The Woman Engineer

The Organ of the Women's Engineering Society (Incorporated 1920).

President : Mrs. J. A. Mollison, C.B.E., B.A., Hon. F.S.E. Hon. Secretary: Miss Caroline Haslett, C.B.E.

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"The Woman Engineer"

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Items of interest and newspaper cuttings regarding the position of women in the Engineering World will be welcomed by the Editor.

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OTHER WOMEN.

To take a long view or a wide view is excellent advice, somewhat like the good advice to take a holiday once in a while. Experts point out that the enfeebled eyesight of this generation is due to the short views to which the town dweller is almost inevitably limited, and the seascapes or landscapes which the vacationist enjoys, providing the longer and wider outlook, are a tonic to the wearied organs of sight.

We are attempting, in this number, to find such a viewpoint, to look a little at the interests of other women, or, more accurately, at the interests of women in general. Such co-ordination is simplified by the Federations, national and international, of Business and Professional Women. As we go to press preparations are being concluded for International Night, when representative women will meet in many parts of the world to hear of progress in varied directions.

An interesting feature will be the international broadcasts, to which we refer later, when the universality of women's aims will be voiced.

The value of a holiday is not in its immediate happiness; it lies in its potentiality for refreshment and in the joy with which it sends one back to one's own job. We feel that this should be the result of the longer and wider outlook in our business and professional lives.

HIS MAJESTY KING GEORGE V.

Tributes have been paid to His Majesty King George V in such numbers, and with so much feeling, that even those who most admired and loved him have been a little surprised and very deeply touched. The Jubilee celebrations had given the Empire an opportunity to express its affection, an opportunity of which it availed itself in no uncertain measure. That outpouring of joyous feeling may have been regarded partly as the nation's first celebration since the turn of the economic tide, or partly as the universal love of a holiday, but having said that, there remained a very notable volume of personal feeling for their Majesties King George and Queen Mary, who appreciated it for what it was worth.

The closing days of King George's reign left no room for qualifications of any kind; the whole world stood breathless to hear how he progressed during his illness, and seemed temporarily stricken on hearing of his death. Mr. Baldwin's worthy broadcast tribute eased the tension, for it expressed for all the King's peoples their deepest feelings of sorrow and their concern for the bereaved family. The thousands who waited for hours to pay their respects at the lying-in-state and the funeral procession were representative of a world that mourned the passing of a good king, and who rejoiced that in these days there had been lived such a noble, royal and humble life.

The Woman Engineer would add its tribute to all the others, but at a time like this it is the voice of a society, not of engineers, but of women, who love and admire "whatsoever things are true, whatsoever things are lovely, whatsoever things are honourable, whatsoever things are of good report." King George was the personification of these things.

Mr. Llewellyn B. Atkinson has resigned his directorship of the Cable Makers' Association, after nineteen years of office in this capacity. In 1913 he was Chairman of the Association, and in 1917 became its secretary. Mr. Atkinson does not intend to sever completely his connection with the C.M.A. We wish to Mr. and Mrs. Atkinson, our good friends of many years' standing, very much happiness in their increased leisure.

Mr. Atkinson is succeeded by Colonel Sir Thomas Fortune Purves, O.B.E., M.I.E.E.

We acknowledge gratefully our indebtedness to the "Electrician" for the loan of blocks which illustrated our article on the Bristol House in our last issue.

OURSELVES

THE ANNUAL CONFERENCE.

SHEFFIELD, JULY 17th-19th.

In spite of the standardisation that is threatening the whole world as a result of easier communications — travel, telephone, radio, etc.—there are still a few names to conjure with, and there is an abiding romance that will not be denied. One such name is Yorkshire. W. Riley may have drawn the picture for us, or may only have drawn attention to it, but the predominant note is breadth, wide acres, broad landscapes, a ready tolerance, an extensive hospitality. The last mentioned is the key to the others.

The W.E.S. has been invited to hold its Fourteenth Annual Conference in Sheffield, and already many members have promised themselves the joy of visiting or revisiting Yorkshire in July from 17th until 19th. The University's Hall of Residence for Women, which will be the Society's home for the Conference, provides sufficient cause for the journey. It is a lovely building, beautifully set in attractive grounds.

The Wolf Safety Lamp Co. (Wm. Maurice), Ltd., of which Miss Monica Maurice is a director, have issued an invitation to their works, and it is hoped to visit, also, the works of Sir Robert Hadfield, who is an honorary member of the Society. Another invitation received is from the Sheffield Aero Club, at Netherthorpe. A Civic Welcome will be accorded to the Society by the Lord Mayor in person.

A special feature of the Conference will be the presidential address from Mrs. J. A. Mollison, herself a graduate of Sheffield.

The dates are: 17th-19th July.

NEWS OF MEMBERS.

The W.E.S. offer their warm congratulations to **Miss Pauline Gower** on her latest honour, the award of the Air Ministry's Second Class Navigator's Licence. Miss Gower is the first woman to obtain this certificate, and it seems that she and her partner, **Miss Dorothy Spicer,** have collected all the honours that are available to them. Members will be interested to know that their air taxi business, Air Trips, Ltd., is continuing to develop.

We congratulate, too, **Miss Isabel Hamilton Sloan,** Principal, Ministry of Labour, on her appearance in the New Year Honours List. Miss Sloan has become an O.B.E.

We apologise to **Miss Dorothy A. Baker** for our statement in last issue that she was on the staff of the British Electrical and Allied Research Association. We should have said the British Electrical and Allied Manufacturers' Association. Miss Baker is now engaged on technical calculations for the Kestner Evaporator and Engineering Company.

We referred in our last issue to the serious accident to **Miss Ruth R. Nichols.** We are glad to have received, a short time ago, a cheery letter from Miss Nichols, expressing thanks for the Society's sympathy and interest, and the hope that she would be piloting a plane again in March. We rejoice with Miss Nichols in her rapid recovery, and shall look for continued good news of her.

THE LATE LADY BEILBY.

On 12th January, the Women's Engineering Society lost one of its oldest and best friends. Lady Emma Clark Beilby had been a member of the Society since 1921, and she was able on several occasions to render such generous assistance as was of inestimable value; it is, indeed, probable that she saved the Society from an early death at more than one crisis in its history.

The Society was represented at the service, held on 15th January, at Golders Green, and a floral tribute was also sent.

Sympathy is extended to Mrs. Soddy and Mr. H. N. Beilby, her children. Lady Beilby was predeceased, in 1924, by her husband, Sir George Beilby, the celebrated industrial chemist, whose inventive genius and fuel research work were recognised by the knighthood conferred on him in 1916.

The following tribute appeared in "The Times," of 17th January:—

"Will you permit me the courtesy of your columns to pay a tribute to Lady Beilby, whose death was announced in 'The Times' yesterday.

"In her quiet, unassuming, yet very practical way, she has over many years given unstinted help, advice and encouragement to many pioneer women's organisations. She sought no recognition for herself, and always insisted that her name should not be associated with any help she had given, and that no seat should be accorded to her on any public body.

"The personal encouragement and practical help which she gave to Women Engineers, I know, was also experienced by many other women's organisations which are struggling to give women a chance of earning a living in the profession in which they feel they can be most useful.

"(*Signed*) CAROLINE HASLETT,
Hon. Sec., Women's Engineering Society."

BUDAPEST—AN IMPRESSION.

By J. M. HARRIS, M.Sc.Eng., M.W.E.S.

So much is heard in praise of Budapest that, on my visit last summer, I confess I went there fearing a disappointment. Nor did I arrive under the best conditions, for it was raining, and the drive from the aerodrome to the hotel was through narrow streets whose appearance was not improved by the damp conditions. Fortunately, it soon stopped raining, and I sallied forth on a tour of inspection. My footsteps turned naturally towards the Danube, and, on reaching the river bank, I realised immediately that my fears were groundless.

How pleasing is the view along the Danube! On the Buda side the terraced hills rise steeply from the river, while on the Pest side the land runs down to the great plains. How successful, too, is the grouping of the buildings! I am inclined to think that this must play a large part in producing so pleasing an impression, as many of the buildings in themselves are not of outstanding beauty. The Royal Palace is an imposing building, forming a suitable centrepiece for the view on the Buda side. To the left of the Palace rises the Gellért Hegy (Hill), with the old citadel at its summit and a statue of the saint in a position to one side, facing Pest. To the right of the Palace is the Coronation Church with its graceful spire, while just below it is the Fishers' Bastion. The interior of the Coronation Church is attractive; it is painted in a curious style, said to result from the Turkish occupation of the city. Other traces of the city's origin are to be seen at Aquincium, where some Roman remains, including part of an amphitheatre, have been uncovered. These are interesting as historical proof, but scarcely worth a visit.

Of the several bridges that join Buda and Pest, I consider the Lánczhid (suspension bridge), built by two British engineers, Tiernay and Adam Clark, in 1842, the most beautiful. It is constructed with a central span and two shore spans and has piers of stone; it is painted a dull green, which, with the natural colour of its piers, makes it harmonise completely, with its setting. Many Hungarians prefer to point out the Erzébet Hid, also a suspension bridge, on account of its single span, but I do not consider that it can compare in grace of outline with the Lánczhid.

On the Pest side, the Parliament building occupies a prominent position on the river front; it is comparatively modern and somewhat ordinary, but the wide interior staircase is rather impressive. St. Stephen's Cathedral stands a little way back from the river, but fails to dominate with its dome and twin towers to the extent expected of such a building. In fact, I did not find it very interesting, but that may have been because I visited the Coronation Church first.

