THE ELECTRICIAN

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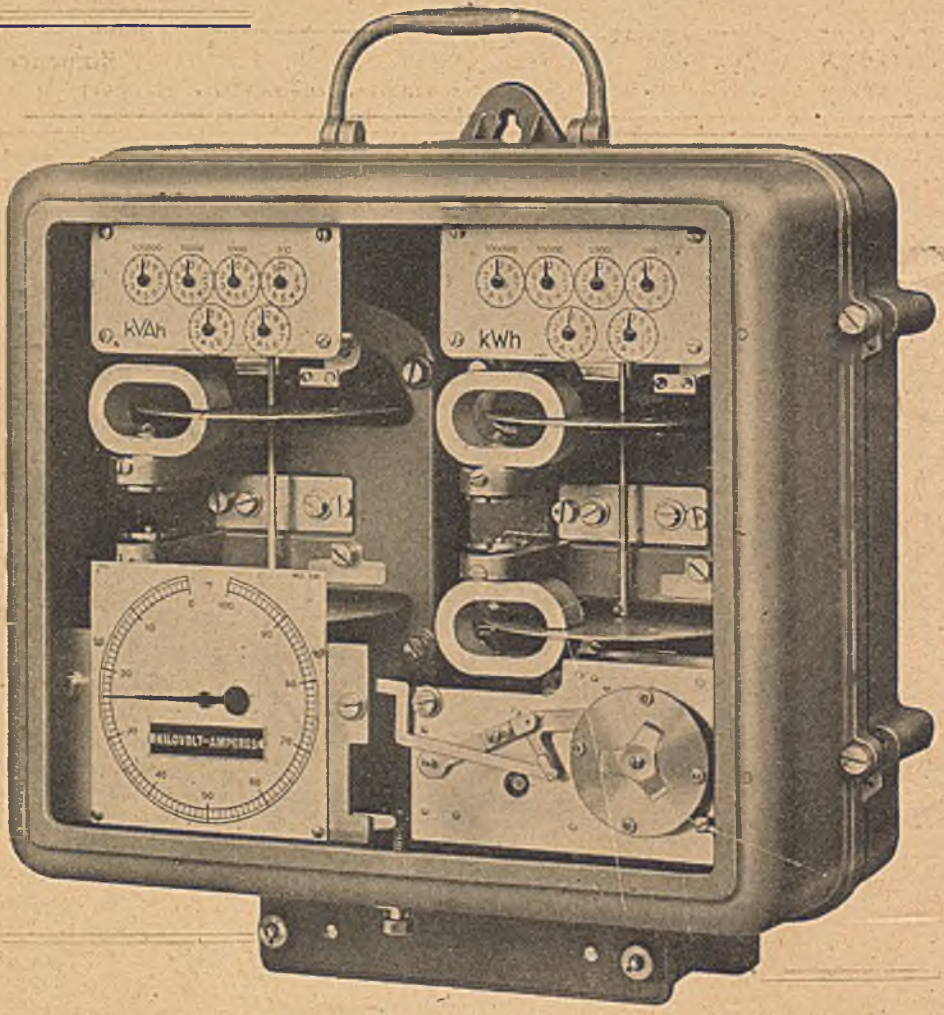

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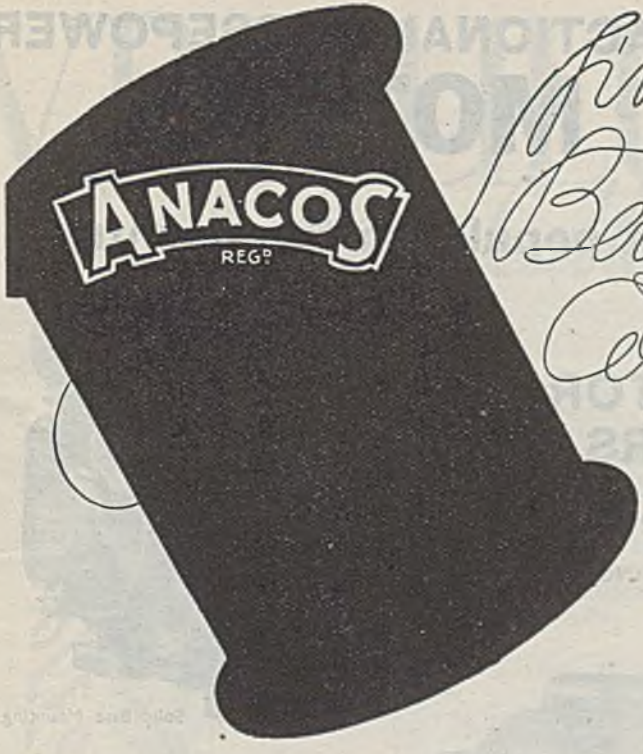

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THE ELECTRICIAN

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CHIEF CONTENTS OF THIS ISSUE

Transfer of Load

ON this page in the May 4 issue of THE ELECTRICIAN, comment was made on the position in which the supply industry is likely to find itself next winter, and though the coming of VE-day since then may, in the opinion of some, have materially altered conditions, it is yet too early to estimate the extent to which the maximum demand in the country generally may be affected. It may be said with some certainty, however, that in spite of the changed circumstances, some shedding of load may still be unavoidable during next winter—especially in the event of a severe cold spell—and confirmation of this possibility is given by the Ministry of Fuel, which is seeking through the Commissioners, the co-operation of all supply authorities in order to reduce to a minimum the inconvenience and loss to industrial and domestic consumers, which such shedding of load may bring about.

The situation is, for obvious reasons, as much the concern of industry as it is that of the supply undertakings, and it is, therefore, interesting to note that a number of undertakings supplying large power consumers have already been able to make arrangements whereby on receipt of a telephone call, the industrial load in certain factories is to be reduced by the required amount, in order that supplies to domestic consumers, shops, hospitals, works engaged on continuous process methods, and so on may not be interrupted.

The success of this or any similar arrangement is, of course, dependent upon the willingness of the principal industrial consumers to co-operate, and calculation of the extent of potential load reduction in each case. It is suggested that during the process of making any such arrangements, now or in the future, the possibility of reducing the amount of the peak by a substantial transfer of load from the morning to the afternoon period should not be overlooked. The reason for this suggestion is based on the fact that during the winter months of 1944 the difference between the morning and afternoon national loads was of the order of 870 000 kW, whereas it is now 1 190 000 kW. If either by some alteration in its working hours or processes, it is possible for industry to partly carry out in the afternoon some of the work executed in the morning, such irregularity of load would be eliminated, or at least reduced. It must also be remembered, that in order to maintain adequate supplies next winter, the supply engineer will require, during the next few months, to overhaul and repair his generating plant, and after the essential withdrawals have been made, the margin available for operation will be dangerously low.

The possibility of giving some relief to existing generating plant was considered as long ago as 1940, when it was suggested that surplus private generating

capacity might be utilised. To this suggestion is now added the recommendation that supply undertakings should investigate methods of arranging with the owners of any standby Diesel plant in their areas for its operation, so as to relieve the public supply system of the whole or part of the demand normally made by the owners of such plant. The Air Ministry have already indicated that some of the Diesel-driven generating sets at their establishments could be used for this purpose, and it is known that in a number of industrial concerns there is similar plant which might be used at peak periods.

Industrial Co-operation Needed

THE above facts are already known to the supply undertakings throughout the country, as also are the suggestions we have given. In the circumstances, therefore, we can do no more than hope that industry will, in its own interest, adjust demand in such a way that the morning and afternoon loads are brought nearer to comparable figures. The supply industry, during the last six years, has operated, and still is, under conditions which limit its freedom to extend its generating capacity, and the responsibility for the present shortage rests not with the industry, but with the Government's Productive Executive. The question of whether that responsibility has been abused or not, though debatable, must remain in abeyance until the present problems of meeting the supply needs of the immediate future are dealt with. In doing so, the industry of the country generally is invited to co-operate with the supply industry in every possible way. To what degree such co-operation has materialised will be known next winter.

The National Register

THE report which the Executive Committee of the National Register of Electrical Installation Contractors presented at the annual meeting yesterday, Thursday, shows that the net number on the register at the end of 1944 was 1 332. In view of the number of contractors who have been put out of business since 1939 for various reasons, this figure is relatively high and may from now on be improved upon. Less satisfactory is the fact that out of 125 visits by the register's inspector to contractors, in 78 cases did the work disclose faults for correction. Bearing in mind that not all contractors are members of the register it is reasonable to assume that their installation work is not in all cases subjected to such severe criticism as is that of registered contractors. The result is that there may be an even greater number of faulty installations put into service than the industry is aware of, and the good name of electricity may suffer in consequence. If out of 125 visits to the work of contractors on the register 78 prove to be faulty, how many non-registered contractors, we wonder, would survive a similar test ? With so much domestic wiring to be done in the immediate future, special care should be taken so that the public safety is ensured on the one hand, and the reputation which electricity holds for service is not besmudged on the other.

Cutting Down Munitions

SOME idea of the concentration of the labour force of this country on the production of munitions of war, was given last week in the House of Commons by Mr. OLIVER LYTTELTON, Minister of Production. Such concentration reached its peak late in 1943, when about 4¼ million people were working on orders for the three Supply Departments. It was then decided to make 1944 the year of maximum impact on Germany and this involved some withdrawal from industry of man-power to increase and maintain the Armed Forces, to strengthen such services as docks, depôts, transport, and so on. By mid-1944 the comparable figure on munitions was 4 million and by the late autumn of the same year the figure was 3¾ million; this figure, even apart from the end of the German war, would, we are told, have fallen to about 3¼ million by next month. An earlier estimate of the man-power required in this country for munitions by the end of the first year of the now Japanese war was about 2¾ million, a figure that was expected to fall progressively over a year. The aim is apparently, to secure as far as possible, that output is cut in those plants which can most usefully and quickly return to essential civil production. The task of organisation ahead is that of reducing smoothly over a period of months, a munitions programme that has taken over five years to build, at a time when large numbers from the

Armed Forces are being simultaneously reabsorbed into civil life. The success with which this will be done will depend upon the ability of industry to restart its civil manufacturing capacity, and that must depend upon the willingness of the Government to release skilled, as against unskilled, labour and sufficient raw materials. Mr. LYTTELTON looks upon it as a formidable task, but without a better understanding than now exists of the needs of industry, it is well nigh impossible of execution.

Birmingham University Extension

THE electrical industry will be particularly sympathetic to the appeal for £1 500 000 which is being made by Birmingham University, for Birmingham was the starting place of many well-known personalities famed for their work in the electrical field. Something over £600 000 has already been subscribed or promised, and, it is pleasing to note that included in the subscription list are the names of many well-known manufacturing organisations. Among the developments at which the appeal aims is a new laboratory for mechanical and electrical engineering, and in view of the higher standard of technical education advocated by the I.E.E., anything that can be done to advance the facilities at our universities should be welcome. Speaking recently on the future of Birmingham, Dr. RAYMOND PRIESTLEY, the vice-chancellor, emphasised that, if the university was to make a real contribution to the country's vital need, it must set out to give students something they could not get elsewhere. If all our universities acted on the same impulse, the requisite standard of technical education needed to lead the world would soon be attained.

