ELECTRON MICROSCOPE IN NEW FIELDS

By DR. V. K. ZWORYKIN.
From "Radio Craft."

Few innovations in the scientific world have made a place for themselves as quickly as the electron microscope: and no wonder. While for centuries previous to this remarkable contribution of radio, research men had been able to enhance the range of the visible world only by small steps, gradually perfecting the light microscope to its present high stage of excellence, the electron microscope almost at once revealed detail of structures up to a hundred times as fine as that visible with the earlier instruments. Within the past year the electron microscope, having been made commercially available, has increasingly proved its value in the fields of biology, chemistry, and metallurgy. Its utility has been greatly enhanced by the development of new methods of observation.

OPERATION EXPLAINED

As the name implies, the electron microscope utilizes electrons in place of light to form a magnified image of the object to be examined. As these minute charged particles, even when possessing a velocity comparable with that of light, do not readily traverse matter, the electron microscope must be carefully evacuated, i.e., freed of air. Furthermore, the electron rays cannot be focused in the usual fashion by material lenses or pass through a glass slide supporting the object. Finally, they cannot be observed directly by the human eye.

Under these conditions it is not surprising that the electron microscope presents an appearance differing greatly from that of the light microscope. Never-
Bump! BANG! B-r-r-r! Bump! Bump! Jarring, crashing over incredible obstacles... and still Brimar Valves go through with flying colours—British colours, too! Ten times tested—ten times more efficient, Brimar have that extra margin of safety demanded for the vital parts they play. Because Brimar Valves are built to "take it," they are the logical choice for all valve replacements. Fit Brimar in your Radio and be sure of long life and trouble-free service at all times.

10 TIMES TESTED - 10 TIMES MORE EFFICIENT

OBTAINABLE FROM ALL RADIO DEALERS.
Standard Telephones and Cables Pty. Ltd., C.P.O. Box 638, Wellington; P.O. Box 982, Christchurch; P.O. Box 362, Wanganui; Electric Lamphouse Ltd., 11 Manners Street, Wellington; Mr. G. E. Tyler, Napier; Swan Electric Co. Ltd., P.O. Box 307, Auckland.

THE HOME RECORDER
ADAPTABLE TO A GRAMOPHONE

(By RAHOB 9390).

This is a small unit using a pickup and can be constructed, without any involved craftsmanship, for a negligible cost. Many will find that old Meccano strips are ideal for most of the metalwork. Figure 1 gives a general elevation of the unit which is fixed to a gramophone, from which the tone arm has been removed. All sizes are variable. They can be altered to suit each different constructor, and gramophone.

A word about the parts comprising this. In Figure 1 UVYS comprises the main frame which may be made of brass, iron, or Meccano strips. XN and the corresponding strip, are a bracket also made of the frame material and LM is a brace. The main shaft F (coloured red) is driven from the sprig on the gramophone, AB. (This is shown in detail in Figure 2. This shaft drives the 2:1 ratio bevel gear, also Meccano, labelled CD. This rotates the threaded shaft G1G at half the speed of the turntable. This shaft is threaded with either 32 or 40 turns to the inch, and...
so the nuts O, O (attached to the tube P) are drawn in 1.54th or 1.50th of an inch for each revolution of the turntable. This threaded shaft bears in W and is held by collars at G1.

EF is a rod wing-nutted at each end. This slides in a curved slot (shown in Figure 3) and controls the raising and lowering of the head. The tube P must be able to slide easily along this rod.

Fig 2.

Collar

Slot for AB

Turntable

X

Note: The crank at the top of shaft U is for winding back. See Fig. 1.

In action, the rotating turntable drives the bevel gears and rotates the threaded shaft. This pulls the nuts O, O, in 1.54th of an inch for each revolution of the turntable. Thus the tube P, supporting the head is pulled in and a stylus engraves a spiral on the blank. This stylus is fitted in the pickup and the pickup is fed with the output of an amplifier. Thus the blank is made into a recording. When playing-back, use a fibre needle.

The details of the height adjuster are found in Figure 3. The radius of the slot is found by extending the arc in made from Meccano wheels, also shown in Figure 4.