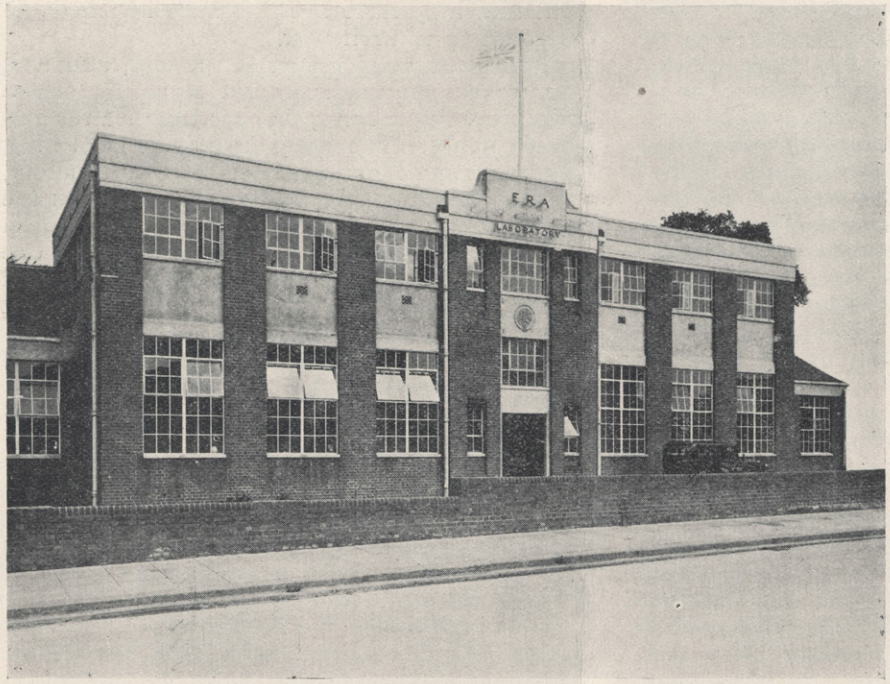
Pest is the newer part of the city, and it is here that the business and shopping centre has grown up. Here, too, are the theatres and opera house. The opera house has been built in the Italian Renaissance style; unfortunately, it was closed during my visit, but it has the reputation for a high standard of performance. Of the main streets, the Andrássy Ut is one of which the Hungarians are very proud, and justly so, for it is wide and perfectly straight for the mile and a-half of its length. It is a pity that one end has been spoilt by a bad approach, for the other is well planned, with the Millennium monument in a central position and an attractive park beyond.

It must not be forgotten that Budapest is both a spa and a holiday resort. There are numerous establishments for people wishing to take a cure, and a variety of attractions for holiday-makers, such as swimming baths, of which the St. Gellért bath, with its artificial waves is probably the best known. The Margaret Island, with extensive park and beautifully cultivated flower beds, is charming; there is a hotel, too, and it would be very pleasant to stay in these delightful surroundings.

Many of the hotels lie along the Danube promenade, the Ferencz József Rakpart, and opposite the Royal Palace. This promenade is a favourite meeting place, and, since no vehicles are allowed along it, promenaders can go at their leisure. All the hotels have their cafés and gypsy orchestras, and many pleasant hours soon pass away. Last, but not least, I must mention the view from the citadel at night. In other cities, I have been taken to the recognised place to view the city by night, but nowhere have I seen anything quite so magnificent as the view from the citadel. The floodlighting and countless other lights produce a sight quite unforgettable!

THE NEW E.R.A. LABORATORY

By WINIFRED HACKETT, B.Sc., Ph.D., M.W.E.S.



The New E.R.A. Laboratory (Front View).

On October 22nd, 1935, H.R.H. the Duke of Kent officially opened the new Laboratory of the British Electrical and Allied Industries Research Association. This association was founded in 1921 to carry out co-operative research for the electrical industry, from which it receives the greater part of its financial support. It is concerned with the investigation of phenomena connected with any problems falling within the scope of the electrical industry, i.e., with the generation, distribution and use of electricity, and with the manufacture of electrical appliances. It has two functions to perform—firstly, to co-ordinate and correlate knowledge and experience already acquired on any specific problem by manufacturers, users, scientific bodies or independent investigators, and, secondly, to bridge the gaps in this knowledge as required by the industry. In the carrying out of experimental investigations, wherever possible, use is made of existing facilities either in other research institutions or in the laboratories of manufacturers or universities. When, however, these are not available, the association has to provide temporary facilities of its own. Owing to the growth of this side of the work, it was found more economical to provide a permanent building for the centralisation and co-ordination of research carried out by the E.R.A. staff and as headquarters for all field work.

The new E.R.A. Laboratory is situated on the recently developed industrial estate at Perivale, Middlesex. The work now transferred to these premises requires a staff of 33 persons, but there is room in the various laboratories for considerable expansion of staff without further extension of building. At the same time, the site of one and a-half acres provides ample room for work requiring an open area, or for further extension of the main buildings for special purposes.

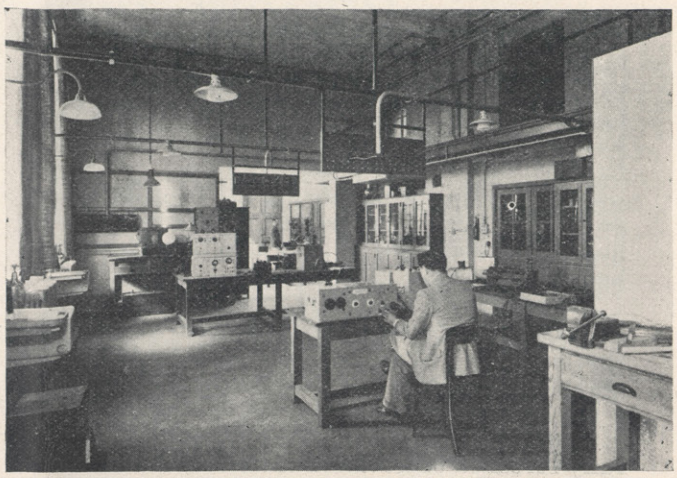
The main building faces south, and consists of a two-storey centre block with single storey wings, the latter being provided with north lights. The workshop, main store, generator room and all the laboratories are situated on the ground floor. A mezzanine floor, built over some of the smaller laboratories, provides space for a drawing office, dark rooms, instrument store, battery room and a corridor for the main switchboards. This floor extends as a gallery round all the main laboratories, thus facilitating the running of temporary cables from one laboratory to another. The first floor contains the library and administrative offices, and also a small kitchen. The main staircase gives access to the flat roof, which provides useful space for open-air tests. The building is water-heated, the water temperature thermostatically controlling the operation of the automatic under-feed forced-draught stoker of the boiler.

The laboratories are supplied with investigators' switchboards, which are mounted in convenient positions above the test benches; from these a variety of A.C. and D.C. supplies can be obtained. One low-voltage A.C. and three low-voltage D.C. supplies are permanently connected to the switchboards, while three other circuits can be connected to any of the numerous normal voltage supplies by means of the distribution plug-boards situated at central points in the east and west wings of building.

On the west side of the building are the high-voltage and the radio and telephone laboratories. The high-voltage laboratory is equipped to give voltages up to 80,000 A.C. and 40,000 D.C. for breakdown tests on insulating materials. A high-voltage air condenser of the parellel plate type is also provided for the measurement of dielectric losses at power frequencies and high voltages by means of a high-voltage Schering bridge.

The radio and telephone laboratory contains the E.R.A. low-voltage Schering bridge for measuring the permittivity and power factor of dielectrics at audio frequencies. The standard equipment of this laboratory includes a neon valve oscillator covering the audio frequency range (50 to 10,000 cycles), a signal generator covering the long and medium wave-lengths (200 to 2,000 metres), and a short-wave generator giving a range of 6 to 80 metres. In addition, the laboratory possesses a considerable amount of portable apparatus, which has been specially developed by the E.R.A. for investigations on the measurement and suppression of interference in connection with telephone and radio reception. The E.R.A. noisemeter and harmonic analyser measures the telephone interference factor on power supply systems, and determines the harmonic content of the supply waveform. This specialised equipment also includes two radio interference measuring sets, one to cover the long and medium wave-length and the other to cover the short-wave range. The former is capable of measuring either the high frequency voltage superimposed on the mains at the source of disturbance or the field strength of the resulting radiated disturbance, and has been used to determine the level of interference from such sources as trolley buses, electric lifts, domestic appliances, etc., with the result that effective means of suppression have been found. The short-wave set, which has been developed in anticipation of the importance of the suppression of interference to television reception is confined to field strength measurements of interfering radiation, the chief disturbing sources in this range being motor-car ignition systems and medical apparatus. In order to eliminate extraneous pick-up on delicate tests, this laboratory is provided with a screened room.

The power frequency heavy current and standardising laboratories are situated on the east side of the building, and behind the latter is the generator room. The power frequency and heavy current laboratory contains a specially constructed oven with auxiliary equipment for conditioning and testing insulating materials at controlled humidities and temperatures. A special technique has been developed for obtaining humidities up to 100% at 100° C. Running along the whole length of this laboratory and communicating with the standardising laboratory is a horizontal cable trench, which is used for research on the current rating of cables under various conditions of installation, e.g., in proximity to steelwork. A vertical chase which runs up to the roof enables a similar investigation to be made on vertical runs of cable.



The Radio and Telephone Laboratory.

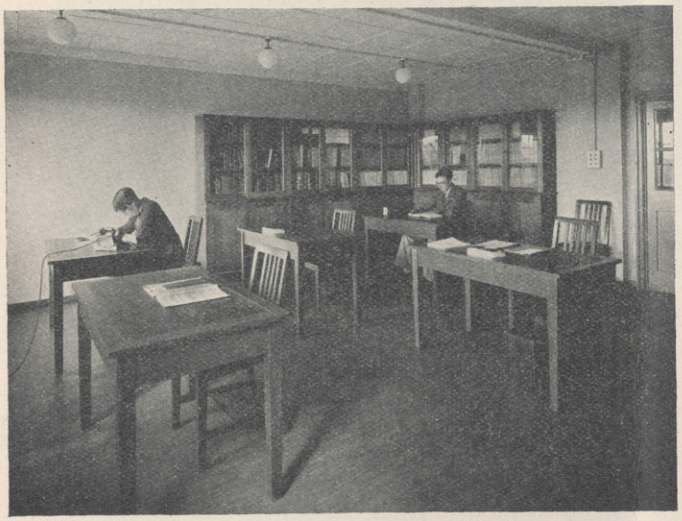
The standardising laboratory contains a D.C. thermo-electric potentiometer for making thermocouple measurements of cable temperatures, and a Campbell-Larsen A.C. potentiometer for measuring cable impedence. Both potentiometers are, of course, also available for calibration purposes.