The E.D.A. Takes the Offensive

AFTER so long taking part in what might be called the war-time negation of electricity, the E.D.A. has assumed a mild offensive in the promotion of electrical development by the publication of a booklet dealing with street lighting. In this, the association reminds the public that a generation is growing up that has never seen real street lighting, and that generation one which is suffering most road casualties. In 1939, there were 70 licensed motor vehicles to every mile of classified road in the country, and the average daily increase in vehicles was nearly 500. To counteract the mounting toll of accidents, electric street lighting was being installed at the rate of 1 000 miles a year, and in 1938 alone replaced 18 900 gas lamps. Next month, with the restoration of the basic petrol ration, the potential dangers of our roads will increase, but with the resumption of street-lighting held up for reasons of fuel economy until July, local authorities are thus presented with a golden opportunity to do all in their power to reduce those dangers. The present absence of street lighting will allow of complete overhaul without inconvenience to the public, and though no one can reasonably expect anything revolutionary in character, every one is entitled to expect their local authority to remove the dangers of the roads attributable to bad lighting—in spite of the war.

Electrical Aids to Military Training

THE application of electrical methods to military training have for many years been an accepted fact, but the variety of such application during the war has exceeded every pre-1939 conception. Information on the subject has for security reasons not been generally available, but with the war in Europe at an end, some slight lifting of the veil of secrecy is possible, and we learn as a result that among the latest methods of training air crews, wired wireless is playing no inconsiderable part. A scheme —conceived, we understand, by Mr. P. ADORJAN, technical director of Rediffusion, Ltd. — was completed and installed in 1940 which does simultaneously for a number of complete air crews what the Link mechanical trainer does for pilots, and since then such equipments have played an important part in building up the air forces of practically all the Allied Nations. The scheme is based on the Rediffusion method of wired wireless and reproduces artificially, with aural and visual effects all the conditions obtaining in actual operations from "briefing" to "reception" on return, including flak, searchlight interference and so on. Incidentally, Mr. ADORJAN read a paper on Wire Broadcasting at a meeting of the Royal Society of Arts on Wednesday, and the details given above lent special interest to his remarks.

French Supply Problems

By Our Correspondent in Paris

ONE of the biggest electricity supply problems which France has to face is the development of her thermal plant in proportion to the construction of hydro-electric stations. For example, the latest figures for current production show a decided decline in generation by water power, because of the dry weather. On the other hand, the recent cold snap caused an increase in consumption which had to be met by thermal plants.

The programme drawn up for the entire reconstruction of hydro-electric plant in France is evidence enough that the French intend putting their country among the first and the largest power producers by this means on the Continent, but generation by thermal stations will have also to be increased in order to meet any possible falling off in hydro-electric output due to weather conditions.

Thermal Stations

At the moment there are about 250 large thermal stations in the country, not counting small plants operated by mines and large metal and steel works, and the bulk of the load falls upon 168 fairly up-to-date units with a total capacity of 5 350 000 kW. The average age of the plants, however, is a good 16 years, although during the past three years many plants, particularly in the Paris region have been modernised.

Of the latter, the most interesting are the installations at Lomme, Mauleuge, Lens, Comines, Bully les Mines and St. Denis II. That at Lomme was brought up-to-date in 1942, with the installation of a new turbine operating at a pressure of 67 kgs. per sq. cm.; together with an alternator of 31 250 kVA, generating at 10 kV, and two automatically fed boilers.

War-time Extensions

The St. Denis II plant was completed in 1942, being the fourth instalment in a long-term programme. The installation comprises a turbine for operation at 58 kgs. per sq. cm., a 72 000 kVA, 10.5 kV alternator, and two pulverised fuel boilers.

In spite of these extensions, however, the war years were very heavy on the country's thermal capacity, one of the difficulties being the irregularities in the coal supply, which necessitated the plants being used spasmodically according to the coal available; the constant starting and stopping which this entailed, contributed to heavy wear. Secondly, coal was very poor in quality, compared with pre-war standards.

In 1939 the Arrighi plant used 0.534 kg of coal per kWh, whereas in 1942 the figure had jumped to 0.608 kg, likewise the Saint Denis II plant, which used 0.514 kg in 1939, now uses 0.582 kg. In 1939 ash content amounted to from 10 to 15 per cent., whereas to-day, the figure is 25 to 30 per cent.

Due to the dry winters, thermal plant in France has, too, been required to carry most of the load and whereas in 1939, in the Paris region, the output was 2 203 milion kWh, it rose in 1943 to 2 741 million kWh, and in the north from 2 908 million to 3 493 million kWh.

Future Developments

The programme for extensions during the next nine years, includes the replacement of at least half the existing thermal plants in the country and, while some opinion was more or less against such extensions in view of the hydro-electric programme, it has been pointed out that hydro-electric generation cannot be depended upon and thermal generating plant of additional capacity is required to meet any emergency.

It is anticipated that there will, during the next ten years, be an increase in hydro-electric capacity from between 1 000 000 and 1 200 000 kW, together with an increase in thermal station capacity of from 300 000 to 360 000 kW.

In the Paris region the increase will be greater than elsewhere. The city is at present fed by a network of 220 kV lines over distances ranging up to 400 km, but it is anticipated that the transmission voltage will be stepped up to 400 kV.

Reconstruction of the network, however, will not be easy, because of the shortage of raw materials.

SCOTTISH HYDRO BOARD

When questioned recently as to the annual remuneration paid to each member of the North of Scotland Hydro-Electric Board, and the annual remuneration paid to the officers of the Board as set out on page 2, of the annual report, dated April 23, 1945, the Secretary of State for Scotland stated that the salaries as determined by the Minister of Fuel and Power and himself, with the approval of the Treasury were: Chairman, £1 000; deputy-chairman, £3 000; and other members, £500. The remuneration of the officers was in terms of the Hydro-Electric Development (Scotland) Act, 1943, determined by the Board, and was not a matter in which he had either locus or cognisance.

Now It Can Be Told

Submarine Cable Oil Pipe-Line—Electrical Engineering Feat

THE substantial contribution made by the British electrical industry to the success of the Allied Armies of Liberation since D-Day by the provision of oil pipe-lines on the principle of the submarine cable without the core has now been revealed. By this means a continuous stream of petrol flowed from this country first to Cherbourg and then to Boulogne and on into Germany. Linked with the thousand-mile oil pipe-line, previously described in THE ELECTRICIAN, these cable pipe-lines, supplemented with a system of steel pipes, together known as "Operation Pluto" (Pipe-Line-Under-the-Ocean) have supplied 120 million galls. of petrol to the Allied mechanised armies since the first cable line came into operation on August 12. Now they carry a million gallons a day. There is a continuous flow from Mersey-side to Frankfurt on the other side of the Rhine, via Dungeness and Boulogne. Of the sixteen pipes running from Dungeness ten are cable pipe-lines. Four other lines run from the Isle of Wight to the Cherbourg Peninsula, making 20 in all. It took ten hours to lay the line from the Isle of Wight to Cherbourg and five hours from Dungeness to Boulogne. It weighs 65 tons to the mile.

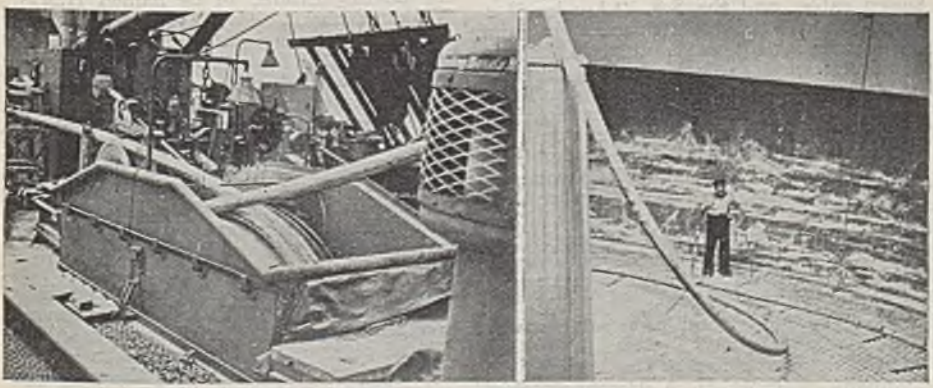
In a statement from 10, Downing Street, the Prime Minister paid the following tribute to British engineering:—

"It is now possible to reveal the existence of an oil pipe-line system under the sea stretching across the Channel to the Continent. A large part of the Allied Expeditionary Force has been supplied with petrol by this unique method, which provides for petroleum the same kind of facilities upon a hostile shore that the Mulberry Harbours provided for general military stores.

"'Operation Pluto' is a wholly British achievement and a feat of amphibious engineering skill of which we may well be proud."

Mr. Geoffrey Lloyd, M.P., Petroleum Warfare Minister, said: "From the very birth of the project we sought the help of industry and all the various firms did marvels of swift development and construction."

The idea of a cross-Channel oil pipe-line was conceived early in April, 1942, when Mr. Geoffrey Lloyd, Minister in charge of the Petroleum Warfare Department (a secret department set up in 1940) arranged a demonstration of flame throwers for Lord Louis Mountbatten, then Chief of Combined Operations. Afterwards, Mr. Lloyd asked Lord Louis whether, on the petroleum side, anything more could be done to assist the Continental operations which were being planned. Lord Louis' reply was "Yes. Can you lay an oil pipe-line across the Channel?" Experts declared that it would be impossible. However, Mr. A. C. Hartley, chief engineer of the Anglo-Iranian Oil Company, suggested that it might be possible to make a pipe-line somewhat like a submarine electric power cable without the cores and insulation and to lay this across the Channel in a few hours from cable-laying ships. Mr. Lloyd placed an order for several hundred yards of this pipe-line which Dr. Wright, managing director of Siemens Bros. and Co., Ltd.,



In the left-hand picture the Hais cable is seen passing round the cable drum used for controlling the speed of laying; on the right the cable is shown carried in a continuous length in the hold of H.M.S. "Latimer"

agreed to manufacture with the utmost priority, and Sir William Fraser, chairman of the Anglo-Iranian Oil Company, pledged his company's support to the development of the idea. The name subsequently given to this pipe-line was Hais (Hartley, Anglo-Iranian, Siemens).

Within the space of a fortnight this trial length was laid in the Thames from a cable ship made available by Sir Stanley Angwin, Engineer-in-Chief, General Post Office. The results were so promising that Mr. Lloyd, after consulting Lord Louis Mountbatten, Sir John Cunningham (Fourth Sea Lord), Sir Walter Venning (Quarter-Master General) and Sir Christopher Courtney (Air Member for Supply and Organisation, Air Ministry), reported the initiation of the project to Mr. Churchill. Mr. Lloyd received word to press ahead with all speed. Subsequently, Vice-Admiral Sir Arthur Palliser, who succeeded Sir John Cunningham, General Sir Thomas Riddell-Webster, who followed Sir Walter Venning, and General Sir Humphrey Gale, S.H.A.E.F. Supplies Chief, took the greatest interest in the project.

