less than had been already paid. On this basis, the net cost of power for the year was $7 308 446.49, or $20.58 per H.P. The adjustment for the year 1943, amounting to $121 006.52, had been added to the reserve for stabilisation of rates.

During the year, the question of a reduction in rates again received the careful consideration of the Commissioners, and the Hydro-Electric Power Commission of Ontario was requested to grant approval to a reduction to forty per cent. of the normal rates for one normal billing period. The saving to consumers resulting from this temporary reduction in rates was estimated at approximately $918 000.00. Early in the present year, this temporary reduction was followed by a permanent reduction in rates which will result in substantial savings to system consumers.

War-time Restrictions

In the report for 1942, attention was drawn to the fact that under date of September 12, 1942, the Power Controller of the Department of Munitions and Supply had issued Order No. P.C. 5 restricting the use of electricity for certain purposes in various designated power shortage areas, including that in which Toronto is situated. The restrictions applied particularly to street lighting and commercial lighting. In the case of street lighting, the restriction involved a curtailment of twenty per cent. of the load. The restriction in commercial lighting involved the discontinuance, with some minor exceptions, of sign, show window, show case, outline, ornamental, decorative and advertising lighting; the discontinuance of electric air-heaters and fires; the discontinuance of outdoor lighting and floodlighting, with minor exceptions, and the curtailment of lighting in theatres, etc. At the same time, the Power Controller publicly appealed to residence consumers to voluntarily reduce their consumption, if possible, to the extent of twenty per cent. The restrictions under the above Order and the amendments thereto were discontinued on October 1, 1944. The restoration of normal street lighting was completed by the end of the year, and commercial lighting was similarly re-established during the same period. The result was reflected in the increase in the annual peak load of the system, but the change occurred too late in the year to appreciably affect the system's revenue.

Large-scale Extensions

The Commissioners have prepared a programme of extensions to the system's plant and equipment involving capital expenditures approximating $2 000 000.00 per year for the first three years following the cessation of hostilities. This programme comprises a large number of projected works which, it is anticipated, may be required within that period.

The A.E.M.T.—The Electroplant Co., Palace of Engineering, Wembley, has been elected a member of the Association of Electrical Machinery Traders.

Company News

ERICSSON TELEPHONES LTD.—Intm. div. 5%, tax free (same).

MANGANESE BRONZE AND BRASS CO., LTD. Intm. on ord. 7½% (same).

ERINOID CO. LTD.—Fst. and fin. 10% (same).

PINCHIN JOHNSON AND CO. LTD.—Intm. div. 2½% (same).

RAWLPLUG CO. LTD.—Intm. div. 10% on ord. (same).

W. M. BEARDMORE AND CO. LTD.—Intm. div. 3% on ord. (same) for 1945.

PACIFIC GAS AND ELECTRIC.—Reg. qtrly. 50 cts. on com., payable Oct. 15.

J. AND F. STONE LTD.—Div. on ord. 15% (6%), for yr. to June 30, payable Oct. 25.

STRAND ELECTRIC HOLDINGS.—Fst. and fin. div. 10% (same), plus bonus 2½% (same); net pft. £15 752 (£15 186).

RANSOMES AND RAPIER, LTD.—Intm. on ord. 2% tax free (same), payable Nov. 23, 1945.

WATFORD ELECTRIC AND MANUFACTURING CO., LTD.—Intm. div. 5% (same), less tax.

RICHARD JOHNSON AND CLAPHAM MORRISON.—Fin. div. on ord. 11¼%, and bonus 5%, mkg. 20% (15%) for yr. ended June 30.

LINLEY ENGINEERING CO., LTD.—Net pft. to May 31, £5 005 (£8 621). Fst. and fin. div. 10% (same), and bonus 2½% (5%), mkg. 12½% (15%).

ASSOCIATED FIRE ALARMS, LTD.—Pft. to June 30, £772 (£1 049), less tax £375 (£680), lvg. net pft. £396 (£369). Div. 3% £858 (same), fwd. £1 682 (£2 144).