The generator room gives a sine-wave supply from a 12.5 kVA. sine-wave alternator, driven by a D.C. motor, which in turn obtains its supply from a D.C. generator direct coupled to an induction motor supplied from the mains. In this way the effect of intermittent variation of the mains voltage is considerably reduced. In order to facilitate cable testing, the speed and load controls of the alternator are operated from the A.C. potentiometer bench in the standardising laboratory. For cable testing the sine-wave supply is taken through three single phase loading transformers capable of giving a three-phase output of 1,000 amperes. The low-voltage D.C. supplies are obtained from eight 500 ampere-hour cells. The main 230 volt D.C. supply is provided by a 450 ampere-hour battery which is charged automatically during the night from a grid-controlled mercury arc rectifier capable of giving 60 amperes. The output voltage of the battery is maintained constant by means of an automatic voltage regulator which switches in additional cells as the discharge voltage falls.

The chemistry and physics laboratories are situated in the rear of the main block, on the west and east side, respectively. The former is fully equipped for normal chemical investigations. The latter is available for various physical researches, and has recently been used for a laboratory investigation in connection with voltage gradients in the neighbour-

hood of small earth electrodes, the object being to find means of obviating the danger to cattle when faults occur on overhead lines in rural districts. In addition, a 30 cycle earth tester has been developed for carrying out field tests on the voltage gradients round sub-stations, and also for measuring the resistivity of soils, the design being such that the measurements are unaffected by D.C. and 50 cycle A.C. leakage currents.

Adjoining the generator room on the north side is an additional block, which has been specially laid out for the experimental investigation of fundamental phenomena associated with circuit-breakers. It consists, essentially, of a test-bay, which is overlooked by a carefully screened observation chamber, and of the housing for the auxiliary equipment. The test-bay contains the experimental switch, in



The Library.

which any type of circuit-breaking device can be mounted for test purposes. For the duration of the test, which is of the order of one-tenth of a second, continuous records of the different mechanical and electrical variables which it is desired to measure are obtained from a bank of Duddell oscillographs operating with rotating drum cameras. Intermittent phenomenon, such as the steep-fronted transients which occur as the circuit-breaker current passes through zero, is recorded on a cathode ray oscillograph equipment which can easily detect frequencies of the order of a million cycles per second. These small periods of time are automatically brought on to the time scale by means of a special timing device which controls the instant at which recording begins to within 1/100,000 second.

The current for circuit-breaker tests is obtained from a 10,000 kW. alternator, which is installed in a separate building at some distance from the main laboratory. The alternator is run up to speed on open circuit by a 300 h.p. motor, the supply to the latter being automatically cut off as the alternator is short-circuited through the circuit-breaker. For the duration of the test an output of about 80,000 kW. can be obtained.

A " travelling test-room " in the form of a trailer has also been provided for investigating transient phenomena which occur during switching operations on actual power networks. The equipment is similar in function to that described above, but of rather less precision. It consists of a six-element cathode ray oscillograph unit with a rotating drum camera giving a traverse of the recording film of 100 metres per second. The trailer is provided with dark-room lighting and equipment for photographic development in situ.

A second trailer has been fitted out for the investigation of the effect of voltage surges due to lightning on overhead lines. The equipment contains a cathode ray oscillograph capable of recording phenomena happening in one ten-millionth of a second. A portable surge generator has also been provided for simulating lightning surges, so that their effects on machines and transformers can be investigated under controlled conditions.

It will be appreciated that the researches described here are only a few of the many researches in progress, and have been specially selected for mention in order to illustrate the application of the more specialised apparatus comprised in the laboratory's permanent equipment. A more complete survey of the association's work has been given elsewhere.*

In conclusion, the author wishes to express her indebtedness to the director of the British Electrical and Allied Industries Research Association for permission to publish this information, and to the various investigators for supplying details of their equipment.

* " The Woman Engineer," Volume III, No. 18, March, 1934, page 281.

SPRING PROGRAMME.

The Directors of the new laboratories of the BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION have invited the Society to visit the laboratories at Perivale on Saturday, 7th March, at 3 p.m. Please make application for tickets and full particulars before 3rd March.

The Council wish to welcome home Miss Teresa Wallach, a member of the Society, who travelled THROUGH AFRICA BY MOTOR BICYCLE, and Miss Blenkiron, on Tuesday, March 10th, at 7 p.m. The reception will be held in the Club Room, 20, Regent Street, S.W.1. Please make application for tickets at an early date. Refreshment tickets: 2s. for members, 2s. 6d. for non-members.

THE LEAGUE AND WOMEN.

On Wednesday, 11th December, 1935, there was held, at, 20 Regent Street, under the auspices of the British Federation of Business and Professional Women, a most interesting meeting, addressed by Miss Craig McGeachy, of the I.L.O., regarding the League of Nations' interest in the Economic Status of Women.

The chair was taken by Miss Haslett, who, in introducing the speaker and the subject, expressed the view that it was good, occasionally, to stop awhile in the exceeding busyness of one's own occupation to look around, to see things in their true perspective, to see one's own job as part of the whole complicated business of life, and to learn something of the work being carried on by other women.

Miss McGeachy referred, in passing, to the current upheaval in League of Nations circles, of which the public were well informed, but pointed out that the League had already accomplished much that was outside the influence of political crises. There was a continuous but quiet progress of considerable importance, about which people seldom thought, but which deserved appreciation.

In 1930, the question of women's civil and political rights had been referred to The Hague in the guise of an Equal Rights Treaty, but it was decided that The Hague had no competence to deal with the matter, which was accordingly shelved. In December, 1933, it was referred by the Inter-American Committee of Women to the Pan-American Union at Montevideo. Since then it has been known as the Montevideo Treaty. The Union decided that it had no power either to accept or reject such a treaty, but it recommended its members to examine the condition of things in their own countries in the light of the terms of the treaty. During 1934 much publicity was, in consequence, given to the matter.

The whole matter was then referred to the League of Nations, although there were mixed feelings regarding it amongst women's organisations. There were three schools of thought:

(1) Those who wished the treaty to be passed,

(2) Those who opposed it on the grounds of the consequent removal of protective legislation,

(3) Those who felt that the treaty would defeat the ends desired by those who were supporting it, for the following reasons, that delegates might sign it without feeling bound by its terms, that they might be unable to have it ratified by their governments, and that they might not be supported by the women's organisation in their countries.

The official view at Geneva was similar to the third mentioned. It was felt that for Geneva to pass the treaty would be somewhat undemocratic, that thought and action should be initiated in the countries concerned. Member states have accordingly been asked to examine the whole position and to report to the League, giving particular attention to the existence of restrictive legislation, the intention being that in the compilation of such reports the attention of the governments would be directed to the problem, which would thus receive more consideration than would otherwise be the case. Women's organisations have also been asked to report, and especially to state how the position has been affected by the economic crisis and recent legislation. At the same time, the I.L.O. agreed to examine the existing conventions to ascertain what the effects of the Montevideo Treaty would be on each of them.

The lecturer referred to the surprising developments in recent legislation. Under the driving necessity to deal with the colossal proportions of unemployment and its disastrous effects on family life, many countries had introduced legislation curtailing the rights of women, particularly of married women, to occupy gainful posts. The results have been completely disappointing and the restrictive regulations are gradually being withdrawn, Sweden, for example, having reopened employment to women, and specifically to married women.

The lecture was followed by questions, to which Miss McGeachy replied very fully. The thanks of the meeting were expressed by acclamation.

AUTUMN PROGRAMME.

On 4th December, the third meeting of the autumn programme was held at 20, Regent Street, when the Hon. A. F. de Moleyns introduced to an interested audience the "HISTORY OF BRITISH AIRSHIPS." The lecture might more accurately be described as a running commentary on slides of the most important airships built in this country. Mr. de Moleyns did not disguise his opposition to the policy of giving up airship development on every possible excuse, of being disheartened by every minor set-back, and of being penny wise, pound foolish, in expenditure on this form of traffic research. Before the conclusion of the meeting, many present were inclined to agree with him.

The lecture was followed by a discussion, in which Mrs. Heywood, Squadron Leader Booth and Captain Rice took part.

Miss Pauline Gower was Chairman of the meeting.

The thanks of the meeting were expressed to Mr. de Moleyns and to Captain Sinclair (who acted as lanternist) by Mrs. Douglas, Vice-President of the Society and by Miss Kennedy (by proxy), Past-President of the Society. Mrs. Heywood conveyed to Miss Gower the meeting's appreciation of her guidance.

WEATHER FORECASTING.

By LILIAN F. LEWIS, B.Sc.

1. The Weather Map.

To the professional forecaster the weather map is vitally important: to him each map possesses its own individuality, almost its own personality, and no two are exactly similar. The general public are also becoming interested in these maps: a copy of the latest available chart appears daily in the most important papers, the current chart is exhibited twice a day on a large blackboard in the window of Adastral House, Kingsway, as soon as the information is received, and the daily weather report (with its weather map) finds its way into many schools. No apology is needed, therefore, in a popular exposition on the methods of forecasting for a brief description of the way in which the weather map is prepared.