The circuit for recording is an ordinary amplifier with mike and tuner inputs. Connect the extension speaker terminals to the recording head. If your set has not these terminals, Figure 5 gives the circuit. A is for push-pull output, B is for single valve. For blanks the best material I have found is light fibrous cardboard, thickly coated with shellac and allowed to harden. Aluminium can be used but old records which have been filed smooth will do. Use a sharp, hard steel stylus, or else a jewel stylus as in Figure 5. When the record is made, lift the drive collar and raise the head. Take the completed record off and rotate the crank, thus winding back the head. The completed record will stand seven or eight play-backs if a fibre needle is used. Although these recordings are not absolutely perfect they give a moderately good playback.

Fig 5.

Sketch of bearing plate for threaded shaft

HEIGHT ADJUSTER

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.
SMALL ADVERTISEMENTS

An advertisement in the Radiogram will be used only of your surplus radio parts. Hard to obtain goods are often brought to light through a small Radiogram advertisement. Advertising on this page costs 2d. per payable word with instructions. To ensure inclusion, your advertisement should be received by us on or before the 15th of the month preceding date of publication. Advertisements addressed c/o "Radiogram" or "Continue" cannot be accepted. Address instructions to "The Radiogram," 11 Manners Street, Wellington, C.I.

FOR SALE—Hiker's Two, £5. G. S. D. Heath, 5 Hill St., Hamilton.

FOR SALE—1 3 gang Variable Condenser. What offers. A. Biland, Te Rapa, Frankton Junction.

FOR SALE—One 3 gang Variable Condenser. What offers. A. Biland, Te Rapa, Frankton Junction.

FOR SALE—Steam Engine, good as new, had little use, £1 or nearest offer. D. Walker, 3 P.M., Awanui (Rahob 12935).

FOR SALE—1 10in. Plesey P.M. Speaker, in new condition, £6 10s. Rahob 11055, c/o 90 Forbury Rd., St. Clair, Dunedin.

FOR SALE—Hiker's One, In neat Cabinet. "Philips" Type. Offers. Apply B. Woodham, 3 Carey St., Wellington, W.I.

FOR SALE—Crystal Microphone, on stand, with 33ft. Flex and Plug, £9 10s. Rahob 11055, c/o 90 Forbury Rd., St. Clair, Dunedin.


FOR SALE—Electric Gramophone Motor and Pick-up (modern outfit), in first-class order, £10 10s. Rahob 11055, c/o 90 Forbury Rd., St. Clair, Dunedin.

FOR SALE—Gramａ． Motor and 11in. Cast "Pyramid" Speaker, £2.50. M. Riddle, 66 Calabar Road, Miramar, Wellington.

FOR SALE—Three Ferranti Audio Transformers. Ratios 1/3, 1/7 and Output. Also one Phillips Ratio 1/3, 12/6 each. J. A. Patrick, 86a Hill St., Wellington.

FOR SALE—Swan Audio Transformer, 1400, 1400 M.P., new, £2 10s. A. A. Dod, Makotuku, Hawke's Bay.

FOR SALE—Crystal Set, with phones, in "Thor" set, as used by leading plate-plates, 4, 5 and 6in. x 1in. thick, 3/9, 5/6, and 8/- each. Rahob 8845, 14 Alba Rd., Epson.

FOR SALE—Wright De Coursey 14in. P.M. Speaker, heavy duty type; will fit 55 watts Price £2. Rahob 11055, c/o 90 Forbury Rd., St. Clair, Dunedin.

FOR SALE—Universal Velocity Microphone Amplifier, 80 watts output and separate power supply. Incorporated with 4 pre-amps, input channels and pick-up with two magic eyes as volume indicator. Has enough volume for the largest dance hall in N.Z. and wonderful outfit for public addresses. First in gets this one, £8 10s. Rahob 11055, c/o 90 Forbury Rd., St. Clair, Dunedin.


WANTED TO SELL—30 Watt Inverse Feedback Amplifier, with 2 speakers, microphone; modulate 150 watt, 2 valve, electric, complete. N. Martin, 29 Cockayne Road, Wellington, N.B.

URGENT SALE—One Dualwave (19-60M & B.C.) coilkit, wired and tested, with AVC and IRF Stage. Complete with 2 gang Condenser and two 2b 600mc T.F.S. All brand new, £10 0s. Particulars from J. Jackson, 262 Waitakere, Christchurch.


WESTINGHOUSE, 1 hp, Split Phase Electric Motors, £6. The Laboursome.