GLACIER METAL CO. LTD.—Co. proposes to increase authorised cap. from £275 000 to £400 000 by creatn. of a further 100 000 pref. shs. of £1 and 100 000 ord. shs. of 5s.

ABERDARE CABLES LTD.—Pft. blce. to Oct. 31, 1944, includg. div. from subsid. and after dirs.' fees, £37 618 (£35 496). Taxn. £27 973 (£21 500), defd. reprs. £1 160 (£7 000). Div. 6% (same, but on increased cap.). Fwd. £9 814 (£9 789).

WILLIAM DOXFORD AND SONS LTD.—Fin. div. 10% and bonus of 2½% on ord. mkg. 17½% for yr. to June 30. Prelim. statemt. shows net pft. after providg. for taxatn. of £184 817 (£173 323). Allocatn. to gen. res. £75 000 (£50 000). Carry-fwd. £59 332 (£52 015).

RANSOME AND MARLES BEARINGS CO., LTD.—Tradg. etc., pft. to June 30 (after tax) £184 143 (£187 039). To dirs.' fees £1 700 (same), deprecn. £59 216 (£62 205), lvg. net pft. £123 227 (£123 134). To war damage £2 210 (£8 714), div. 20% £70 000 (same), contings. £50 000 (£35 000), dirs.' remun. £3 000 (same), fwd. £83 365 (£85 348).

LEYLAND AND BIRMINGHAM RUBBER CO., LTD.—Net tradg. pft. (after tax), £124 744 (£121 005). Dirs.' remun. £4 815 (same), deprecn. £13 295 (£13 802) discount prov. £1 666 (£864), lvg. net pft. £104 968 (£101 524). Pref. div. again takes £75 000 gross (same). Res. £20 000 (same), lvg. carry fwd. £56 075 (£52 107).

PHILCO RADIO AND TELEVISION CORPN. OF GT. BRITAIN.—Prelim. statemt. gives div. 10% on 1 250 000 ord. shs. for 1944/45, and 25% on 1 000 000 shs. for 1943/44. Net tradg. pft. for yr. ended Mar. 31, 1945, is announced as £115,701 (£108 862). After deductg. £55 814 (£49 874) for bank interest, note interest and premium, depreciatn., deferred repairs, dirs.' fees, sinkg. fund and interest on sinkg. fund certs., and pref. cap. redemptn. fund, net credit blce. was £59 887 (£58 988). Prov. for current N.D.C. and inc.-tax—after takg. acct. of provn. for future taxatn. previously made, is £31 741 (£2 074) and pref. div. £12 337 (£10 500). The 10% div. will absorb £6 250 and will leave a fwd. blce. £9 559 higher at £12 930.

Company Meetings

BARCELONA TRACTION LIGHT AND POWER CO. LTD.—The annual meeting was held in Toronto on October 3. In the course of his address the president, Mr. Henri Speciael, referred at some length to the serious drought in Spain and the consequent heavy restrictions on the consumption of electric current with an adverse effect on earnings. He stated that the gross earnings for the first eight months of 1945 were down 17 million pesetas and expenses were increased by an even greater sum, chiefly arising from heavier steam generation expenses and the cost of emergency power purchased from other suppliers.

EAST AFRICAN POWER AND LIGHTING CO., LTD.—The annual meeting was held at Nairobi on September 28. In the course of his remarks the chairman, Maj. H. F. Ward, said the maximum demand over the war period in all the company's East African areas of supply increased from 8 360 kW to 15 317 kW with a sharply increasing load factor. Despite the fact that additional plant to meet these demands could only be procured from very restricted sources they were able, during the war period, to increase their installed plant capacity from 19 000 kW to 25 000 kW. The directors were hopeful that as normality returns it will be possible to contemplate charges reduction.

COMPANY MEETING

ABERDARE CABLES LIMITED

Continued Good Progress

The ninth ordinary general meeting of Aberdare Cables, Limited, was held on October 4, in London, Sir George Usher (chairman of the company) presiding.