2. Observing Stations.

The Meteorological Office, Air Ministry, maintains a large number of official observing stations scattered over Great Britain and Ireland. Each station is manned by trained observers, competent to take accurate readings of pressure, wind, temperature, humidity, weather at the time of observation, past weather, the amount, type and height of the clouds, visibility, rainfall during the past 12 hours, etc. If there is no anemometer at the station, the observer must be able to estimate the speed and direction of the wind according to the Beaufort scale. The instruments used are all standard, tested instruments, and their site at the station is carefully chosen. In the British Isles there are 44 stations at which detailed observations of surface conditions are taken at 7 a.m., 1 p.m. and 6 p.m. G.M.T., and at 20 of these, observations are taken also at 1 a.m. About ten minutes before the observation hour, the observer begins to take his readings and writes each down in a note-book as he reads it. This done, he converts the message into an international code consisting of groups of five figures, and immediately transmits it by wireless, telephone or telegraph to the Central Office, London. Similar forecast services exist in other countries, and, by international agreement, observations are taken at approximately the same hours. In Europe, observations are taken at most stations at 7 a.m., 1 p.m. and 6 p.m. G.M.T.

3. International System of Distributing Information.

Information covering as wide an area as possible is essential in the preparation of forecasts, and so each country (again by international agreement) issues by wireless a synoptic message, consisting of reports from a number of selected stations. Further, Europe and the whole of Russia is divided into three large areas, and a comprehensive collective message is issued from a high-powered wireless station in each area: a message for western and south-western Europe is issued from Paris, one for central and northern Europe from Hamburg, and one for the U.S.S.R. from Moscow. Officers on selected ships on the Atlantic take observations at 6 a.m., noon, 6 p.m. and midnight, G.M.T.: the observations are coded and the message sent out by wireless.

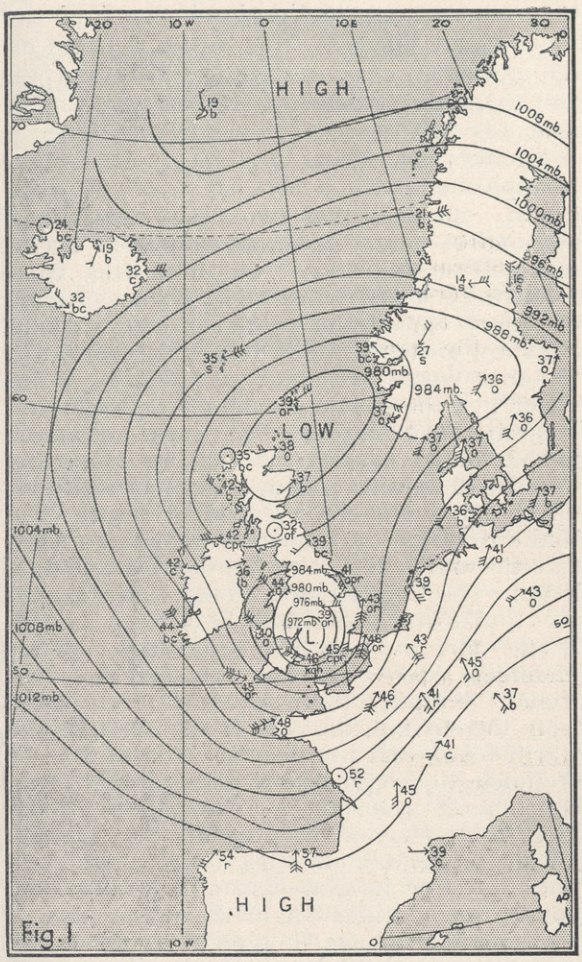
4. How Weather Maps are Made.

Time is of the utmost importance, and, in the Forecast Division of the Meteorological Office, London, wireless messages, picked up by the receiving station on the roof of the Air Ministry, are sent down a pneumatic tube into a room adjacent to the forecast room, telegrams are received from the Central Telegraph Office on a teleprinter in the same room, and the telephones are also housed there. The messages are taken in duplicate or triplicate, and are dealt with immediately on arrival by technical assistants. One copy is used to prepare a synoptic message to be broadcast to other countries, and one is passed to a draughtsman for plotting on the map. The observations from ships on the Atlantic and those from stations in the British Isles are usually among the first to arrive. European information is taken chiefly from the three collective messages from Paris, Hamburg and Moscow, and within two hours of the time of observation, it is possible to see, set out on the chart, a graphical representation of the weather conditions (including wind, pressure, change in pressure during the past three hours, temperature, present weather, past weather, visibility, etc.) from 40° W. on the Atlantic to eastern Russia, and from Spitzbergen to the Mediterranean and north Africa.

5. Systems of Isobars.

Isobars (lines of equal pressure reduced to mean sea level) are sketched in on the map, and various isobaric systems emerge—the depression, secondary depression, wedge, anticyclone, etc. Each of these types of pressure system has, in general, a certain kind of weather associated with it but, in particular cases, the type is more or less intense. The depression or low pressure area is surrounded by closed isobars, generally oval in shape. In the Northern Hemisphere, the winds circulate round it in an anti-clockwise direction almost parallel to the isobars, but turning a little inwards towards the centre of low pressure. If the pressure increases rapidly from the centre outwards, the isobars are very close together

and the depression is said to be deep or intense: the winds will be strong, and perhaps a gale will occur. A secondary depression is one which develops in the circulation of the main depression, generally on the south side of it in the region of the British Isles. The anticyclone is a region of higher pressure than its surroundings: winds circulate round it in a clockwise direction in the Northern Hemisphere and are, as a rule, light. The depression and secondary depression bring unsettled weather and sometimes strong winds and gales and, as the trough or line of lowest pressure passes, discontinuity of wind, temperature and weather. The anticyclone maintains settled weather and generally light winds: it gives warm, sunny conditions in summer and dry, cold conditions, with much fog inland, in winter. These descriptions are very inadequate, but a detailed account may be found in the "Weather Map," published by H.M. Stationery Office. It is the duty of the forecaster to decide, with the aid of the preceding charts, in which way the isobaric systems shown on the chart will move, where they will be in, say, 12 hours or 24 hours, whether they will remain the same or become more or less intense. One of the elements plotted on the map for each station is the rise or fall of pressure during the past three hours: this is called the "barometric tendency." In all the above questions the barometric tendency is of great significance. For instance, a depression will probably move in the direction of the greatest negative barometric tendencies. If pressure has fallen rapidly near the centre of the system during the past three hours the depression is probably deepening, but if the fall has ceased or started to rise in the neighbourhood the system has begun to fill up, will become less active, and will probably remain stationary or move more slowly. In the case of the deepening depression, wind force will increase, possibly to a gale, and weather will deteriorate, while, in the case of the dying depression, the force of the wind will decrease and weather improve. Perhaps this sounds a simple process, but the kind of weather in different depressions varies a good deal in spite of a general similarity, the system rarely continues to move at the same speed or in exactly the same direction as it has done previously and, as has already been pointed out, its intensity may vary greatly during its short life. Further, a secondary depression may develop. Secondary depressions frequently move very rapidly, and are, on occasion, much more active than the main depression. For example, the intense and destructive gale in southern England on September 16th-17th, 1935, was due to a secondary which developed off the south-west coasts of the British Isles, the main depression being centred off north-west Scotland. The



WEATHER MAP FOR 8TH. MARCH, 1922. 7h.

forecaster will watch for discontinuities of wind and temperature at nearby observations. These signify the juxtaposition of warm and cold air masses, i.e., air transported from low and high latitudes respectively and it is at these places of discontinuity that depressions usually form. Figure 1 shows a portion of the weather map for 8th March, 1922, at 7 a.m. It indicates the way in which the observations are plotted, but much fuller information is given on the "working chart." The isobaric system shown off the north of Scotland is the primary depression, while the system centred over southern England is a deep secondary depression which caused exceptionally violent gales.

6. The Norwegian System—Cold and Warm Fronts.

During the war, Norwegian meteorologists were unable to obtain reports from other countries and so they formed a very close net-work of stations in their own country. At these stations observations were taken very frequently. On studying the reports, it was found that abrupt discontinuities of wind, temperature and weather often occurred, and fur-

ther research led to the development of the Polar Front Theory. This theory is based on the movement of air masses of different origin and therefore of different temperature, and it demands that depressions are formed when a warm air mass of equatorial origin comes into juxtaposition with a cold air mass of polar origin. Suppose that two broad streams of air, one of polar origin moving from north-east and one equatorial origin moving from south-west, are flowing side by side. At the boundary (called the "Polar Front") conditions are unstable and waves will form on it. In other words, a tongue of warm air is inserted into the stream of cold air. (See Fig. 2, diagrams *a*, *b* and *c*.) The warm air in the tongue blows against the cold air along the line GH (diagram *c*), and, being lighter, slides up over it along a very gradual slope. The cold air behind the tongue of warm air undercuts the warm air along the line FG and lifts it up. The line GH, where the warm air begins to rise over the cold air, is called a "warm front," and the line FG, where the cold air undercuts the warm air, is called a "cold front." Finally, the warm air is all lifted from the surface, the cold front overtakes the warm front, and the depression is said to be occluded, the single line of discontinuity being called an "occlusion." (This phase has almost been reached in diagram *d*.) In the lower part of diagram *c* is given a vertical section of the conditions prevailing above the dotted line marked UX in the upper part of *c*. Note the change in type of cloud as the warm front approaches, and also the type of cloud around the cold front. The regions of rainfall are shown by vertical shading in the vertical section, and by stippled areas elsewhere in figure 2.