Bristol Channel Experiment

As a first step in the next phase of the task, Mr. Lloyd placed an order with Siemens and W. T. Henley's Telegraph Works Co., Ltd., for two 30-mile lengths, to the original 2-inch diameter design for pressure trials. This design was subsequently modified to provide larger carrying capacity by increasing the diameter to 3 in. and strengthening the cable for working pressures in excess of 1 200 lbs. a sq. in. It was decided that an experimental lay should be made across the Bristol Channel where the currents and other conditions approximated those in the English Channel.

No existing cable ship was large enough to carry a full length of this unusually heavy cable, and the S.S. " London," a coaster, was fitted out with cable gear and became the cable layer H.M.S. " Holdfast." An experimental cable was laid by this ship in December, 1942, from Swansea to Ilfracombe, and this, after considerable difficulties were successfully overcome, delivered petrol from one shore to another. Consumers of petrol in North Devon and Cornwall did not realise that, for more than a year, their supplies of petrol had been pumped across the Bristol Channel from Swansea. Large supplies of Hais cable were ordered when this test had proved the feasibility of the scheme.

Meanwhile, a second proposal made at the end of April, 1942, by Mr. B. J. Ellis, chief oilfields engineer of the Burmah Oil Company, with Mr. H. A. Hammick, chief engineer of the Iraq Petroleum Company, who had been seconded by their companies to the Petroleum Department, was being developed and this was called Hamel pipe (Hammick/Ellis). With the help of Stewarts and Lloyds Ltd., A.1. Electric Welding Machines Ltd., and the National Physical Laboratory, it was proved that 20 ft. lengths of 3-in. diameter steel pipe could be welded automatically into any required length, and could be wound on to a drum like cotton on a cotton reel, and pulled off again relatively straight, provided only that the drum was 30 or more feet in diameter.

The Director of Naval Construction at the Admiralty developed Mr. Ellis's first idea, on which Messrs. J. and E. Hall had given valuable advice, and designed H.M.S. " Persephone " which, from being a hopper barge, was converted to a craft with a great wheel rotating in trunnions on her deck, capable of carrying many miles of 3 in. Hamel pipe, and of paying it into the sea. After H.M.S. " Persephone " had shown that Hamel pipe could be " packed " in this way for delivery where required in one piece, the development was undertaken of the second idea of the floating drum capable of carrying the full length of pipe which might be required for the Channel crossing, and which model tests made by the National Physical Laboratory in their ships' tanks had showed capable of being towed like a large bobbin, paying off pipe as it went. Sir Allan McDiarmid, chairman of Messrs. Stewarts and Lloyds, arranged for his company to proceed with the construction and later with the management of a special factory, for electrically welding 20 ft. lengths of pipe into 4 000 ft. lengths at the rate of 10 miles a day, and of facilities for storing these lengths to a total of 350 miles.

Co-ordination of the Scheme

Arrangements were made for mooring the floating drums, to be named H.M.S. " Conundrums," or more briefly, " Conuns," in deep water at the end of the pipe racks, so that the 4 000 ft. lengths might be welded into a continuous length of 30 or more miles and wound neatly on the Conuns while they were rotated. The Conun is 90 ft. long and more than 50 ft. in diameter overall and, when fully wound weighs, 1 600 tons—the weight of a destroyer—and can carry 70 miles of pipeline. The drum around which the pipe is wound is 40 ft. in diameter and 60 ft. long.

After the successful trials of the Hais cable in April, 1943, Mr. Lloyd arranged that the manufacture of Hais cable and of Hamel pipe and the co-ordination of the whole scheme, together with the provision of pumping stations on the English shore should be the responsibility of the Petroleum Warfare Department of which Major-

General Sir Donald Banks is Director-General. The work then developed in conjunction with the Admiralty Department of Miscellaneous Weapons Development, and the responsibility for laying the pipes at sea was accepted by the Royal Navy.

Force "Pluto," under Captain J. F. Hutchings, R.N., was then formed. It was composed of ships of all sizes, from 10 000 tons down to barges and motor boats, manned by Merchant Navy seamen under the White Ensign, and was placed under the command of Admiral Sir Bertram Ramsey, Allied Naval Commander of the Invasion Forces. The main base was at Southampton, and there was a second base at Tilbury. It numbered 100 officers and 1 000 men. Three merchant ships, in addition to H.M.S. "Holdfast," were fitted out with special cable-laying machinery. Two were capable of carrying 100 miles of 3 in. Hais cable and the other ship 30 miles. Thames barges were converted for handling cable at the shore ends where the large ships could not operate. Six "Conuns" were constructed for handling the Hamel pipe. New pipe lines were run from the British system to take petrol to the coast. Special high pressure pumping stations were cleverly camouflaged in an old fort, a modern amusement park and in a row of seaside bungalows.

Shortly before D-Day the Prime Minister accompanied by Mr. Geoffrey Lloyd and Admiral Sir Bertram Ramsay made a personal inspection of the apparatus. Operation Pluto began a few weeks after D-Day as soon as the mines had been swept from the approaches to the tip of the Cherbourg Peninsula. Several lines were established and the R.A.S.C. personnel responsible for the operation of the installations began pumping petrol to Normandy. As soon as Boulogne was captured and the mines on the Dungeness-Boulogne route had been cleared, pipelines were laid.

In a short time, the R.A.S.C. began to pump oil to the Continent from the cleverly concealed pump stations on the coast. The Royal Engineers built, and the R.A.S.C. operated, a continually lengthening series of pipe lines which stretched from Boulogne to Antwerp to Eindhoven, to Emerich, and soon a millions gallons a day were being pumped from the Mersey to the Rhine.

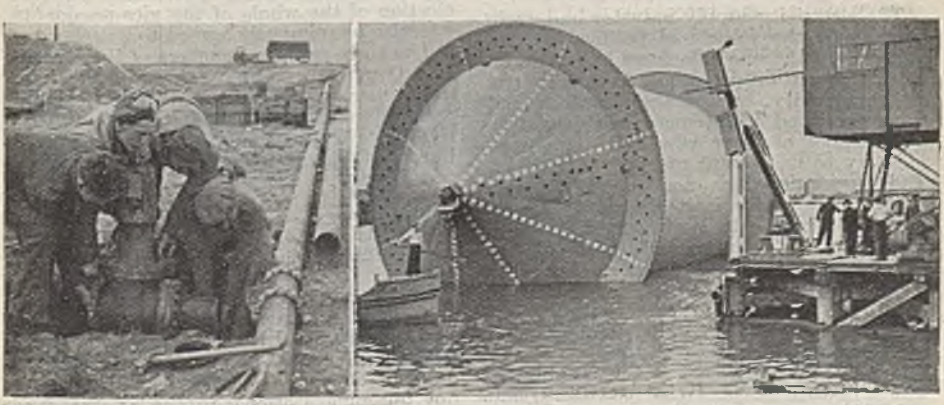
A special Petroleum Unit of the R.A.S.C. maintains direct contact with the French terminals of the submarine lines by cross-Channel wireless telephone. Any variation in the quantities delivered through the lines can be instantly detected and reported. Many of the pipe-line laying operations took place under adverse conditions of weather; 500 miles of pipe were laid between Dungeness and Boulogne.

Among the companies who contributed to Operation Pluto were the following:—

Hais cable: Siemens Bros. and Co., Ltd., Johnson and Phillips, Ltd., W. T. Henley's Telegraph Works Co., Ltd., Callender's Cable and Construction Co., Ltd., Pirelli General Cable Works, W. T. Glover and Co., Ltd., Standard Telephones and Cables, Ltd., Edison Swan Electric Co., Ltd., the Telegraph Construction and Maintenance Co.

Hamel pipe: The A.I. Electric Welding Machines, Ltd., the British Insulated Cables Ltd., J. and E. Hall, British Thomson-Houston Co., Ltd.

Construction of the pumping terminals and the supply of the pumping plant, etc.: Mather and Platt Ltd., A. Reyrolle and Co., Ltd., the Isle of Wight Electric Light and Power Co., the Folkestone Electricity Supply Co., Ltd., the County of London Electric Supply Co., Ltd.



On the left British troops are seen installing the T-union valve in the first petrol pipe-line to Boulogne. On the right is a "Conun" being moved into position for the winding of the steel pipe

Annual Meeting of A.O.E.C.

The President on Government Control

THE annual general meeting of the Association of Officers and Staff Members of Electricity (Power and Supply) Companies of Great Britain, was held at Falcon House, London, May 17, the chair being taken by the president, Brig.-General R. F. Legge.

In submitting for approval the report of the Executive Committee and statement of accounts for 1944, the President said that the subscriptions received during the year amounted to £212 15s. as against £148 5s. in the previous year, an increase of £64 10s. There was a surplus of income over expenditure of £142 17s. 9d. which had been credited to the association's fund, now amounting to approximately £750. Investments had been increased by the purchase of £100, 3½ per cent. War Loan 1952, and a further purchase of stock would be made during the current year.

The time was approaching when the Executive Committee would consider whether the association could be thought to be possessed of sufficient funds for immediate purposes, and this might lead to a proposal to reduce the annual subscription for the current year to a nominal sum to meet current expenditure for administration.

The influence of the association would be in direct ratio to the strength of its membership and he looked forward to the time when every employee who was qualified to join the association would become a member so that, if and when necessary, it could speak with authority.

Subject of Political Controversy

The electricity supply industry had again been made the subject of political controversy. On the one side there had been an attack by certain politicians to gain control of the industry, and on the other there had been published a statement in explanation and defence of those who had carried the industry to its present prosperous position. The association was not concerned with party politics, but it might not be inappropriate for him to issue a reminder that important parties interested in the efficient running of that vital industry were the employees and consumers. The stimulating effect of enterprise, so often endangered by Government control, led to expansion of business and an increase in the numbers employed in the industry, which in turn assisted the national policy of full employment. Expansion also tended to reduce over-all costs and bring about a lower price per unit to the consumers.

The industry was already subject to a substantial measure of control through existing legislation, and an examination of some of the Electricity Acts showed that Parliament had not always been the fountain of wisdom in relation to the business of electricity supply. Politicians who attacked an industry were not usually the best informed witnesses of the facts, and the consumer public might well be warned in their own interests to examine very closely the probability of an increase in the price per unit sold, if a further extension of Government control was brought about. But whatever legislative proposals might be made to assist co-ordination in the industry, the association was extremely vigilant on behalf of its members so that the principle of compensation to employees whose position might be worsened, should be maintained and be included in the Bill.

Employees of Holding Companies

The existing provisions for compensation did not afford protection to employees of holding companies which controlled authorised undertakings, and whose work was in or about an authorised undertaking. The Executive Committee had been in communication with the Ministry of Fuel and Power on the subject and had an assurance that the points raised by the association would receive the consideration of the Minister. The Ministry had exhibited a most helpful attitude and they had confidence that the interests of these employees would receive the protection desired.

Brig.-General Legge was re-elected president for the ensuing year, and the re-election of the whole of the vice-presidents was also unanimously agreed to.

The three retiring members of the Executive Committee were re-elected and three new members—Messrs. W. C. Gould (Southern Areas Corporation), W. E. Budding (Edmundsons Electricity Corporation, Ltd.), and H. J. Tyler (London Electric Supply Corporation)—were elected to fill vacancies.