The chairman said: I am happy to place before you the accounts for the year ended October 31, 1944, and to report continued good progress in the current year. Our organisation has been actively employed during the war years in coping with the heavy demands for war material. Your company has delivered nearly one and a half million 25-pounder shells, nearly 400 000 6-pounder shells, approximately 15 000 mines and smoke bombs, and over 100 000 miles of copper wire for the purpose of telephonic and telegraphic communication. We are proud to think this has been accomplished on the site of a derelict coal mine. In other words, your company is a living example of a new industry arising from the ashes of an old one, and we are gratified to think that on this site we are now employing, in what was an entirely new industry in South Wales, as many people as formerly earned their livelihood in raising coal there.

"Q.P.I."

We have a well filled order book and excellent prospects. Our export business is developing on sound and satisfactory lines. Our Q.P.I. cables are finding a ready sale in markets formerly the monopoly of the Cable Makers' Association. I might explain that "Q.P.I." means—Quality, Price, Independence.

It has been our pleasure during recent months to welcome home our representatives in Africa, India and Australia, who report considerable activity in those markets.

Other important export business includes contracts with the U.S.S.R., Turkey, Egypt, Portugal and France, to mention but a few of the countries with which we are in active daily negotiation. Our munition contracts are now completed, so that we can turn our full activity towards our peace-time products.

Our subsidiary, South Wales Switchgear, Ltd., continues to make satisfactory progress. It has done valuable work for the Admiralty throughout the war period and is now turning its attention to the development and marketing of industrial and domestic equipment.

In conclusion, I should like to express my thanks to the managing director, Mr. F. G. Penny, to Mr. Wignall and Mr. Nicholas, to Mr. Gilliver, our efficient secretary, and to the workpeople and staff who have so loyally supported us throughout the difficult days of war.

We send our cordial greetings to all employees serving in H.M. Forces and hope they will soon be with us again.

The report and accounts were unanimously adopted and the proposed dividend of 6 per cent., was approved.

Commercial Notes

Mortgages and Charges

NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge shall be registered within* 21 *days after its creation, and that every company shall, in its annual summary, specify the total amount of debt due from it in respect of mortgages or charges. The following mortgages and charges have been registered. The total debt prior to the present creation, as shown in the annual summary, is given—marked with an *—followed by the date of the summary, but such total may have been reduced.*

ELECTRON (LONDON) LTD., London, W., gramophone, wireless and electrical manufacturers.—Sept. 12, £1 000 deb. to R. Slayton, London, general charge.

R. J. KEMP AND CO., LTD., Coalville, electrical engineers.—Sept. 20, £3 000 (not ex.) charge, to Lloyds Bank Ltd.; charged on premises at Ashby Road, Coalville. * ——. Mar. 25, 1943.

REDCAR RADIO RELAYS LTD.—Sept. 10, charge, to Burnley Building Society securing £1 000 and any other money &c.; charged on 23/25, West Dyke Road, Redcar. *Nil. Dec. 31, 1944.

UNITED COMPONENTS LTD., London, E.C., electric and wireless dealers.— Sept. 20, £1 000 deb. to W. Harris, London; general charge.

COREX COMMUNICATIONS EQUIPMENT LTD., London, S.W., electrical and wireless engineers.—Sept. 20, mort., to Barclays Bank Ltd., securing all moneys due or to become due to the Bank; charged on moneys under contracts. *£7 196. May 30, 1944.

Company Winding Up

HANTS ELECTRIC CHASSIS.—At a meeting of the members of the said company, held at Electra House, Victoria Embankment, London, on September 19, 1945, the resolution was duly passed "that the company be wound up voluntarily and that Mr. Harold Percy Goodall of Electra House, London, W.C.2, be appointed Liquidator."

Notice of Dividend

BRIDGMAN, Howard Cecil, 37, Canynge Road, Clifton, Bristol, lately residing and carrying on business at 7, Abbey Road, Westbury-on-Trym, Bristol, electrical engineer. First and final dividend 7½d. per £, payable Oct. 19, 1945, The Official Receiver's Office, 26, Baldwin Street, Bristol 1.