On the weather map warm and cold fronts may be traced by abrupt changes in wind direction and force. Also, the warm air has come from low latitudes and is distinguished by high temperature, high relative humidity and relatively poor visibility. The cold air, on the contrary, has come from higher latitudes and has, in addition to a low temperature, low humidity and generally good visibility. In advance of the warm front there is a belt of continuous rain, due to the upward movement of the warm damp air. Behind the cold front there are sharp showers and perhaps thunder, as the cold air cuts under the warm and lifts it. The depression, which is formed at the apex of the wave, moves in the direction of the wind in the tongue of warm air, or the "warm sector," and so the direction of motion of the fronts is also known. It is not always an easy matter to trace fronts on a chart of western Europe because depressions are often almost occluded by the time they reach the British Isles and the characteristic features of the fronts have become less

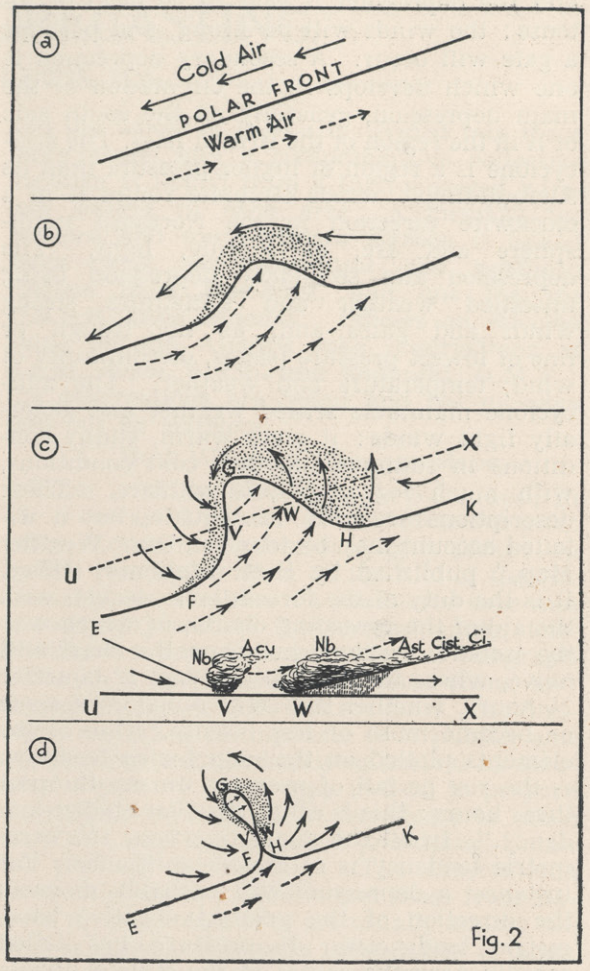


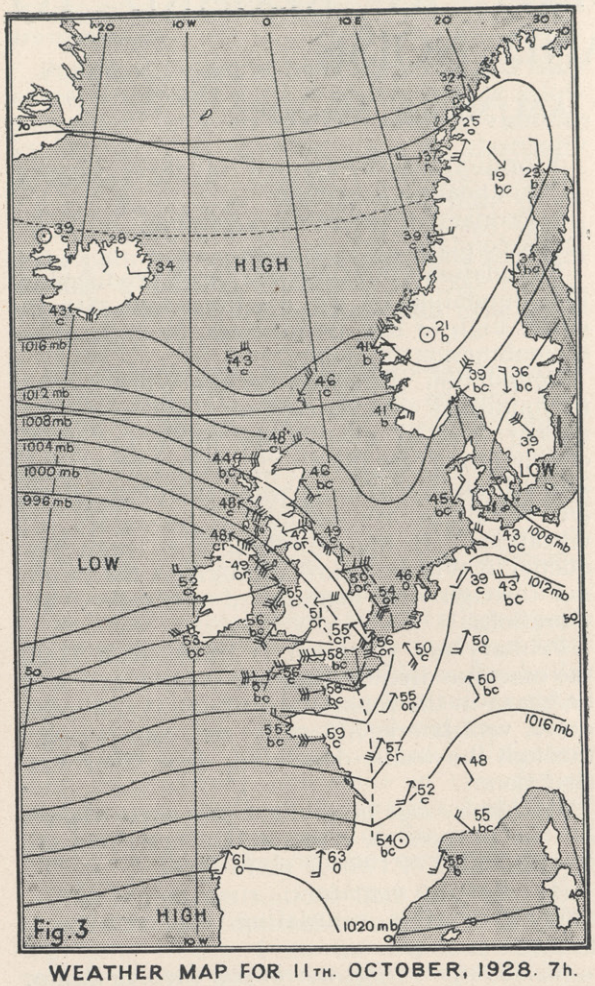
Fig. 2

marked at the surface. The upper air conditions, however, sometimes help to locate them.

If the fronts can be traced, an accurate forecast for a period of six or twelve hours can be made and these shorter forecasts are of very great value to aviators. In Figure 3 the broken line represents a warm front. Note the change in wind direction and difference in temperature in front of and behind the line of discontinuity and the belt of rain in front of it.

7. Upper Air Observations.

(1) *Winds.* At many meteorological stations small rubber balloons are inflated with hydrogen and their flight followed through a theodolite. Taking the free lift as known, the direction and velocity of the wind at specified heights can be calculated. A more accurate method, called the "Tail Method," is to measure in the eyepiece of the telescope the apparent length of a tail attached to the balloon. From the apparent length of the tail, the azimuth and angle of elevation of the balloon and the angle subtended at the eyepiece by the tail of the balloon, the velocity and direction at a given height can be determined. Another method is to watch the bal-



WEATHER MAP FOR 11TH. OCTOBER, 1928. 7h.
WARM FRONT

loon simultaneously through two theodolites placed at the ends of a base line of known length. The objection to this method is the number of people required to carry out the experiment.

(2) *Temperature.* At selected stations aeroplane flights are made for the purpose of obtaining the temperature and humidity of the air at given heights above the ground. Readings of dry and wet bulb temperatures at given heights are taken directly from specially constructed thermometers carried on the aeroplane.

A knowledge of the variation of wind, temperature and humidity with height above the ground at a given place provides information with regard to the type of air mass in that region and, in this way, is of value in fixing the position of "fronts" on a map in which the surface discontinuities are not sharply defined.

[The permission of the Stationery Office to reproduce the illustrations used in this article is gratefully acknowledged.]

BOOK REVIEWS.

Our library has reached another stage in its increasing usefulness by the addition of the final volume of HUTCHINSON'S TECHNICAL AND SCIENTIFIC ENCYCLOPÆDIA, to which we have already referred. It is an excellent work of reference, and should be on the shelves of every engineer.

The Technical Press has just issued a small book, entitled "THE YOUNG ENGINEER," by J. N. Digues La Touche, M.Inst.C.E., who has had considerable experience in India. The foreword by Colonel Sir Gordon Risley Hearn, C.I.E., D.S.O., expresses the opinion, which the reader will soon form for himself, that the book is to be strongly recommended. It deals, primarily, with the problems of the young engineer in the East, but the author's experience and advice should prove of benefit to the man or woman bearing the responsibility for a job for the first time. The introduction is written in a happy vein, and concludes with these words: "The engineer should train himself to visualise his work . . . . this power, when gained, will save him from many mistakes. All the same, nearly as much can be learnt from mistakes as from success."

It is scarcely necessary to draw attention to the SANITARY INSPECTOR'S HANDBOOK, by H. H. Clay, of which a second edition has just been issued. The Handbook is a recognised authority on its subject, as the necessity for a new edition in less than three years indicates. The book has been brought up to date, and such amendments made as recent legislation, particularly the Housing Act of 1935, dictated.

Jordan and Sons, Ltd., published, at the close of the year, the eleventh edition of the booklet, "CONVERTING A BUSINESS INTO A PRIVATE COMPANY," by Herbert W. Jordan. In its small compass it contains much useful information, set out very clearly.

CHANGE OF ADDRESS.

We have been asked to point out that the branch office of Messrs. CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., in Southampton has moved to larger premises at 17, STRAND, the telephone number, SOUTHAMPTON 2919, remaining the same.

ISOLATION OF MACHINERY IN REGARD TO VIBRATION AND NOISE.

PAPER BY ROBERT B. GREY, A.M.I.Mech.E., M.Inst.P.T.

Twenty-five years ago vibration and noise were generally looked upon as the inevitable accompaniment to the working of any machine; to-day they are considered an unnecessary evil and a matter for serious consideration, or even for litigation. The Anti-Noise League, though mainly concerned with excess traffic sounds, is interested in eliminating any noise creating a nuisance in the surroundings.

In spite of great improvements, the vast majority of machines create vibration or noise, or both. The high speed machine, such as a turbine or blower, sets up a high frequency vibration which is heard as noise, and the slowly moving machine lower frequencies, felt as vibration or oscillation.

It is, of course, preferable to eliminate vibration and noise at the source, in the machine itself; this is a state of perfection, however, which at present is impracticable. Consequently, methods of isolation have to be applied to the foundation or support to prevent transmission of vibration and noise to the surroundings.

Definitions.

In the dictionary vibration is defined as oscillation, and noise as "sound of any kind." Both are, however, vibration, and the following definitions are used in this paper.

Vibration is defined as such when frequencies fall below 50 per second and it is perceptible to the senses as movement.

Noise is defined as those vibrations having frequencies above 50 per second and perceptible to the senses as sound.

Amplitude is the range of movement of a body on each side of the mean position.

Period is the time to complete one vibration.

Frequency is the number of vibrations in one unit of time, usually either one minute or one second.

Natural Frequency is that frequency at which a system will vibrate of itself after having been set in motion. Thus a weight suspended from a spring, if pulled down and released, will continue to vibrate at the natural frequency of the sprung weight, until its energy is damped out.

Resonance is the synchronising of the frequencies of two systems. Thus, if a machine vibrates with a frequency of 10 per second, and is mounted upon a floor having a natural frequency of 10 per second, then the floor will vibrate heavily under the influence of the vibration of the machine, and is said to be in resonance with its frequency.

Vibration may be divided into three classes:

Foundation vibration.
Primary or direct air vibration.
Secondary air vibration.

Foundation vibrations are those produced in the foundation by the machine, and may be either high or low frequencies, or more often a combination of both.

Foundation vibrations set the whole of the surroundings into movement at the same frequency, and by moving the floors and walls of a building, set the air in contact with these into vibration also at the same frequency; these air vibrations are defined as secondary air vibrations. If the vibration is of high frequency it will be heard throughout the building through the medium of secondary air vibrations.