WORKING MODEL STEAM ENGINES, 37/6 each. The Laboursome.

SUPREMACY, the great war game, 19/6 per set. The Laboursome.

RAHOB—35s—Sparks Club Badges can be obtained from the 7/4, 10s. cash, each. Rahob 7430, 350 Devon Street East, New Plymouth.

FOR SALE — Hiker's Two in Cabinet 21in. x 10in. x 9in., with or without headphones; no batteries; excellent condition; also one Phono and one Ford Coil, single gang condenser. What offers? A. Pollard, Chalmers Avenue, Ashburton.

FOR SALE—Parts of Amplifier, complete with Carbon Mickey new. R. X 6G6'TG Valves (No. 413p or 6CS), £7 10s. Also, Parts for 6-valve Broadcast Radio, complete with Carbon Mickey new. (63v. Valves), £9 10s. 1 12in. Majestic Speaker, 1,000 Field Coil, no trannie, £1 10s. R. Gardner, Dunedin.

WILL PAY GOOD PRICE For Portable Gramophone, with or without records. Rahob 7295, 3 M. Karupa, c/o Peta Freezing Co., Ltd., Petaera.
ONE shilling paid for every “slip” published; 5/- for particularly good ones.

22B, September 8, 1944, 9.18 a.m.: Aunt Daisy: “If you have a pocket with two aprons in . . .”

22B, September 15th, 1944, Aunt Daisy describing her experiences in Hollywood: “Then there are the tables you sit under . . . .”

22B, September 19th, 1944, 7.55 p.m.: “I didn’t think he would ever put a woman round his arm—at . . . .”

2YC, September 16th, 1944, 7.15 p.m.: “When My Dream Goat Comes Home.”

An American Station. Stock market report: “Pigs have gone up by 3 cents.”

2KY, 28/9/44, 8.30 (N.Z. time), in “Fostard’s Shoes” session: “Equipped with hot and cold shadows.”

OSRAM LAMPS

Behind the name Osram there are years of lamp-making experience, huge laboratories, research workers, and finest materials. That’s why you can always be sure that when you buy an Osram Lamp you are buying the best. But the cost need not be more.

40 WATT 2/2
60 WATT 2/3
75 WATT 3/3
100 WATT 4/-
150 WATT 7/-
200 WATT 10/3

All sizes available.

Buy Osram. Stocked and recommended by the Lamphouse.

PHOTOGRAPHIC RECORD

A photograph from Rahob 7540, in colour. A very nice addition to our collection.

ONE shilling paid for every “slip” published; 5/- for particularly good ones.

22B, September 8, 1944, 9.18 a.m.: Aunt Daisy: “If you have a pocket with two aprons in . . .”

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40 WATT 2/2
60 WATT 2/3
75 WATT 3/3
100 WATT 4/-
150 WATT 7/-
200 WATT 10/3

All sizes available.

Buy Osram. Stocked and recommended by the Lamphouse.

THE MEASUREMENT OF RESISTANCE

By J. W. STRAEDIE, B.Sc.

(from the Australasian Radio World)

Maybe it’s a speaker field, or just a resistor with colour chip off. How do you measure its resistance?

Resistance is invariably measured by the voltage drop when a constant current flows. Invariably, the basic principle is Ohm’s Law, one form of which states that the voltage drop across a resistor is equal to the product of the current in amperes and the resistance in ohms.

SIMPLE METHOD.

This leads to a very simple, but not very accurate method. A 1½-volt dry cell is connected in series with a milliammeter and the resistance is measured. The meter reads the current flowing and the voltage drop is assumed to be nearly all of the 1½ volts. Suppose the meter reads 25 ma., or 0.025 ampere. Then E equals 1½ × R and R equals E/1½ where E is voltage drop, 1½ equals current in amperes and R equals resistance in ohms.

R equals (E/1½) = 1½ × 40 = 60 ohms.

NOT ACCURATE.

This method is not very accurate because the voltage drop across the unknown resistance is not 1½ volts. Part of the voltage (electrical pressure) is used up across the cell itself and across the meter. Besides, if the resistance happens to be too small, then too much current will flow and burn out the meter, or at least bend its pointer.

The accuracy may be considerably improved by using a separate meter, a voltmeter, to measure the actual voltage drop across the resistance, but again inaccuracy must occur, because a small part of the current goes through the voltmeter instead of through the unknown resistance.