Coming Events

Friday, October 12 (To-day).

I.E.E., N.W. CENTRE (RADIO GROUP).—Manchester. "Studio Technique in Television," D. C. Birkinshaw and D. R. Campbell. *6 p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN.—Institution of Electrical Engineers, London, W.C.2. Symposium of speeches. *2.30 p.m.*

Saturday, October 13.

JUNIOR INSTITUTION OF ENGINEERS, N.W. SECTION.—Manchester. Annual general meeting, followed by presidential address, "The Engineer's Tools—Words and Figures," L. H. A. Carr. *2.30 p.m.*

Sunday, October 14.

INSTITUTE OF ECONOMIC ENGINEERING.—Waldorf Hotel, Aldwych, London. "Notes on Factory Organisation," Prof. F. L. Meyenberg. *2.30 p.m.*

Monday, October 15.

I.E.E., LONDON STUDENTS' SECTION.—London, W.C.2. Chairman's address, "Tuning Forks," H. Shorland. *7 p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel. "Technical Education in the Present and Immediate Future," C. F. Partridge.

I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. "The Place of Radiant, Dielectric and Eddy-Current Heating in the Process Heating Field," L. J. C. Connell, O. W. Humphreys and J. L. Ryecroft. *6 p.m.*

Tuesday, October 16.

I.E.E., E. MIDLAND SUB-CENTRE, DERBY.—"Excess Current Protection by H.R.C. Fuses on Medium Voltage Circuits," R. T. Lythall. *6.30 p.m.*

I.E.E., N.W. CENTRE.—Manchester. "Modern Electric Lift Practice," L. S. Atkinson. *6 p.m.*

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—E.L.M.A. Lighting Service Bureau, London, W.C.2. Presidential address, E. R. Wilkinson. *6.15 p.m.*, preceded by industrial films, *5.45 p.m.*

BRITISH SOCIETY FOR INTERNATIONAL BIBLIOGRAPHY.—I.E.E., London, W.C.2. Presidential address, Dr. S. C. Bradford. *2.30 p.m.*

Wednesday, October 17.

I.E.E., TRANSMISSION SECTION.—London, W.C.2. Chairman's inaugural address, E. T. Norris. *5.30 p.m.*

INSTITUTE OF WELDING, LEEDS BRANCH.—Bradford. "Welded Construction and the Drawing Office." H. V. Hill. *7 p.m.*——W. SCOTLAND BRANCH.—Glasgow. "Some Technical Problems in the Execution of 'Pluto'," J. S. Blair. *6.30 p.m.*

Thursday, October 18.

I.E.E.—London, W.C.2. Discussion, "Weather and Electric Power Systems," opened by J. S. Forrest, H. W. Grimmitt, A. J. Drummond and Wing Comdr. R. M. Poulter. Joint meeting with the Royal Meteorological Society. *5.30 p.m.*

Friday, October 19.

I.E.E., N.E. STUDENTS' SECTION.—"My Occupation and some Experiences." (Informal talks from members of the Section.) *6.30 p.m.*

Saturday, October 20.

I.E.E., N. MID. STUDENTS' SECTION.—Leeds. "Colour," Dr. Mole, J. A. Foot and K. A. Milligan. *2.30 p.m.*——I.E.E., LONDON STUDENTS' SECTION.—Visit to Eversheds and Vignoles, Ltd. *9.45 a.m.*

A.M.E. AND M.E., S. WALES BRANCH.—Bridgend. Discussion, "Electrical and Mechanical Aspects of the Reid Report." (Joint meeting with W. Wales Branch.)

INSTITUTE OF ECONOMIC PLANNING, MIDLAND SECTION.—Birmingham. "Competitive Planning," A. H. Huckle. *2.30 p.m.*

Metal Prices

		Monday, Price.	Oct. 8 Inc.	Oct. 8 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.	—	¼d.
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)...	per ton	£7 13 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	„	£28 5 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	—	£38 10 0

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

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