Primary air vibration is transmitted from the machine directly through the air, and will be heard in the room and through doors, windows, ventilators, lift wells, etc., and perhaps through the walls, depending upon their construction.

Machinery can be divided into three classes for the purpose of isolation, though there are combinations of two or more types.

(1) *Rotary machines*, such as turbines, motor generators, ventilating fans, centrifugal pumps.

(2) *Reciprocating machines*, such as steam, gas and oil engines, compressors, printing presses of the flat bed type, and other industrial machinery.

(3) *Impact machines*, such as the steam and drop hammer, fly presses, jarring machines.

General Principles.

The methods used for preventing the transmission of low frequencies are also useful in preventing the transmission of higher frequencies.

Whatever the type of machine, the principles applied are the same, degree and method of application being altered to suit the machine and its surrounding conditions.

The first principle is that the machine must be supported elastically, so that the free energy or vibration is dissipated in internal friction in the supporting medium by allowing the machine a certain freedom of movement.

Secondly, the supporting elastic medium under its load must have a natural frequency below any frequency of the machine—the greater the difference between the forced frequency and the natural frequency of the supporting system, the lower the transmission

of vibration—in other words, the softer the spring or more elastic the medium, the less the transmission.

Forced vibration of high frequency has little effect, if imposed upon a system having a low frequency, for example, if an engine running at 500 r.p.m. is mounted upon an elastically supported system having a frequency of 100 r.p.m., the system will transmit little or no vibration—if, however, this is reversed, and a 100 r.p.m. frequency is imposed upon a system having a natural frequency of 500 r.p.m., vibration will be transmitted with little or no reduction.

All systems have a natural frequency of vibration, and will pick up or respond to a similar frequency, even of low amplitude, which may be transmitted from a remote machine, and amplify it sufficiently to cause a nuisance. The system is then in resonance with the incoming vibration. The effect of resonance is at all times difficult to overcome.

An example of this recently occurred in a large departmental store—two 3-cylinder compressors were installed on the roof and little or no vibration was perceptible in the building, until some time later certain minor structural alterations were carried out two floors below and about 150 ft. to one side. Vibration then became very noticeable in one section of floor—obviously the alteration had tuned the floor to the frequency of the compressor, picked up the vibration and amplified it.

It is sometimes noticed that the hum from a motor is more noticeable in parts of a building quite remote from the machine—this is nearly always due to resonance between the hum of the machine and some portion of the building structure. These cases can only be prevented by altering the frequency of the floor or wall of that part of the building responding to the motor, or by altering the machine.

Rotary Machinery.

Rotary machinery, such as a turbo generator, is generally isolated on account of noise.

Machinery of this type can usually be successfully isolated by a layer of isolating material interposed between a concrete slab supporting the machine and a concrete raft resting on the subsoil—the side of the supporting slab is kept clear of the surroundings by either an air space or insulation material.

If the machine is to be installed upon an upper floor then spring isolation should be adopted.

Reciprocating Machinery.

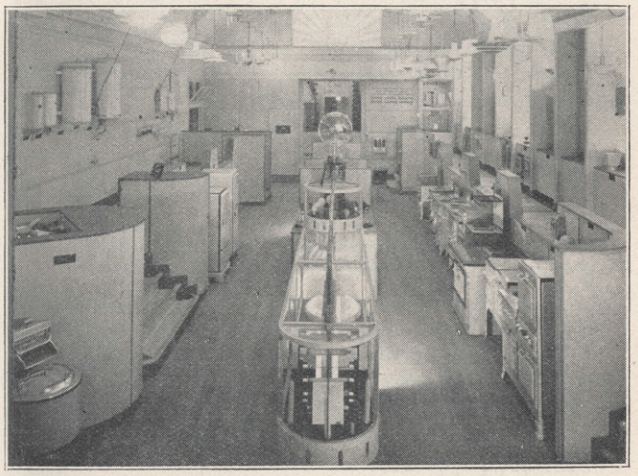
Reciprocating machines, such as Diesel engines, generally set up vibration due to inertia effects. The principal causes of vibration in Diesel and similar engines are:—

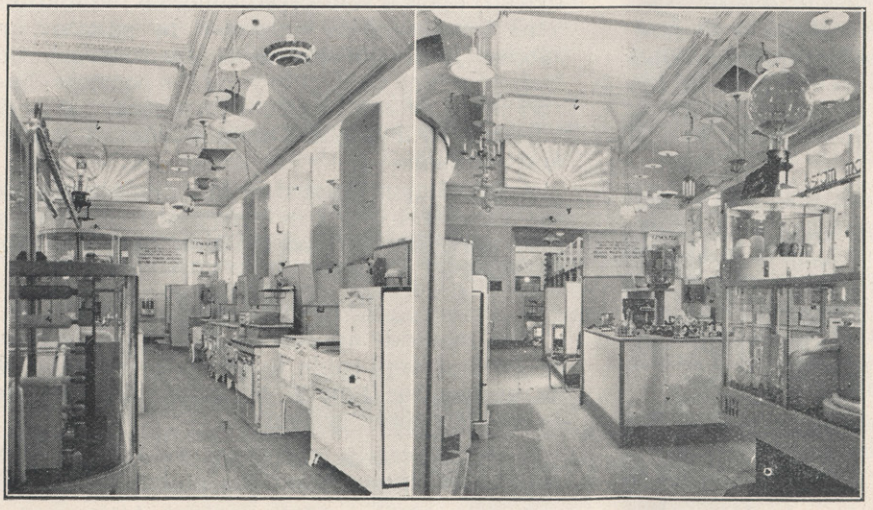
Unbalanced vertical forces due to the reciprocating and rotating masses causing vertical vibration,

Unbalanced horizontal forces due to the rotating masses causing horizontal vibration,

(*Continued on page* 94.)

THE BUILDING CENTRE.





Through the courtesy of The Electrical Times *we reproduce three photographs of the Building Centre to which we refer on page 95 in connection with the Exhibition of the Work of Women Architects.*

Unbalanced couples tending to rock the engine on its foundations,

Detonating effects.

Several conditions must be considered if a Diesel engine is to be installed with freedom from vibration. If vibration is a serious consideration, then an engine having 6 or 8 cylinders is to be recommended.

The four cylinder four stroke engine with cranks at 180° has an inherent unbalanced force taking effect at twice the number of revolutions, which cannot be overcome by attaching weights to the cranks. A very effective method of balancing was devised by Mr. Lanchester, and is known as harmonic balancing gear. It consists of two rotating or oscillating masses moving in opposite directions and driven off the crankshaft at twice the engine speed. The weights may be placed directly over the centre line of the crankshaft or one on each side of the centre line. Numbers of engines have this device fitted, and it was standard on certain Vauxhall cars a few years ago.

An eight cylinder engine should have its cranks arranged 2—4—2, as any other arrangement will create out of balance effects.

Special attention is being given here to Diesel engines, because they are popular and economical producers of power.

To obtain freedom from vibration, foundations must be designed with some regard to the type of engine, class of subsoil and character of surroundings.

The most effective method is to mount the engine and its foundation upon springs.

A more simple, but not so effective, method is to isolate the base of the foundation with a layer of resilient material, and leave an air space completely surrounding the foundation block. Cork in its natural form cut into sections and fitted into steel frames is one of the best forms of resilient isolating material, and has been applied to great numbers of Diesel engines, as well as other types of machinery.

The disadvantage of this method is its non-adjustability and the limited frequency range it will absorb. Should vibration become apparent after the engine is started up, nothing can be done to adjust the foundation to suit the conditions.

Although the greatest care may have been taken in designing the foundation with knowledge of all known conditions, there is always a liability of transmitted vibration due to unknown underground conditions, such as a soft strata of clay at considerable depth out-cropping some distance away and setting a building on the outcrop into vibration.

It is on account of these limitations that the spring method has been developed.

This type of foundation can be designed to have any predetermined frequency, which can be much lower than is practicable with any form of resilient material—it is readily adjustable to meet surrounding conditions.

Machinery in Modern Buildings.

The isolation of the machinery in the up-to-date building requires careful consideration. All the machines must be considered separately, on account of their varying characteristics and their different positions in the building.

Ventilating and Heating Plant.

Motor driven fans can be a prolific source of vibration and noise.

To ensure freedom from such disturbance the fan runner should be driven through a tex rope or similar belt, and not direct coupled to the motor.

The motor must be isolated from the base supporting it, preferably by anti-vibration devices—this will prevent the transmission of motor hum into the fan casing and air stream.

The fan casing should be supported upon isolating material and connected to the ducts through a flexible length of canvas or leather to break the metallic continuity.

Lining the inside of the duct with a sound absorbing material reduces the reverberation inside the duct and renders the system more silent.

If the distance from the plenum fan to the outlets is short, then baffle boxes should be inserted in the line to prevent egress of noise caused by the fan runner.

Air conditioning equipment, including refrigerating compressors, should be carefully isolated.

Reciprocating compressors are likely to create vibration, and the most effective method of isolation is through the medium of correctly designed springs.

It is advisable to mount the compressor and its motor, whether direct coupled or belt driven, upon a reinforced concrete foundation. This foundation is supported by suitably arranged joists embedded in the concrete, the ends of which project beyond the concrete, and rest upon or are attached to a series of anti-vibrators or a patented arrangement of springs and dampers.

A foundation isolated in this manner against the comparatively low frequency of rotation also prevents the transmission of the higher frequencies of noise.

Pumping Plant.

The methods applied to fan equipment are in general applicable to pumping plant, such as accelerator pumps on both heating and domestic supply system.

It is generally necessary to isolate completely the motor from the pump in order to

prevent the transmission of hum into the water lines and consequently into the building. This precaution is essential on A.C. supplies, particularly on single phase.

The metallic continuity of pipelines can be broken by a length of rubber hose, reinforced, if necessary, to withstand the pressure due to head.