The Hon. Treasurer (Mr. F. Judge) and the Secretary (Mr. E. J. Gibbons) were unanimously re-elected.

Vernon, British Columbia.—The West Canadian Hydro Electric Corporation Ltd., announces plans completed for an up-to-date sub-station to be constructed at Vernon, which will have a capacity two-and-a-half times that already serving the city. Work will be commenced as soon as materials now on order are delivered.

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

Mr. H. N. Sporborg is retiring at the end of June from the position of chairman of the board of the British Thomson-Houston Co., Ltd., after completing 43 years' service with that company. He is also relinquishing the positions of vice-chairman of Associated Electrical Industries, Ltd., chairman of the Cosmos Manufacturing Co., Ltd., chairman of Lamp Caps, Ltd., director of the Metropolitan-Vickers Electrical Co., Ltd., and director of the Switchgear Testing Co., Ltd.

Mr. H. N. Sporborg

The Council of the Institute of Fuel has decided to award the Melchett Medal for 1945 to **Professor C. H. Lander,** Professor of Engineering, Imperial College of Science and Technology.

Mr. W. F. F. Martin Hurst has resigned from the board of the British Thermostat Co., Ltd., on appointment as chairman and managing director of Teddington Controls, a subsidiary company.

Mr. I. F. Watt (English Electric Co., Ltd.), as past chairman; **Mr. S. A. Hunter** (Electric Construction Co., Ltd.), as chairman; and **Mr. F. Cook** (Birmingham Electric Furnaces), as vice-chairman, have been nominated by the Committee of the I.E.E. South Midland Students' Section for election at the annual meeting on May 30.

Henry VIII with his six wives in the Metrovick Dramatic Society's production of "1066 and all That"

The most ambitious show yet given by the G.E.C. Dramatic Society was their presentation of Noel Coward's play, "Blithe Spirit," at Magnet House, Kingsway. On five nights and at a matinee, the company delighted audiences with their excellent acting. It was held to be the society's most polished production. The cast was Joan Marshall (Edith), Jean Freeman (Ruth), William Peacock (Charles), Robert Scutt (Doctor Bradman), Eileen Brotherton (Mrs. Bradman), Kathleen Wilson (Madame Arcati), Elsie Walbancke (Elvira). Much of the success was due to the direction and coaching by Dudley Pearmain, the producer, and the efforts of Lewis A. Foster, who was responsible for the stage management and the setting. The proceeds, amounting to over £200, were handed to the Hon. Mrs. Gamage for the Red Cross Prisoners of War Fund. The society's contribution to war charities, since 1939, now exceeds £1 000.

Cast in G.E.C. Dramatic Society's presentation of "Blithe Spirit"

Mr. N. S. Holland, late director of A. C. Cossor, Ltd., left £697 688 (net £649 967).

The Metropolitan-Vickers Dramatic Society have completed nine performances of the musical play "1066 and All That" at Stretford, Lancs. With its 24 scenes, elaborate costumes, large cast and full orchestra, the production was a big achievement for an amateur company. Large audiences acclaimed its outstanding success.

The honorary degree of Doctor of Science is to be conferred by Leeds University on **Sir Edward Appleton,** F.R.S., secretary of the Department of Scientific and Industrial Research. He is a native of Bradford.

Members of the United States Senate Committee on Communications, accom-

panied by the Chairman of the Federal Communications Council and U.S. Army and Navy communications chiefs, visited Electra House, London, headquarters of Cable and Wireless, Ltd., on May 17. **Senator Burton K. Wheeler** headed the party, which was received by **Sir Edward Wilshaw,** chairman, and shown over the London telegraph station.

Mr. H. R. Turner has resigned from the board of Turner and Newall, Ltd.

Obituary

Mr. C. T. Hopkins, a director of the Lightfoot Refrigeration Co., Ltd., aged 79 years.

Sir Rayner Childe Barker, late director-in-chief, Indo-European Telegraph Department, and formerly director of the Persian Section, on May 14, aged 86 years.

Planned Light and Colour Combination

THE advantages of studying colour and artificial light jointly are shown by the photographs reproduced on this page of the effects of such combinations in an engineering shop and an inspection department of a large works in an industrial estate in the North of England.

In the engineering shop the lighting plan (consisting of multi-rows of 500 W Cosmos tungsten lamps in dispersive fittings symmetrically spaced at a height of 14 ft. above the floor) is of conventional design, but the walls and floor are all light coloured, and as a result it is possible to obtain a service illumination of 12-15 f.c. over the whole of the floor area—an intensity which could hardly have been achieved without a considerable increase in load had the walls and floor been left dark.

In addition, this combination of correct lighting and light coloured surroundings, benefits operatives by reducing marked differences in brightness, and thus preventing undue strain on the eyes.

Another feature of interest is the provision of an emergency low voltage lighting system, supplementary to the main lighting, supplied by storage batteries.

An illumination of 25-30 f.c. is obtained in the inspection department by utilising 80 V 5 ft. fluorescent lamps housed in continuous troughing mounted 10 ft. above the floor level.

This lighting scheme was designed by Metropolitan-Vickers lighting engineers, and the complete wiring installation was carried out by F. Reid, Ferens and Co., Ltd., of Sunderland.

Below: An inspection department lit by 5 ft. fluorescent lamps in continuous troughing.

Above: Multi rows of 500 W. Cosmos tungsten lamps in dispersive fittings in an engineering shop.

Magnetic Materials

Sir Laurence Bragg on Their Scientific Development

THE annual lecture to the I.E.E. Measurements Section was delivered on Friday, May 18, by Sir Laurence Bragg, Cavendish Professor of Physics in the University of Cambridge, who dealt with the scientific development of magnetic materials.

Sir Harry Railing, president of the institution, was present at the meeting, over which Dr. W. G. Radley, chairman of the section, presided.

Sir Laurence Bragg said we needed magnetic materials which combined fairly high saturation value with a low hysteresis loss, particularly so that they did not become heated too much in cyclic magnetic processes. Again, we needed magnetic materials which combined a high coercivity, a high "hanging-on" to that magnetism, with as much remanence as possible. We needed magnets for loud speakers, instruments and other purposes. Further, one of the highly important types of material was one having high initial permeability, for light current electrical engineering particularly. And, now that we were working with such high frequencies, we needed materials with reasonable permeability and extremely high resistance, and materials with desirable magneto-striction properties.

Was not the whole field of magnetic materials one in which pure and applied science should collaborate to place our country in a stronger position, perhaps, than it occupied at present? His friends had told him that other people had got ahead of us in the making of good transformer steel, that they could make it with a lower hysteresis loss than we could. In the field of permanent magnets one did not quite see why the great brainwaves of the last 20 years or so should have come from Japan, of all places.

Possible Reasons for Development

It was interesting to seek reasons why that should be so. Perhaps it was due to the influence of a great teacher going on and on. One could trace the enormous development of electronics in America to the fact that O. W. Richardson went there a generation ago; perhaps the reason why Japan, with no very great scientific achievements to her credit, had yet produced exciting new magnetic materials was that Ewing went to Japan some forty years ago as a professor at the Imperial University.

Again, high permeability was something we had borrowed, he believed, from America. It was not that we had not done excellent work in this country; but had we really done all that we might do in initiating new lines? He mentioned some of the centres of research in this country, and said we must try to get them together and, by interchange of views, to surprise the world by bringing out the very latest.

Theory of Magnetism

Sir Laurence went on to discuss the theory of magnetism, to show the lines along which we might effect improvement and those on which nature had set a barrier. He referred briefly to the theories of the circulation of the molecular magnets, and said the difference between a para-magnetic and a ferro-magnetic body was not that one had weak molecular magnets and the other had strong molecular magnets. It was that in a para-magnetic body the magnets were not subject to discipline, but pointed in all directions, and that a field applied to them would turn them only slowly, although if one made the field strong enough one would arrive at something approaching the ferro-magnet; whereas in the ferro-magnetic body the molecular magnets were an extraordinarily docile crowd waiting to be given a tip as to where to point. Magnetisation, the desire to point the same way, was a matter of interaction between one atom and another. Nickel, cobalt and iron happened to fulfil the conditions of being ferro-magnetics; there was an easy direction of magnetisation.

Which of the fundamental properties could we alter, and which could we not alter? Saturation, a profound atomic property, was not influenced by the "geography" of the crystal. The elementary magnet was a property of the nature of the metal as a whole, and, except within rather rigid limits set by nature, we could not get anything better than iron or cobalt, which had high saturation values, nickel having rather less saturation value. So that it seemed there was nothing to be done there, unless we re-built the universe entirely.

As to remanence—the magnetism which a body retained when the field was taken off—we could not do very much. It depended on the distribution of the easy axes. For instance, in a body such as cobalt, which had one easy and one bad axis, by applying a field one could swing the elementary magnets into line. When the field was taken off, the best that could happen was that the magnets would all go

back to the hexagonal axis. The remanence would be 0.5 of the saturation. In iron there were three cube edges, and one of them was fairly sure to be in the direction required. If they all remained in the best direction, there would be about 0.83 of the saturation left as remanence; and for nickel it was about 0.86. At any rate, one would get some 20 or 30 per cent. less than the saturation as remanence, and we could not beat that.

The Curie point, which was sensitive to composition, was another property it was very difficult to alter.

Permeability

Coming to the things that we could do, Sir Laurence said that theoretically there was no reason why initial permeability should not be infinite, giving the condition where the magnetic field would completely turn over all the elementary magnets. The reluctance to change the direction of the magnets was due to strains which occurred as the body cooled. The way in which to achieve very high initial permeability was to arrive at something with no magneto-striction, so that the strains were not locked up in the body when it cooled.

In coercivity we had a lot to play with. There was no reason why a body should not hang on like grim death to all the magnetism remanent in it when the field was removed. We had never achieved that ideal, but we could go a long way towards it. The figure of merit — coercivity x remanence—of permanent magnets had been improved in recent years by an enormous factor; indeed, he had a magnet which would fit into his waistcoat pocket but which would lift half a hundredweight.

In an ideal world there was no reason why there should be a hysteresis loop, i.e., why there should be any energy wasted. Enormous improvement had in fact been achieved in that direction.

Thus, the three factors in which improvement had been effected — initial permeability, coercivity and hysteresis loss —were just those in respect of which there were no natural limits.

Indicating some of the ways in which we were trying to attack these problems on the theoretical side, Sir Laurence mentioned some fundamental work on transformer sheet steel which had been undertaken at the request of the E.R.A., and some of the methods by which the work was being carried out.

In conclusion, he said he could not pretend to speak as an expert on magnetic materials; but he did speak as one who had always been very keen on the linkage between pure and applied research. In the field of magnetic materials there could be very good collaboration between the pure science laboratories and those who needed the materials for various purposes. He believed one was justified in saying that other countries had rather beaten us to the post during the last few years; we should get together and see what we could do about it.

The National Register

THE report of the Executive Committee to the Registration Board of the National Register of Electrical Installation Contractors, presented at the annual meeting held at the Lighting Service Bureau, Savoy Hill, London, yesterday, May 24, stated that 15 new certificates were issued during the year. Of 32 applications for registration received in 1944, 14 were accepted, 4 were declined, and 14 were under investigation at the end of the year. The net number on the register at December 31, 1944, was 1 332, compared with 1 339 at the date of the last annual report. Twenty-five contractors were removed from the register for various reasons, and three were reinstated.