In ordinary, “multi-meters” and “volt-ohm-meters,” only one meter, a milliammeter is used. To make up for the drop in voltage across the meter and cell or battery, a large resistor is inserted in series with them and adjusted until the total resistance of battery (or cell) meter and resistor is equal to some fixed value, usually such that the meter gives full scale deflection with zero external resistance. As the resistance to be measured increases, the meter reads less and less. (The meter is said to be backward reading.) Finally the deflection of the meter needle is too small to be measured, thus setting an upper limit to the resistance that can be measured. The resistance of the battery or cell changes with age so that there is another reason why an adjustable resistor is required in the multi-meter.

LOW OHMS.

For low resistances the unknown resistance may be connected in parallel with the meter, thus bypassing some of the current. As the resistance to be measured is made less so more current is bypassed and the meter reads less. The higher the meter reading, the greater the resistance. Such “low-ohm” meters are therefore “forward-reading.”

All the methods considered so far depend on the accuracy of calibration of the meter(s). Small commercial meters may be calibrated to within 2 per cent., but even 1 per cent, is sometimes too much variation, so more accurate methods must be considered.

BRIDGE METHODS

Resistance may be compared with the resistance of some “standard” (which may have been measured by a University

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.
Weather and U.S.-W
From "Wireless World."

Some interesting facts regarding the influence of weather on the propagation of ultra-short waves emerge from a study of the records of signal strength variations in the Post Office radio telephone link between Guernsey and England from 1937 to 1939.

The path between stations was about 88 miles in length over sea, of which 36 miles was outside the optical range; the wavelengths employed were 5 and 8 metres. Continuous records taken by the Post Office were analysed by Dr. B. L. Smith Rose and Miss A. C. Strickland, M.Sc., to show correlation between signal strength and atmospheric conditions. The results are given in a paper recently read before the I.E.E.

It is clearly established that weather has an influence on the variations of signal intensity. During periods of high barometric pressure, often accompanied by temperature inversions, signal strength was at a maximum, but there was much fading of the slow type. Low-pressure conditions with very little temperature inversion gave the steadiest signals though of rather low level. Snowy and foggy weather also gave a steady signal even when the atmospheric pressure was high.

The authors conclude: "It seems clear that the main agencies causing variations in signal intensities on these wavelengths are the variations in refractive index of the air in the lower atmosphere, due not only to changes in moisture content, and in addition the presence or absence of temperature inversion layers from which the waves can be reflected at heights of from a few hundred to a few thousand feet."

DRILLING GLASS

This is done very readily with a common drill by using a mixture of turpentine and camphor. When the point of the drill has come through, it should be taken out and the hole worked through with the point of a three-cornered file, and in addition by hand with a sharp edge. Use the corners of the file as a reamer. Great care must be taken not to crack the glass but to finish off the point of it in finishing the hole after the point of the drill has come through. Use the mixture freely during the drilling and scraping. The above mixture will be found useful in drilling hard cast iron.

THE NOTENNA AERIAL ELIMINATOR

Equally successful on both broadcast and short-wave. Replaces aerials of all types. Very compact size. No lightning arrestor required. Reduces noise, interference and man-made static. Simply attached between aerial and earth terminals on your set and to earth wire. Money back if you are not more than satisfied.

Dimensions 4in. x 21/2 in. x 2in.

Cat. No. MA110 3/5 each

ENSIGN 3 IN 1 TUNERS

AERIAL TUNER WAVE TRAP AERIAL ELIMINATOR

Depending on the manner it is connected, this useful piece of apparatus serves any of the above functions. Operates on any make or model of radio receiver, greatly enhancing the performance. As an aerial tuner it will improve the reception of weak stations. As a wave trap it will prevent interference between stations and improve selectivity. As an aerial eliminator it makes an outdoor aerial unnecessary. The tuner is complete with instructions and can be fitted by anyone in a few minutes. Size 5 in. long x 21 in. high and 11 in. wide.

Cat. No. MC100 4/6
Electron Microscope

(Continued from Page 1)

logical problems. In the field of bacteriology many of the disease-producing micro-organisms have revealed a wealth of information which heretofore could only be surmised. In some cases chemical changes within the individual germ cell, the formation of metallic tellurium crystals in diphtheria bacilli—could be observed.