LIFTS.

Basement lifts must have isolated foundations. This usually takes the form of an isolated concrete block to which the lift gear is attached. Care has to be taken regarding distribution of weight and pull. Overhead gears sometimes involve considerable difficulties to obtain effective isolation.

The isolation may be either anti-vibrators or resilient material, but the greatest care must also be taken to obtain correct live load pressures and distribution.

Motor generators and similar machines are usually mounted directly upon anti-vibrators.

INDUSTRIAL MACHINERY.

This obviously covers a very wide range of machinery, the greater proportion of which can be successfuly isolated.

Pneumatic hammers are working successfully upon patent spring isolation foundations as well as foundations isolated upon resilient mediums.

The isolation of large rotary newspaper printing presses prevents the vibration affecting adjoining presses, and also results in better printing.

Sand blast plant, transformers, stamping presses, jarring machines, blowers in glass works, chocolate machines, box making machines, and scores of other types have been successfully isolated.

MACHINERY ON BOARD SHIP.

There is no doubt that passengers to-day show preference for the ship with the least vibration and noise, and money spent on isolating the numerous items of machinery will be well repaid.

Diesel electric driven ships, such as the "Loch Nevis," have their main Diesel engines and generators isolated upon a patent system of springs.

This isolation has reduced the vibration to such an extent that when the vessel is running at full speed vibration is almost imperceptible.

Auxiliary Diesel generators have been isolated successfully upon anti-vibrators.

Sensitive apparatus, such as wireless telephony on Atlantic liners has been mounted upon an isolated deck to protect it from the ship's vibrations.

INSTRUMENTS.

Very sensitive instruments are in use for the measurement of vibration. These are most useful in designing isolating equipment, as they disclose exactly the degree and type of movement taking place. They also afford means for comparison before and after isolation.

In cases of litigation, they afford evidence of the existence or otherwise of vibration, indicating its amplitude and frequency.

Noise is measured by an acoustic meter.

CONCLUSION.

Machinery should be selected with care as to balance and freedom from noise. It should be installed in a basement, if possible, in preference to an upper floor. It should be mounted upon a properly designed elastic support. All rigid connection between the machinery and the building should be avoided.

A little thought given to isolation before installing a machine can save a lot of trouble and expense after the machine is in operation. "Prevention is cheaper than cure."

[NOTE.—Extracted from a paper read to the Association of Supervising Electrical Engineers, on January 21st, 1936.]

HONORARY LEGAL ADVISER.

The Women's Engineering Society has been honoured by the recent appointment of Mrs. Helena Normanton as honorary legal adviser. Mrs. Normanton is an outstanding figure in the legal world, and almost a household name, so popular are her articles in many and varied journals.

WOMEN ARCHITECTS.

The Building Centre, in New Bond Street, housed, during February, an unusual exhibition illustrating the work of women architects. This included several models, one of them an excellently conceived design for a block of flats, each equipped with a balcony and intended for occupation by working class families. Most of the work was shown by means of photographs, and revealed a surprising variety of subject. New houses, remodelled dwellings, country cottages whose thatched roofs sheltered the necessities and conveniences of the age, buildings that served in turn as parish hall and parish church, factories and offices were all there, and seemed not incongruous company for the Shakespeare Memorial Theatre, of whose woman architect the exhibition served as a reminder.

The interiors were equally interesting, particularly the original treatment of fireplaces. In this direction the designs indicated that something new was required for modern fitments, and not a mere adaptation of existing arrangements. There were also cocktail bars, restaurants, kitchens—including the E.A.W. Housecraft Kitchen—and other interior designs of much merit.

The exhibition was staged in the new premises of the Building Centre, whose increasing usefulness made an extension imperative. The Centre is at all times deserving of a visit—of many visits—apart from its special displays.

INTERNATIONAL FEDERATION OF BUSINESS AND PROFESSIONAL WOMEN.

WIDENING HORIZONS.

GREAT BRITAIN.

The British Industries Fair was opened at both London and Birmingham on February 18th, to remain open until February 28th, 1936. The British Federation offered to help and look after visiting members. Miss Caroline Haslett, Chairman of the British Federation, had also sent an invitation to any members planning to be at Birmingham on Thursday, February 20th, to come as her guests to a special tea being organised at the Fair that afternoon, at which the Dowager Lady Swaythling would be the speaker.

Women's International Art Club Exhibition. This Club, which is a member of the British Federation, is holding its 35th annual exhibition, opened on Saturday, February 22nd, 1936, by His Excellency Count Raczynski, the Polish Ambassador. The exhibition will remain open until March 14th, and a section has been reserved in which the works of some of our Polish women artists will be shown.

HUNGARY.

The Visit of Women Physicians to Hungary last autumn was a great success. Visitors from Poland, Norway, and Austria, were greeted at Budapest by Mr. Zoltan Szviezsenyi the Director, and Miss Teresi Zsigmondy, Secretary-General of the Hungarian Federation, and were shown various places of interest. In the evening a banquet was held in the Hotel Gellert. The next day the warm water wells, sanitorium and sulphur baths on St. Margaret's Island were visited, and an excursion made to St. Janos mountain. On the third day more institutions claimed their interest, and in the afternoon a lecture, entitled "Women and the Actual Situation of the World," was given by Dr. Beth in the Feszek Club. In the evening, a farewell banquet was given by Mr. Szviezsenyi. Some of the visitors spent an interesting time at Debrecen, where they visited the famous University Hospitals, and at Nyiregyhaza, where they were invited to a luxurious dinner by the Municipality, and shown over the hospitals and salt water wells. After two more delightful days in Budapest, they left for home, saying they had enjoyed a wonderful holiday.

The Hungarian Federation hopes to arrange another of these tours this year, and as soon as information is available, national organisations will be circularised.

HOLLAND.

A New National Federation. Congratulations are extended to our members in Holland, whose efforts to form a National Federation were rewarded on Saturday, February 15th. The name of the new organisation will be "Nederlandsche Bond Van Vrouwen Werkzaam in Bedryf en Beroep," and it will be composed of the four clubs which already exist in Holland at Amsterdam, The Hague, Rotterdam, and Utrecht.

NORWAY.

Two New Committees. We hear from our Norwegian Federation that they have formed two new committees, a Programme Committee and a Tours Committee, the chairmen being Miss Mathilde Oftedal and Miss Rignor Kielland, respectively. The latter committee is hoping to arrange a tour to Paris this summer in connection with our International Congress in July. We warmly congratulate our Norwegian Federation on the formation of these two most useful committees, and hope that their work will have encouraging results.

SWEDEN.

New Club at Upsala. News comes from Sweden of the formation last month of a new Club at Upsala, the oldest University Town in Sweden. The temporary Board consists of eight of the leading business and professional women of this town, the President being Mrs. Ester Paulson, medical gymnast, and the secretary, Högre Allmänna Läroverk för Flickor (Head of the Upsala Secondary School for Girls). We send warm congratulations both to our National Federation in Sweden and to the members of this new Club, and wish them every success in the work they have undertaken.

PALESTINE.

New Club at Jerusalem. A Club will be opened at Jerusalem in the Holy Land, on Thursday, 27th February.

INTERNATIONAL NIGHT.

February 27th was celebrated as International Night by the International Federation of Business and Professional Women in many countries of the world. In Great Britain the celebration took the form of a reception, at which the President of the Women's Engineering Society, Mrs. J. A. Mollison, was one of the speakers.

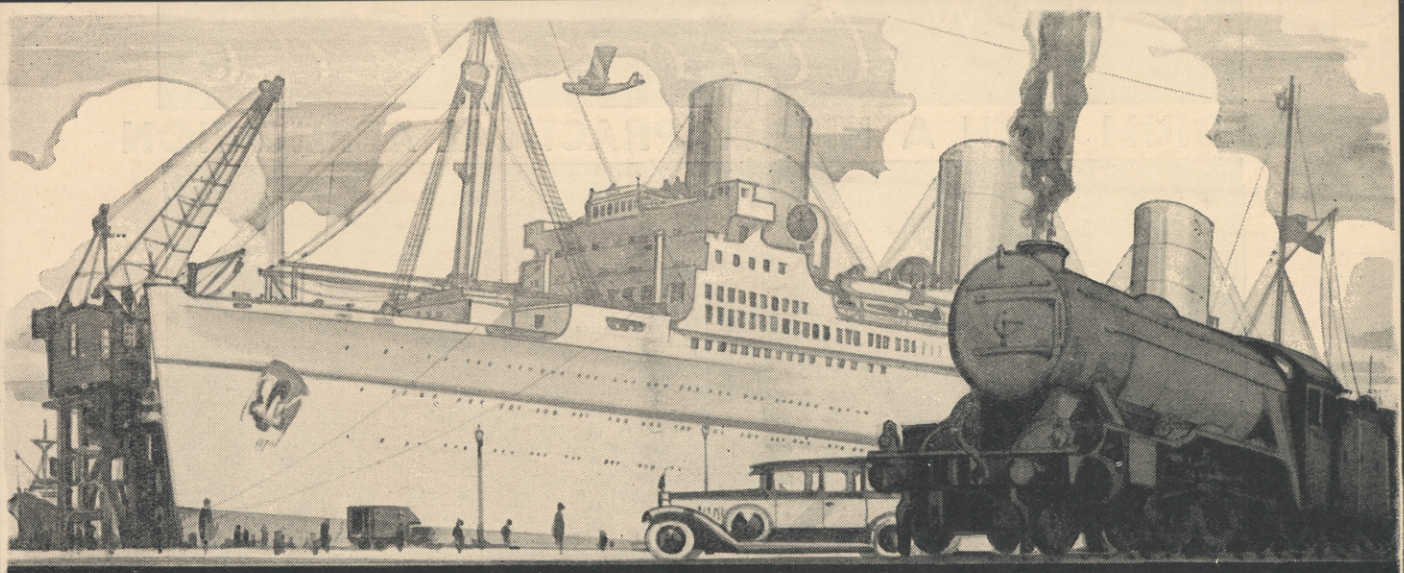
An international broadcast was a special feature of the world-wide celebrations, and we hope to reproduce the messages in our next issue. The messages were read by:

Miss Lena Madesin Phillips, New York, President of the International Federation,

Miss Caroline Haslett, London, Chairman of the Council, British Federation.