During the year the register's inspector made 125 visits to contractors. In 28 cases work was satisfactory and no action was called for, and in 78 cases the visits disclosed faults for correction.

The statement of accounts showed that the total income for the year was substantially the same as that for 1943. The total expenditure showed an increase due chiefly to increased war bonus to staff and income tax.

A PROUD RECORD

We have been informed that last autumn, the Metropolitan-Vickers built Lancaster "Aries" flew round the world while on a navigational mission to the Pacific, and toured the United States, Canada and South Africa. Back in this country some members of the crew visited the works just before the naming of the 1 000th bomber produced in the Metropolitan-Vickers factory at Trafford Park on December 21, 1944. Now "Aries" has made another expedition to gather navigational data, this time over the North Pole. Wing-Commander D. C. McKinley, D.F.C., A.F.C., a pioneer on the Atlantic Service, is captain of the aircraft, and he captained "Aries" on the flight mentioned above.

South Shields.—The Electricity Commissioners have made an order extending by one year the authority under the South Shields Rural Electricity Act, under which the various local authorities can acquire the electricity supply undertakings in their area.

Birmingham University

Extensions and Developments—An Electrical Wing

THE University of Birmingham has launched an appeal for £1 500 000 for developments and extensions. The plans include new buildings at Edgbaston for arts, commerce, law, engineering, library and adult education; additional halls of residence for students; increased facilities for scientific research and cultural activities. The endowment of a Professorship of Electronics is to cost approximately £40 000.

In the proposed new home for the departments of mechanical and electrical engineering, each department will occupy a separate wing, forming a self-contained unit with laboratories, lecture rooms and a senior drawing office. The central portion of the building, containing the large lecture theatre, main drawing office and the library, will be shared by both departments.

The Engineering School of the University serves an area containing the largest concentration of engineering in the country. It is fully alive to its responsibilities, and realises that only by the fullest co-operation between the universities, the technical colleges and industry can post-war requirements be met.

Technology and Industry

The layout and equipment of the engineering schools remain as planned thirty-five years ago. The bulk of the equipment is not only obsolete, but unsuited to modern laboratory requirements, while facilities for post-graduate courses and specialised study are almost entirely lacking. Moreover, for want of space, it is impossible to increase the pre-war annual output of students—an obviously vital need in these days.

For these reasons the University feels justified in appealing to all branches of the engineering industry for help in carrying out the scheme.

At the launching of the appeal, the Vice-Chancellor, Dr. R. E. Priestley, said if we build wisely the future of university education in Britain should lie largely with the provincial universities. The University of Birmingham and the Midlands planned to play a worthy part in what should be a university renaissance such as Britain had never experienced. To-day the new urban universities were only beginning to pull their weight; in the future their part must be increasingly important with a national life built on technology and industry.

The Dean of the Faculty of Science emphasised that applied science must always be preceded by pure science, and he mentioned a little known fact that scientific research at Birmingham had played an important part in the development of radio-location during the war.

Of the £638 636 promised so far, the subscribers have earmarked £228 615 for engineering (mechanical and electrical).

Among those who have already sent or promised donations are: W. and T. Avery, Ltd. £25 000; Belliss and Morcom, Ltd., £4 200; Birmingham Battery and Metal Co., Ltd., £1 000; British Thomson-Houston Co., Ltd., £14 000; W. Canning and Co., Ltd., £20 000; Chance Bros, Ltd., £7 000; General Electric Co., Ltd., £14 000; Higgs Motors, Ltd., £10 500; Joseph Lucas, Ltd., £112 000; Rubery Owen and Co., Ltd., £14 000; Serc Radiators, Ltd., £3 500.

LONDON STUDENTS

A paper entitled "A.C. Generator Protection," which had been written by an Egyptian author, Mr. D. A. Daoud, was presented to the London Students' Section on May 14 by Messrs. P. W. Castle and G. Lyon.

The capabilities desirable for a sound protective scheme were stated to be comprehensiveness, sensitivity and discrimination. Faults could be divided into internal and external types. The former were mainly insulation failures, and the latter rose from abnormal system conditions.

Stator insulation failures fell into four groups, namely, faults between phases, short circuits on one phase only, earth faults, and earth faults accompanied by system faults on other phases. External faults varied in seriousness. Loss of d.c. excitation or of motive power would merely result in a machine failing to supply its load, or taking a motor current, but external short circuits or overloads might have serious effects.

Phase to phase faults were commonly dealt with by differential, that is Merz-Price systems, or by self-balance protection. Short circuits between turns could be handled either by a current balance method on Merz-Price lines, or by some form of voltage balance. The class of earth-fault protection applied depended on whether the generator was part of a generator-transformer unit, and whether the system was earthed.

Over-current protection was valuable to back up other forms of protection. Induction pattern relays were employed having an inverse and definite minimum time characteristic. For over-voltage protection a relay was normally connected to the voltage transformer supplying the instrument circuits.

Branch Book-Keeping

By S. HOWARD WITHEY, F.C.I.

ELECTRICAL contractors who intend transacting business at branches will find it necessary to keep separate accounts for income-tax purposes, and generally speaking it is advisable to open a complete set of books at each branch and to adopt a system which will enable the figures to be incorporated in the head office accounts.

Before it is possible to commence a set of books at a branch, it will be necessary to prepare an opening statement showing the value of the assets to be taken over and the amounts of the different liabilities, and the contractor who proposes to keep complete records at a branch should determine the balance to be credited to head office account by enumerating the assets on the right-hand or credit side of the opening statement, and the liabilities on the debit side. The difference between these two totals can then be regarded in the same light as a capital account.

Nature of Assets

The assets may consist of book debts, stock-in-trade, fixtures and fittings, cash at bank, and cash in hand, while the only liability to be taken over may be the sum owing to sundry trade creditors and suppliers from whom goods, articles, materials or stores have been bought. The amount by which the total value of the assets exceeds the sum owing to creditors should be transferred to the credit side of a head office account opened in the branch private or general ledger, showing the date, and the words, "By Balance." Each item shown in the list of book debts would have to be recorded as the opened entry on the debit side of a separate personal account kept in a sales or customers' ledger, while each item in the list of outstanding creditors would be shown as the opening balance on the credit side of a separate personal account kept in the branch purchases or bought ledger, and after posting the value of each asset, or group of assets, direct from the opening statement to the debit side of a separate account kept in the private or impersonal ledger, the way will be prepared for the keeping of a complete set of books on the spot.

Although there is no recognised order in which the various accounts should appear in the private ledger, it is a good plan to open the head office account on page one, followed by the bank account and the different asset accounts.

Goods sent from headquarters to a branch where no separate accounts are kept, and components sent from store, should be invoiced out at selling prices, the invoices giving the number or quantity ordered, particulars of the different kinds, the number or quantity delivered, and the value of each kind or description. When there are several branches to be supplied, a separate invoice book can be kept for each branch, and it is advisable to use different coloured forms for different articles. Accounts for plant and machinery, business premises and goodwill, are usually kept at the head office and not at the branch, the amount of depreciation written off at the end of the year being recorded on the credit side of the head office account, and debited to depreciation account. At the stock-taking date, the figures shown in the branch books can be merged with those shown in the head office books, the final accounts being reconciled in the manner indicated below.

On March 31, 1945, the following summary of outstanding balances appeared in the books of a branch shop, and it is desired to draw up a trading account, profit and loss account, and balance sheet in the

SUMMARY OF BALANCES.

March 31, 1945.

	Debit. £ s. d.	*Credit.* £ s. d.
Head Office Account, as at April 1, 1944 ...	—	2 410 6 8
Cash sent to Head Office	967 10 6	—
Sales, less returns and allowances	—	3 860 11 7
Purchases (Head Office)	2 051 7 8	—
Carriage on Goods from Head Office	12 6 9	—
Wages and Salaries ...	350 17 9	—
Discounts obtained ...	—	19 6 6
Rent, Rates, Taxes and Insurance	589 16 5	—
Bad Debts written off ...	15 7 2	—
Depreciation	52 10 0	—
Stock - in - trade, as at March 31, 1944 ...	1 211 10 3	—
Cash at Bank	433 6 8	
Book Debts	223 3 3	
Discounts allowed ...	10 1 11	
Furniture, Fixtures and Fittings	338 10 6	
Sundry Trade expenses...	33 15 11	—
	£6 290 4 9	£6 290 4 9

TRADING ACCOUNT.

March 31, 1945.

Debit.	£ s. d.
To Stock as at March 31, 1944	1 211 10 3
„ Purchases	2 051 7 3
„ Carriage Inwards	12 6 9
„ Balance, being gross profit, transferred to Profit and Loss Account ...	1 381 4 5
	£4 656 9 1

Credit.	£ s. d.
By Sales, net	3 860 11 7
„ Stock, as at March 31, 1945	795 17 6
	£4 656 9 1

branch private ledger, and to make up the corresponding accounts in the head office books.—The stock-in-trade as at the end of the year was valued at £795 17s. 6d.

The balance of gross profit for the year is shown at £1 381 4s. 6d., and this amount would be transferred direct to the credit side of the periodical profit and loss account. To this would then be added the discount obtained, and against this total would be debited the various charges and branch expenses, the result being a net profit of £348 1s. 9d., as shown in the column opposite.

After transferring the net profit to the head office account, the latter would show a credit balance of £1 790 17s. 11d., to be inserted on the liabilities side of the balance sheet, this figure corresponding with the total of the assets, viz.:—£795 17s. 6d., stock; £433 6s. 8d. cash; £223 3s. 3d., book debts; and £338 10s. 6d., furniture, etc. In the head office books, the branch trading account would be made up by crediting the sales and closing stock figures, and by debiting the opening stock purchases, and carriage inwards, those entries being preferably passed through a journal. The same principles would be applied when making up the branch profit and loss account. The amount of cash sent to head office would be debited to head office account in the branch books, and credited to the branch account in the head office books.

PROFIT AND LOSS ACCOUNT.
[Year Ended March 31, 1945.

Debit.	£	s.	d.
To Wages and Salaries	350	17	9
„ Rent, Rates, Taxes and Insurance ...	589	16	5
„ Bad Debts written off	15	7	2
„ Depreciation	52	10	0
„ Discounts allowed	10	1	11
„ Sundry Trade expenses	33	15	11
„ Balance, being net profit transferred to Head Office account	348	1	9
	£1 400	10	11

Credit.	£	s.	d.
By Gross Profit from Trading account ...	1 381	4	5
„ Discounts obtained	19	6	6
	£1 400	10	11

News in Brief

Automatic Traffic Signals.—Mr. Noel Baker stated recently in the House of Commons that there was difficulty in restoring the normal peace standard of street lighting. Until that was restored, it was not possible to have the full light in traffic signals, otherwise there would be too much dazzle.

Dingwall Street Lighting.—The T.C. has decided to adopt electricity for street lighting in place of gas.

Demonstration Kitchens.—The Torquay Electricity Committee has agreed to take part in the scheme of the British Electrical Development Association to provide demonstration post-war electric kitchens and to make a contribution of £100.

Electrical Exhibition.—A ten-days industrial electrical exhibition arranged by the Tynemouth Corporation has been held at North Shields. The exhibition was opened by the Mayor of Tynemouth (Coun. T. Duff) and comprised 26 stands. The exhibits included an all-electric kitchen while about 20 local firms also had stands.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of May 21, 1920: It is announced that on June 9 the King will open at the Crystal Palace the Imperial War Museum, to which is attached the Great Victory Exhibition, a dual enterprise which will tax even the capacity of the Palace, the largest exhibition building in the world. The sections comprising electricity, engineering and gas will have a commanding interest, and the public will have an opportunity of learning how knowledge gained in the science of war can be applied to the progressive achievements of peace.*

Electricity in the Factory.—The speaker for the May 26 meeting of the Women's Engineering Society is Mr. R. E. Watson, who has chosen for his subject "Distribution of Electricity in the Factory." The meeting will commence at 3 p.m. followed by tea at 4.30 p.m.

Aluminium Exhibition.—An exhibition, "Aluminium—from War to Peace" is to be opened on May 30, at 11.30 a.m., at Selfridges Store, London, W.1, by the Rt. Hon. Sir Stafford Cripps. The exhibition will conclude on June 30.

"Electricity Looks Forward." — The North West Area Committee of the E.D.A. are organising an exhibition entitled "Electricity Looks Forward," in the premises of Kendal Milne Ltd., Deansgate, Manchester. The exhibition, which will be opened at 2.30 p.m. on May 29, by Lord Brabazon of Tara, will run until June 19.

Motor-bus Experiment.—Manchester passenger transport department, has been authorised to experiment with power operated doors on motor-buses.

Book Reviews

Electro-Plating: A Survey of Modern Practice. (Fifth edition.) By S. Field and A. Dudley Weill. (London: Pitman.) Pp. viii + 483. 15s. net.

The rapid developments that have taken place in industrial processes to meet the unprecedented demands of modern warfare have called for parallel advances in the science and art of electrodeposition by reason of its wide application in engineering, the making of instruments, and so on. The scarcity of some former essential materials called for alternative methods in this as in other fields of industrial activity. These and the newer processes of a practical nature, which may have peace-time applications, have been touched upon in the fifth edition of this comprehensive survey of modern practice in electro plating. Details have necessarily to be reserved for later publication. The early chapters of the book cover fundamental principles, and lead by progressive stages to the principles of chemical analysis of electro-depositing solutions, some materials used in electro plating, sources of current, properties of electro-depositing solutions, electro plating plant, mechanical cleaning, chemical cleaning, and then on to the deposition of copper, silver, gold, nickel, zinc, cadmium, chromium, various metals and alloys, the testing of electro-deposits, allied processes, and metal colouring.

Alternating Currents Simplified. By G. W. Stubbings. (London: E. and F. N. Spon.) Pp. 203. Price 12s. 6d. net.

Mr. Stubbings is well-known as a writer on electrical technology, who has a flair for presenting theoretical material in a practical guise. He is, moreover, easy to read, for his style is popular without ever descending to the "elementary" level of the hack writers whose scissors-and-paste productions seem nowadays to be flooding the bookstalls. His latest venture is a courageous one according to its sub-title: A non-mathematical text book on the rudiments of a.c. theory.

In the course of just over 200 pages the author covers a pretty wide field, bearing in mind the audience to which this new book is addressed, namely, those students "who understand the implications of an algebraic formula and the elements of trigonometry," as well as practising engineers "who wish to strengthen their grasp of a.c. theory." After three opening chapters on fundamental principles, Mr. Stubbings deals with simple a.c. circuit theory, the action of the transformer, non-sinusoidal currents and voltages, and transient phenomena. He then goes on to describe the interconnection of three sources of alternating voltage to form a three-phase supply, and to discuss the characteristics of both unbalanced and balanced three-phase systems. Finally, he gives an account of the basic theory of measurements in single- and three-phase circuits.

The novel feature of Mr. Stubbings' approach to the vector method of solving a.c. problems—a hurdle at which the majority of "popularisers" fall down badly—is the detailed study of a very low-frequency a.c. obtained from a d.c. supply by hand regulation governed by a clock indicator. Those opening chapters are extremely well done. So for that matter are the two chapters on three-phase systems and the section on the "doubling effect" in the chapter on transient conditions. H.R.

High Frequency Transmission Lines. By Willis Jackson. (London: Methuen and Co.) Pp. vii + 152. 6s. net.

The aim of the author of this monograph is to extend the well-known transmission line theory into the ultra-high frequency region where the wave length is comparable with the spacing between the conductors. Under such circumstances a line having a length of a few centimetres can be designed to act as an almost pure reactance of any desired value and such lengths of line can be used as circuit elements, as resonant circuits in oscillators and as parts of measuring devices for determining wave length, permittivity and other quantities. Chapter I outlines some of these applications and is followed by a development, from the fundamental field equations, of the line equations and propagation characteristics, particular reference being made to the values of the line constants of coaxial, open twin and screened twin lines at these high frequencies. The remaining half of the monograph deals with line terminations and resonant lines and includes the author's graphical method of solving transmission line problems by means of the circle diagram.

Although the applications of ultra-high-frequency currents are highly specialised the underlying principles are fundamental and we therefore commend this book to all serious students of electrical engineering as well as to specialists in the ultra-high-frequency field. E.O.T.

BOOKS RECEIVED

Protective Gear Handbook. By M. Kaufmann. (London: Pitman) Pp. ix + 298. 30s.

Science Abstracts. Secs. A. and B. Vol. 48. No. 565. (January). Issued by the I.E.E. (London: Spon.). Single Nos. 3s. 6d. An. sub. 35s. or 60s. for both sections.

War-Time Electricity in U.S.A.

A Review of the Operation of Undertakings

AN interesting study of productivity in electric power generation is given in a monthly review recently issued by the United States Department of Labour.

This shows that the expansion of industrial activity under the U.S. war production programme entailed a substantial increase in electric-energy requirements. Greatly increased amounts of electric energy have been consumed in the production of aluminium, magnesium, ferro-alloys, zinc, etc., by electro-chemical processes, and in the metal working machinery, mineral extractive, textiles, and paper industries. Although fears were expressed at an early date that the supply of electric power might be insufficient to fill war and essential civilian needs, it has thus far been adequate. Increased production of electric energy has been achieved largely by more intensive utilisation of power plant facilities; the expansion of capacity since the war began has been relatively small. More complete utilisation of generating equipment has been made possible by increased inter-connection of power systems, the adoption of " war time," three-shift plant operation, and minor technical changes which permitted the operation of equipment above rated capacity.

Result of Increased Capacity Utilisation

A result of the increase in capacity utilisation has been a rise in productivity in generating stations. Output per man-hour advanced about 20 per cent. between 1937 and 1942 and about 13 per cent. between 1939 and 1942. Even in 1939, before the impact of the European war was felt, the absolute level of productivity was striking. Nearly 3 million kWh of electricity were produced per generating station employee, an amount equivalent to the electricity consumption of 300 or more wage earners in manufacturing industries.

The amount of electric energy generated by the utilities included in this study rose by 47 per cent. between 1937 and 1942 and 39 per cent. between 1939 and 1942. Fuel plants (steam and internal combustion) which produced 72 per cent. of the total in 1942, experienced a 46 per cent. increase in production between 1939 and 1942 and a 17 per cent. gain in output per man-hour. The changes in hydro-electric plants have been more moderate; output rose 25 per cent. and output per man-hour 8 per cent., between 1939 and 1942. In fuel plants, production and productivity have increased each year since 1939, the largest advances occurring between 1939 and 1941. Hydro-electric plants, on the other hand, increased their production only slightly from 1939 to 1941, and output per man-hour declined somewhat between the two years. Between 1941 and 1942, however, energy generated in hydro-electric plants rose 18 per cent. and energy generated per man-hour about 10 per cent.

The total number of workers employed at generating stations, approximately 48 000 in 1942, constitutes less than 20 per cent. of the estimated total for the electric light and power industry as a whole. Fuel plants employ about five times as many workers as do hydro-electric plants. For both types of generating stations together, 3 330 000 kWh of energy were generated per employee in 1942. Output per man-hour was more than 2 000 H.P.-h. In hydro-electric plants, output per employee was about twice as high as that in fuel plants.

Factors Affecting Productivity

The expansion of capacity between 1939 and 1942 was relatively small—11 per cent. for all plants, 2 per cent. for hydro-electric plants, and 14 per cent. for fuel plants. Capacity utilisation rose 25 per cent. in all power plants, 22 per cent. in hydro-electric plants, and 28 per cent. in fuel plants during the same period. As in the case of productivity, the greatest increase in energy generated per kilowatt of capacity occurred between 1941 and 1942 for hydro-electric plants, and between 1939 and 1941 for fuel plants. Since the equipment in electric-power plants is largely automatic, little or no additional labour is required when the load increases. A portion of the increased utilisation of capacity shown for the industry in recent years, however, represents the entrance into regular operation of standby plants. Such increases in capacity utilisation, unlike those for individual plants, do not tend to increase output per man-hour, since additional employees are generally required when such plants enter into regular service.

Greater interconnection of power systems, substitution of " war time " for standard time, and 3-shift plant operation have contributed to some smoothing out of the load curve. Although the annual plant factor (the ratio of energy generated to the total which would be generated if all units operated at their rated capacity during every hour of the year) has been increasing, particularly since the war, the figure for all plants was only 49.8 per cent. in 1942; for hydro-electric plants it was 59.7 per cent., and for fuel plants 46.8 per cent.

Power pools have been formed in almost all sections of the country. In 1941, for example, the Federal Power Commission initiated the formation of a giant power pool in 17 south-eastern states. In five south-western states — Arkansas, Oklahoma, Texas, Louisiana, and Mississippi— power systems with a combined capacity of 3 000 000 kW were interconnected. Co-ordinated operation of six large power systems in five Pacific north-west states is estimated to have released the equivalent of 50 000-100 000 kW of new capacity; interconnection of the Southern California Edison Co. and Los Angeles city power systems is reported to have permitted the cancellation of scheduled new generating capacity of 185 000 kW.

The institution of " war time " in February 1942 is estimated to have reduced the peak demand for the year by 1 500 000 kW, and to have saved a million kW of energy, which would have required the equivalent of 10 000 wagonloads of coal. Three-shift operation of war plants has also made some contribution to increased utilisation of power-plants facilities, since the power load is ordinarily lowest between 11 p.m. and 6 a.m.

Plant factors have been improved in recent years by slight changes which made possible the operation of equipment above rated capacity. Among the changes reported are the use of ventilator fans, reduction of generating room temperature, increases in the gas pressure in hydrogen-cooled units, and increases in the height of flashboards on dams.

Like other industries, the electric light and power industry has had to meet war-time operating problems—shortages of trained personnel, difficulties of obtaining equipment, etc. Some companies have " pooled " their man-power, so that personnel may be shifted where necessary. Utilities have expanded their training programmes and have given employees diversified training, so that they may be able to handle various jobs in emergencies. In some cases, office employees, meter readers, and bill collectors have been trained for operating jobs. A few companies have trained women for jobs in generating stations. At some semi-automatic hydro-electric plants, for example, wives of operators have been employed as assistant operators or relief operators.