Miss Mary C. Mount, Ontario, President of the Canadian Federation,

Miss Charl Ormond Williams, Washington, President of the U.S. Federation.



THE WOMAN ENGINEER

The Organ of The Women's Engineering Society (Incorporated 1920)

Vol. IV. No. 6. MARCH, 1936. Price 6d.

A NEW *decorative*

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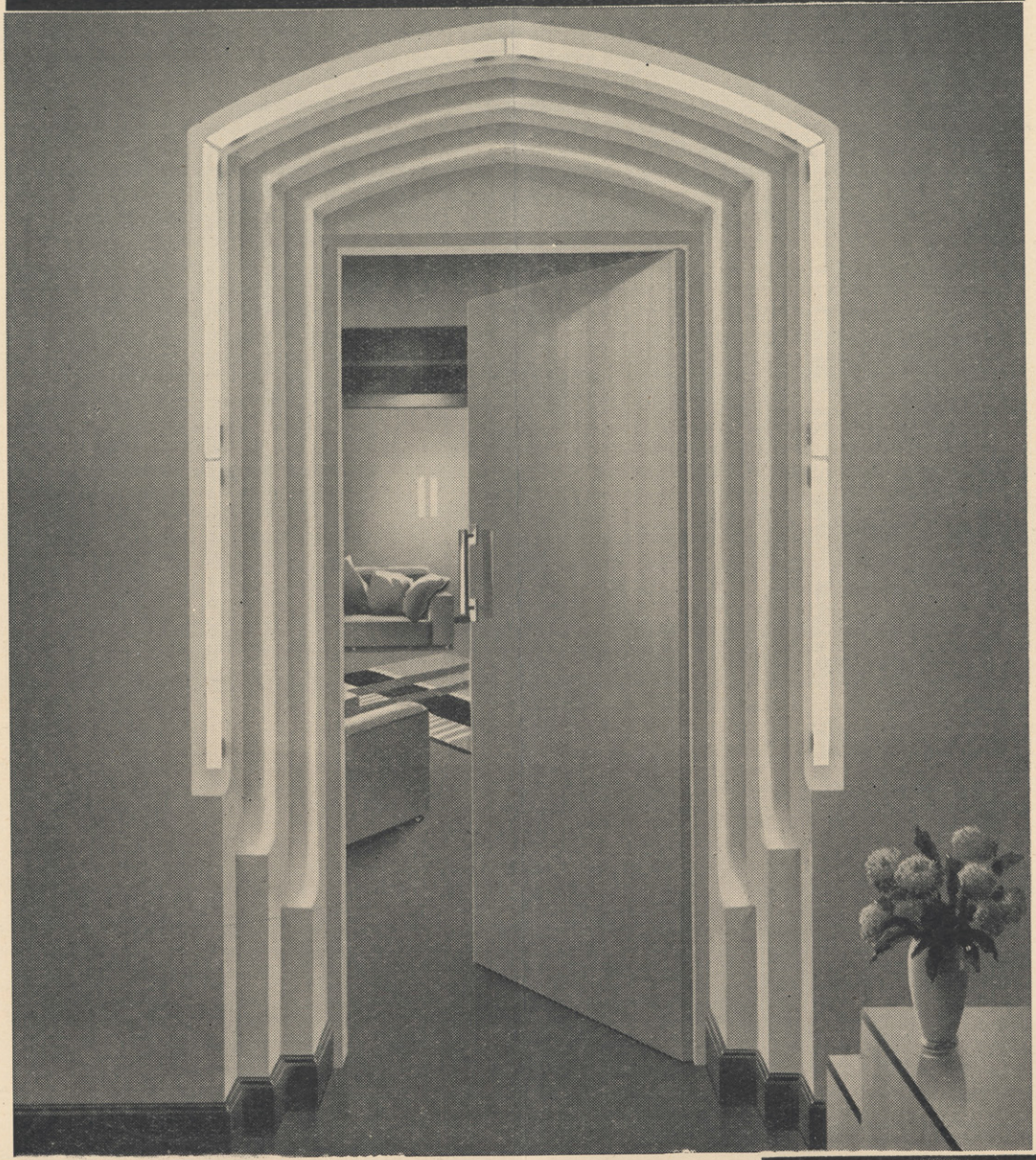

A softness and good diffusion of light given by this type of lamp is of decorative as well as functional value. When mounted together they have the appearance of a continuous band of light. Almost any shape can be made up. No holders or contacts are visible, Write for descriptive Booklet No. L.1016.

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THE ELECTRICAL ASSOCIATION FOR WOMEN

INCORPORATED

ELEVENTH ANNUAL CONFERENCE

London, May 13th-16th, 1936

INFORMAL RECEPTION	by the Committee of the London Branch at Prince's Galleries, Piccadilly, W.1.	**Wednesday, 13th. 7 p.m.—9 p.m.**
ANNUAL GENERAL MEETING	at the Park Lane Hotel, Piccadilly, W.1.	**Thursday, 14th. 11 a.m.**
LUNCHEON	at the Park Lane Hotel, Piccadilly, W.1.	**Thursday, 14th. 1 p.m.**
BRANCH SESSION to be followed by Tea	at the Park Lane Hotel, Piccadilly, W.1.	**Thursday, 14th. 3 p.m.**
RECEPTION and an ADDRESS	by the National Executive Committee at the Institution of Electrical Engineers, Savoy Place, Strand, W.C.2. by Mr. C. C. Paterson, O.B.E., M.Inst.C.E., M.I.E.E., F.Inst.P., on "The Liberation of the Electron—its Effect on Everyday Life." (A discourse based on the 1933 Faraday Lecture of the I.E.E.)	**Thursday, 14th. 8.30 p.m.—10.30 p.m.**
VISIT	to Northmet House, Southgate, N.14, by courtesy of the North Metropolitan Electric Power Supply Co., followed by Tour of the Company's rural areas. Buffet Luncheon by invitation of the Company.	**Friday, 15th. 10.30 a.m.—4.30 p.m.**
BALL	at the Park Lane Hotel, Piccadilly, W.1.	**Friday, 15th. 9 p.m.—2 a.m.**
INFORMAL VISITS to	**The Building Centre, 158, New Bond Street, W.1** (by courtesy of the Directors) or **The Lighting Centre, 143, Knightsbridge, S.W.3** (by courtesy of Messrs. Troughton & Young) or **The E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, W.C.2** (by courtesy of Mr. W. J. Jones, M.Sc.(Eng.), M.I.E.E.) or **The Housing Centre, 13, Suffolk Street, S.W.1** (by courtesy of the Committee).	**Saturday, 16th. 11 a.m.—noon.**

The Electrical Association for Women

20, Regent Street
London
S.W.1

G.E.C.

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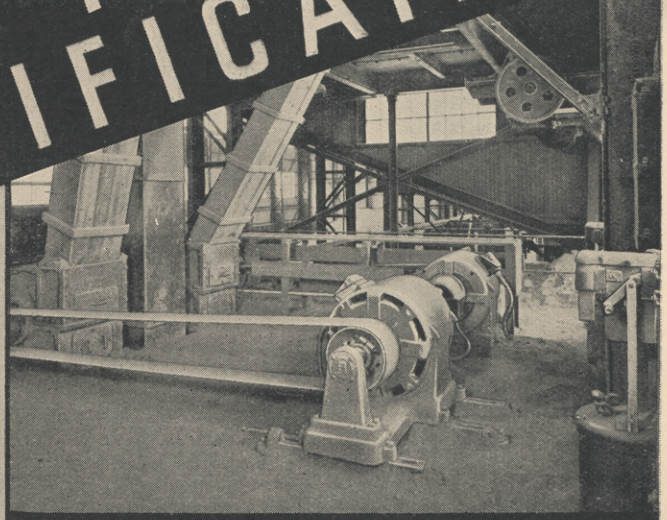
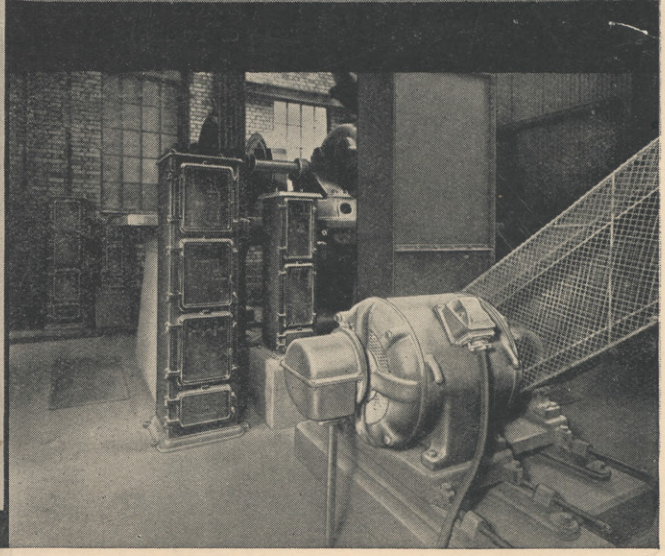
POWER PLANT

FERTILIZER FACTORY ELECTRIFICATION





These views show some of the G.E.C. electrical equipment at the fertilizer factory of Fison, Packard & Prentice, Ltd., Ipswich. This factory is designed for an output of 70,000 tons of fertilizer per annum and is completely electrified on modern lines. Over 80 WITTON Motors, ranging from 1½ h.p. to 50 h.p. are employed in the scheme, together with G.E.C. switchgear, distribution boards, electromagnetic vibrating screens and other equipment.

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