New Equipment and Methods

New equipment installed during the period considered has followed the well-established trend toward larger capacity, improved design, and operation at higher temperatures and pressures. Thus, according to Federal Power Commission statistics, generators installed in all privately owned utilities during 1940 had an average capacity of 24 000 kW, while those installed between 1929 and 1939 had an average rating of 13 000 kW. New equipment has been more automatic, and fuel-handling systems and cooling systems have been improved. Turbines operating under high steam pressure are often superimposed on older equipment (" topping "), so that the steam which passes as exhaust from the new turbine may be used again in the older turbine at lower pressure. Hydrogen cooling, introduced in 1937 and now used in most large generating units, has cut down friction and the adverse effect of heat on the dielectric strength of the windings in the generator. The development of special silicon steels has permitted an appreciable reduction of losses in the steel cores of generators. Mercury vapour turbines, though still of minor importance, have operated with the expenditure of only 9 000 B.Th.u. of heat energy per kWh of electric energy produced, compared with the use of about 11 000 B.Th.u. per kWh in the best steam plants.

Fuel Costs and Output

Many of the improvements made in recent years have had the principal object of decreasing fuel costs rather than labour costs, but labour requirements have also been reduced. The use of equipment with higher capacity ratings and the increase in plant capacities have contributed particularly to increased output per man-hour, since little more labour is required for the supervision of large units than for small ones. The tendency toward greater output per employee as size increases is well-defined. In hydro-electric plants, companies with generating plants of average capacity below 2 000 kW generated 1 566 000 kWh of current per employee; those plants averaging over 80 000 kW capacity generated 11 483 000 kWh per employee. The pattern for steam plants is similar. In companies with average plant capacity below 2 000 kW, annual output per employee was 235 000 kWh; in companies with plants averaging more than 80 000 kW capacity, the corresponding figure was 3 596 000.

Electricity in the Highlands.—Speaking on " The Future of the Scottish Highlands as Affected by the Hydro-Electric Project," in Edinburgh, recently, Mr. Allan Arthur emphasised that it was hoped by means of the hydro-electric scheme to economise the country's coal supplies. A much greater economy would be effected by the electrification of the railways than by the costly utilisation of the water power of the Highlands. Two per cent. at most of the country's output of coal would produce as much electric power as all the proposed schemes.

Electricity Supply

Glasgow.—The Electricity Committee is to extend mains at a cost of £3 325.

Burton-on-Trent.—Surplus revenue is to be used for the purchase of meters at £500 and for mains services and transformers at £2 500.

Torquay.—The Electricity Committee has given permission to the Urban Electric Supply Co., Ltd., to afford supply to consumers in Dittisham.

Bradford.—The Electricity Committee is seeking sanction to borrow £226 250 for the installation of a turbo-alternator at the Valley power station.

Hove.—The Electricity Committee is to provide a sub-station in Stapley to meet increased demand in the Elm Drive area and to provide supply to 48 houses to be erected on the Knoll estate, at a cost of £4 640.

Walthamstow (London).—The Metropolitan Water Board has arranged for the Walthamstow Corporation to provide cables, switchgear and metering equipment, at Ferry Lane pumping station at a cost of £7 138.

Glasgow.—The Gas Committee has arranged for the electricity department to supply a battery for an electric locomotive at Provan gasworks at a cost of £200 and connect up cable reeling drums at Dalmarnock gasworks at a cost of £120.

Liverpool.—The Electric Power and Lighting Committee is making application to the Commissioners to borrow up to £33 000 in connection with provision of a supply of electrical energy to the L.M.S. Railway for their Liverpool-Southport electric line.

Salford.—Application is being made by the Light, Heat and Power Committee to the Commissioners for permission to increase the unit rates for electricity which are not covered by the Coal Price Variation Clause, by $\frac{1}{10}$d. per unit as from the meter readings of Sept, 1945.

Torquay.—Mains and sub-stations are to be provided at Newton Abbot at a cost of £16 500; sub-station and mains at a cost of £2 200 in the central area, and a temporary overhead line at a cost of £570 in the Aller district to correct the voltage drop which is occurring owing to the existence of a small factory and increase in domestic load.

Northern Ireland.—By a majority vote, Belfast Corporation has given its approval of the Government suggestion to set up a Central Authority to control electric production and distribution. The full powers of Belfast Corporation, which for some time were administered by three Administrators, appointed by the Government, are to be restored as from June 30 of this year.

Berwick.—The Corporation is to meet representatives of the Scottish Southern Electric Supply Co., Ltd., regarding post-war street lighting charges. The firm has suggested that a new contract should be drawn up whereby the responsibility for lighting, extinguishing, repairs and maintenance and the provision of new equipment should be transferred from the company to the Council.

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.

Salford Electricity Department, May 26.—Supply and delivery of 36 steel street lighting standards. Particulars from the City Electrical Engineer, Frederick Road, Salford, 6.

Barking B.C., June 4.—Supply, delivery and erection of 6.6 kV switchgear. Specification from the Borough Electrical Engineer, Ripple Road, Barking.

Manchester City Council, June 5.—Supply and erection of low-pressure pipework—Stuart Street, generating station (Specification No. 828); 10 000 kVA transformer—Denton (West) sub-station (Specification No. 829). Particulars from Mr. R. A. S. Thwaites, Electricity Department, Town Hall, Manchester, 2; deposit, £1 1s. each specification.

Dunbar, B.C., June 9.—Supply, delivery and installation of street lighting equipment, including poles, lanterns, wiring, and control gear. Specifications from the Burgh Surveyor, Town House, Dunbar.

Leeds Waterworks Department, June 11.—Supply of two electrically-driven centrifugal pumps, 700 g.p.m., with motors and float-operated switchgear. Particulars from the Manager and Engineer, Waterworks Department, Civic Hall, Leeds, 1.

Amble U.D.C., June 14.—Supply, laying and jointing of l.t. mains and distributors, supply, erecting and connecting of feeder pillars and laying, jointing and connecting of services. Specification from Mr. W. C. Roy, Electricity Department, Dilston Terrace, Amble, Northumberland.

Industrial Information

Employment of Overseas Agents.—The Gauge and Tool Makers' Association have already dealt with over 500 applications for copies of a specimen agreement which the Export Committee of the association has prepared for the employment of overseas agents.

G.E.C. Journal.—In the current issue, the Editor, Mr. W. H. Richardson, tells something of the company's war-time progress and development, Mr. R. Horler contributes an article on "Relay Interlocking Power Signalling Control," and Messrs. L. W. Barsdorf and J. C. Adams describe the lighting installation of the Portela Airport, Lisbon.

"Take the Right Road."—Under this title, a booklet has been produced by Marryat and Place, Ltd., for the guidance of electrical engineering apprentices employed in their organisation, and its aim is the prevention of accidents. It is illustrated with humorous drawings emphasising dangers to be avoided in lift maintenance.

Delaron.—A data book giving the physical and electrical properties of their laminated plastic Delaron and its various industrial applications has been published by De LaRue Insulation, Ltd. There is an accompanying machining manual for Delaron (price 1s.) which should be invaluable to all users of this plastic.

Control of Plastics.—Under the Control of Plastics (No. 3) (Revocation) Order, 1945, licences are no longer necessary for the acquisition, disposal, treatment and use of plastics in the form of moulding powder, or synthetic resin, in the production of which formaldehyde, phenol, cresol, urea, thiourea and cellulose acetate are involved. Use of cellulose acetate moulding powders is still restricted.

Government Surplus Machine Tools.—It has been decided to maintain, in Belfast a complete record of all the surplus Government machines lying in Northern Ireland, which are available for disposal. Full information regarding the operation of the disposal scheme can be obtained from the Machine Tool Control Regional Office, Law Court Buildings, Belfast.

Electrical Handbook for Women.—The fourth edition has just been published. This new supply of the only electrical textbook of its kind has been necessitated by applications from schools and colleges, organisations of women and girls, and the three women's Services, who have found it essential to their courses of electrical instruction. The handbook, published by the English Universities Press, price 7s. 6d. (8s. post free), is available through any bookseller.

Irons.—The Central Price Regulation Committee has approved the following prices for "Clifton" electric irons, complete with flex and connector, manufactured by Clifton Aircraft, Ltd.—Iron with bakelite handle; wholesale buying price, 13s. 6d.; wholesale selling price, 16s. 10d.; retail, 22s. 6d.; iron with wooden handle: wholesale buying price, 12s. 7d.; wholesale selling price, 15s. 9d.; retail, 21s. The prices are exclusive of purchase tax.

Safety in Operating Theatres.—A memorandum issued under the authority of the Council of the I.E.E., entitled "Safety in Operating Theatres and Anæsthetic Rooms," has been circulated by the Electrical Contractors' Association to its members for their information. It contains the warning notice, based on recommendations made by the Operating Theatres Electrical Apparatus Committee of the I.E.E., which has been adopted by the Ministry of Health for distribution to hospitals, nursing homes and similar institutions.

Supply Developments.—Two leaflets of interest to supply authorities have been issued by Siemens Electric Lamps and Supplies, Ltd. They are entitled: "Z 158—Street Lighting Fuse Box," and "Z 159—Metal-clad Service Equipment." The first gives the specification and prices of the weatherproof street lighting fuse box No. 1860 for wall or pole mounting. The metal-clad service equipment described in the second leaflet is a range of cast iron service switch fuse boxes and components. The gear can be assembled for almost any arrangement of service control, industrial or domestic.

Wages for Boys.—It has been decided by the Council of the N.F.E.A. that on and from the third pay day in May, for the pay period covered by that pay day, the hourly rates, plus 2d. an hour Cost of Living (War) Adjustment, to be paid to youths aged 14 and 15 years shall be as follows:—Category II: Age 14 (15 per cent. of the journeyman's basic rate), Grade A, 3½d.; Grade B, 3d.; Mersey district, 3½d.; Grade C, 3d. Age 15 (17½ per cent. of the journeyman's basic rate), Grade A, 4d.; Grade B, 3½d.; Mersey district, 3¾d.; Grade C, 3½d. Category III: Age 14 (17½ per cent. of the journeyman's basic rate), Grade A, 4d.; Grade B, 3½d.; Mersey district, 3¾d.; Grade C, 3½d. Age 15 (20 per cent. of the journeyman's basic rate), Grade A, 4¾d; Grade B, 4d.; Mersey district, 4½d.; Grade C, 4d.

Company News

HENRY MEADOWS, LTD.—Intm. on ord. 7½%.

AMERICAN TELEPHONE AND TELEGRAPH.—Reg. qtrly. $2.25.

J. I. THORNEYCROFT AND CO., LTD.—Intm. div. 5% on ord. (same).

METROPOLITAN CABLE AND CONSTRUCTION CO., LTD.—Pft. for 1944 announced as being £56 881.

CALCUTTA ELECTRIC SUPPLY.—Sec. intm. div. 3% mkg. 6%, tax free (same).

BROOKE TOOL MANUFACTURING CO., LTD.—Intm. 7½% (same), payable June 5.

ALTRINCHAM ELECTRIC SUPPLY CO., LTD.—Net pft. 1944 is announced at £25 450 (£25 700).

HYDRO-ELECTRIC SECURITIES.—Usual hlf.-yrly. div. on 5% "B" cum. prefd. part. shs. payable Aug. 1.

EDMUNDSONS ELECTRICITY CORPORATION, LTD.—Fin. div. on ord. 3½%, less tax (same), making 6% for yr. ended Mar. 31 (same).

STOTHERT AND PITT, LTD.—Co. is to increase its authorised cap. from £350 000 to £500 000 by the creation of £150 000 £1 ord. shs.

HOFFMANN MANUFACTURING CO., LTD.—Co. has decided to pay no further div. for 1944. Intm. was 7½%, tax free. Pft. is announced as £77 606 (£217 930)

SOUTHERN AREAS ELECTRIC CORPORATION.—Net pft. 1944 £27 667 (£21 620) plus £17 274 (£20 041) brot. in. Div. 5% (same), to gen. res. £15 000 (£4 800), fwd. £10 354.

RAWLPLUG CO., LTD.—Net tdg. pft. 1944 £77 780 (£94 152), divs., int. and fees £1 128 (£1 200), tax deduct. from divs. nil (£26 375), mkg. £78 908 (£121 727), fwd. £50 194 (£44 114).

EVER READY (IRELAND).—Pft. to Mar. 31, £15 327 (£14 339), plus £1 407 (£1 431) brot. in. To pref. div. £1 200 (same), ord. div. 10% (same) £5 000, to res. £9 395 (£8 163), fwd. £1 139.

ANGLO - AMERICAN TELEGRAPH.—Rents recvd. from Western Union Telegraph to Mar. 31, £262 500 (same). Divs. paid £131 250 (same), tax £131 250 (same) leavg. credit blce. £65 625 (same).

STURTEVANT ENGINEERING CO., LTD.—Net pft. 1944 £25 074 (£25 553). To rebuildg. res. £10 000 (£6 000). Conting. nil (£4 000), fin. div. 2½% and bonus 3½%, mkg. 11¼% tax free (10% tax free), fwd. £10 511 (£9 137).

RIVER PLATE ELECTRICITY AND OTHER SECURITIES CORPORATION.—Fin. div. 6% (5%) on ord., less tax, mkg. 8% (7%) for yr. ended Apr. 15. Net pfts. £32 078 (£31 537) to res. £1 581 (£2 973), fwd., £18 663 (£15 545).

DUNLOP RUBBER CO., LTD.—Net pft. subject to fin. audit, £2 615 700 (£2 765 797), pref. divs. pd. for yr. £200 000 (same) and dirs. recommend divd. on ord. of 8% (same), less tax, will absorb £357 104. Carrd. fwd. £648 091.

RICHARD JOHNSON AND NEPHEW, LTD.—Pft. to Mar. 31 (after tax) £45 860 (£43 773). To dirs.' fees £1.062 (£1 250), lvg. £44 797 (£42 523). Pref. div. £10 500, to pensions £7 500, genl. res. £10 000, ord. div. 9% £13 500 (all same), fwd., £42 505 (£39 207).

WEST DEVON ELECTRIC SUPPLY.—Gross rev. 1944 £104 337 (£90 499). After taxatn., deprecn. and pref. div., avail. blce. £32 682 (£27 670). To future taxn. £5 000 (nil), war insur. £3 000 (same), gen. res. £2 000 (same), ord. div. 5% (same), fwd. £5 182 (£5 170).

MERGER PLAN.—It is proposed to form a new co. for the purpose of amalgamatg. the Mid-Cheshire Electricity Supply Co. and its subsid., the Mersey Power Co., and an application has bn. made to the Electricity Commissioners for power to transfer the undertakgs. to the proposed new co.

RHEOSTATIC CO.—Accts. show trdg. pft. £38 956 (£35 626), add other income mkg.

(Continued on page 478)

Metal Prices

Friday, May 18.

		Price.	Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	„	£62 0 0	—	—
H.C. Wires, basis ...	per lb.	9 7/16d.	—	—
Sheet	„	11 1/16d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	„	1s. 0 7/8d.		—
Brass (60/40)—				
Rod, basis	„	—	—	—
Sheet „	„	—	—	—
Wire „	„	11d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)...	per ton	£7 13 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	„	£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	„	£26 10 0	—	—
Foreign or Colonial	„	£25 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...	„	£25 15 0	—	—
Mercury (spot) Warehouse	per bott.	£69 15 0	—	—

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

£38 966 (£35 701); to dirs.' fees £250 (same), deprectn. £9 030 (£8 180), inc. tax and E.P.T. £19 956 (£18 487); net pft. £9 730 (£8 784), to pref. div. £1 500 (same), fin. on ord. 8%, mkg. 12%, less tax, £4 200 (same), to gen. res. £4 000 (£3 000), fwd. £4 170 (£4 140).

MARCONI INTERNATIONAL MARINE COMMUNICATION CO.—Total receipts in 1944, £27 134 up at £696 122. Rentals, maintce., ships' telegrams, gross pft. on sales and sundry receipts were £573 726, (£553 663), and receipts from subsids., etc., £122 396 (£115 325), mkg. total pft. £696 122 (£668 988). Net blce. £90 138 (£93 392). Carried fwd. £35 055 (£34 371).

FINANCE CORPORATION FOR INDUSTRY.—It is announced that the first board of directors has been selected for the Finance Corporation for Industry, the £125 000 000 organisation formed by the banks and insurance companies to assist in the finance of British industry after the war. The chairman is Lord Hyndley. Directors include Lieut.-General Sir. R. Weeks and Sir R. Sinclair. Financial experts will include Sir J. Morison, Mr. Ivor Spens, Sir J. Raisman and Mr. F. Frazer. Science is represented by Prof. C. D. Ellis.

W. CANNING AND CO., LTD.—Tradg. pft. 1944, after taxn. £78 481 (£81 623), plus other income £1 559 (£662), mkg. £80 040 (£82 285). To dirs.' fees £500 (same), depreen. £6 584 (£6 520), spec. depreen. of props. £5 223 (£6 767), leavg. net pft. £67 733 (£68 498), plus £52 571 (£47 823) brot. in. To intm. div. 5% (same) £7 500, fin. div. 5% and bonus 12½% (both same), mkg. 22½% (same), to res. £15 000 (£25 000), to employees' benev. fund £5 000 (same), University of B'ham developmts. appeal £10 000 (nil), fwd. £56 554.

RANSOMES SIMS AND JEFFERIES.—After depreen. £35 000 (same), prov. A.R.P. and resg. for E.P.T. and defd. rprs., trdg. pft. 1944 £116 456 (£111 670), plus other income £3 410 (£3 394) mkg. £119 866 (£115 064). To dirs.' fees £1 500 (same), deb. int. £11 250 (same), taxn. £64 000 (£55 000), leavg. net pft. £43 116 (£47 314) added to £58 858 (£55 359 and £32 675 pft. on sales of investmts.) brot. in. Pref. div. absorbs, less tax, £5 500 (same), ord. div. 7½% (same) £18 750 net, to pension res. £15 000 (£25 000), res. post-war reconstructn. and conting. nil (£27 240), fwd. £62 724.

Commercial Information

Mortgages and Charges

NOTE.—*The Companies Act of* 1908 *provides tha 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.*

H. GARSTANG LTD., Blackburn, electrical and motor engineers.—April 28, 1st deb., to Martins Bank Ltd. securing all moneys due or to become due to the Bank; general charge. *Nil. May 17, 1944.

County Court Judgments

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

READE, J. R., 27, The Broadway, Woodford Green, wireless dealer. £15 15s. Mar. 27.

TAYLOR, Ernest A., 125, Willereley Avenue, Sidcup, electrician. £19 13s. 4d. Mar. 27.

A. BARTON (ENGINEERS) LTD., R/O, Providence Foundry, St. Helens Junction. £80 0s. 3d. Mar. 27.

SMITH, H. (male), 5, West Promenade, Driffield, electrician. £17 4s. 7d. April 5.

Satisfaction

CINEMA-TELEVISION, LTD., London, W.1. —Sat'n. Mar. 26, of debs. reg. May 20, 1941.

Coming Events

Saturday, May 26.

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel. Luncheon-Reunion. *12.30* for *1 p.m.*

I.E.E., BRISTOL STUDENTS' SECTION.—Bristol. Annual general meeting. "Some Hydro-Electric Possibilities and Achievements," W. A. Hatch.

WOMEN'S ENGINEERING SOCIETY.—20, Regent Street, London, S.W.1. "Distribution of Electricity in the Factory," R. E. Watson. *3 p.m.*

Wednesday, May 30.

I.E.E., TRANSMISSION SECTION.—London, W.C.2. "Localisation of Faults in Low-Voltage Cables, With Special Reference to Factory Technique," J. H. Savage. *5.30 p.m.*

I.E.E., S. MID. CENTRE.—Visit to Hams Hall "B" power station. Leave Dale End electric supply department, *12 noon.*—S. MID. STUDENTS' SECTION.—Birmingham. Annual general meeting. Paper, "Electrical Technique in Resistance Welding," T. E. Calverley. *7 p.m.*

I.E.E., N.W. CENTRE, MEASUREMENTS GROUP.—Engineers' Club, Manchester. Informal meeting. *5.30 p.m.*

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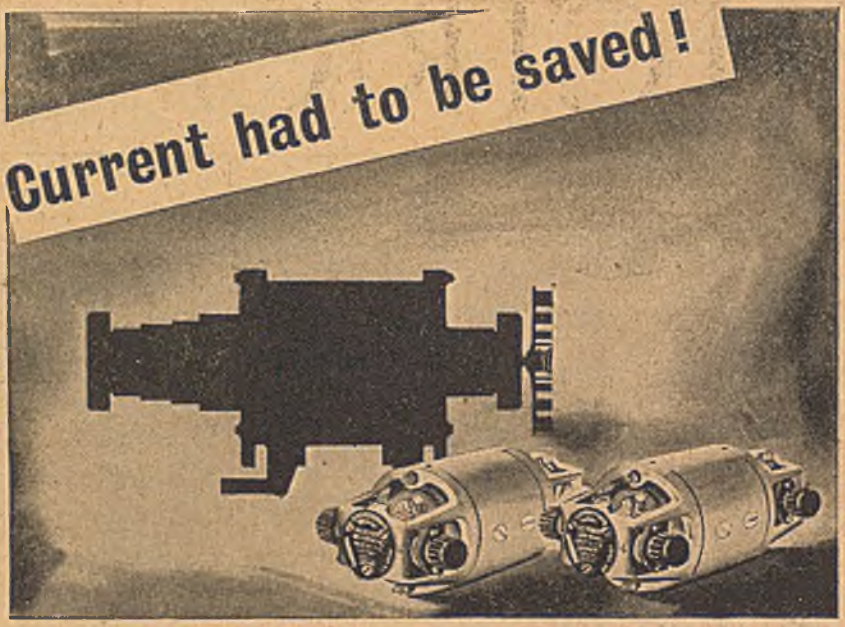

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