STUDY CHROMOSOMES

Even more striking has been the success of the electron microscope in the field of the viruses, disease-causing agents beyond the range of the ordinary microscope. A microscope which shows a fan of tobacco mosaic disease virus "molecules" cohering in characteristic fashion. Numerous other plant viruses and the effect on them of illuminating materials have been studied, yielding valuable information for the eventual control of diseases caused by them.

Simultaneously work has gone on to determine the structure of chromosomes the entities within every living cell which determine the inheritable characteristics of the cells. These studies, which require extraordinary skill in the preparation of the specimens, indicate the great complexity of their basic elements. Other investigations have concerned themselves with revealing the delicate forms of insect life. Photographs have been made showing a breathing tube of a mosquito larva, magnified 7500 times. These, like the scales of butterfly wings and the iridescent covers of beetles, have shown structures of great beauty and regularity.

APPLIED TO METALS

In the field of industry the electron microscope found almost immediate applications in the study and control of all types of matter in finely divided form, in suspension—dusts and smokes, the characteristic states of pigments, insecticides, ceramic materials, medical chemistry. Many other substances where the individual particles are too small to be identified by the light microscope, the electron microscope, with its much greater resolving power, not only makes it possible to count the particles and to classify them with respect to their size, but also shows their characteristic shapes which are usually highly irregular. A good example of this are micrographs which the electron microscope may serve better as an indication of future possibilities than as a record of past accomplishments.

Considerable as these may be, they are bound to be outstanding in a very short time by the concerted effort of many workers who, even at the present moment, are applying the electron microscope to the solution of the many problems which face them.

"R.C.A. Radio Age," N.Y.

WITTIQUIZ ANSWERS

1.—Because there is sufficient internal resistance in the grid condenser to act as a leak, and so some resistance is apparent across the socket and tube base.

2.—B. 3.—A.

3.—D. F—G, G—P, P—SU, SU—G—SU.

4.—No. Heat causes element expansion. Therefore the distance between them is altered, but the capacitance is altered slightly.

RADIOTRONS

made by
R.C.A.

The bombing of German war industry continues. Day and night Allied bombers bomb Western Germany, enemy factories and plants. Think—could this be accomplished without good communication between planes and base? Radio devices play an essential part in all operations. The best in tubes is needed. That is why you don't always assure the Radiotron you require. Remember they're on active service. In the meantime do what the services do—order Radiotrons for preference.

Stocked and sold by the
THE LAMPHOUS.

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.

PEN FRIENDS WANTED

Rahobs wishing to contact other readers may have their names, addresses and interests published at a cost of 1/- for each announcement, which must not exceed 25 words.

Rahob A404, Thomas J. Williamson, 49 Isaac Street, Spring Hill, Brisbane, Australia, wishes to enter into correspondence with some other members to exchange ideas, etc.

Rahob A124, Godfrey Robb, Box No. 16, Port Hedland, Western Australia, wishes to exchange Australian Magazines for New Zealand Magazines.

Rahob A222, J. Hughes, 14 Fairview Grove, East Malvern, Victoria, Australia, would like to meet or correspond with any Rahobs interested in the construction of Main and Battery Sets. (Shortwave, fairly advanced.)

RAHOB LIBRARY

The donation of a book from Rahob 72/6.

Several other books have been received from various Rahobs, who have not included their names or numbers. If we have not written to you, Rahobs, please accept our sincere thanks.

RAHOB LIBRARY DONATION.

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HOBBIERS
CLUB'S
Own Page

MASTERTON.
The first meeting was held and was a great success. Officers have been elected and plans made for the future meetings.

Rahobs in Masterton and the surrounding districts who would like to join the Club are advised to get in touch with the Secretary, G. J. Brodden, 49 Worksop Road, Masterton.

HAMILTON.
Meetings are now being held regularly and interesting talks have been given by some of the more advanced members. It is hoped to arrange for a permanent home shortly, and in the meantime Rahobs wishing to join the club should get in touch with the Secretary, A. D. Nelson, 12 Ulster Street, Hamilton.

DUNEDIN.
Y.M.C.A. RADIO HOBBIES CLUB.
Dunedin held its second Radio Exhibition Window Display last month, and once again the club is to be congratulated on its splendid effort. The list of entries was larger than that of last year, and a much higher standard of work was shown than in the Dunedin public. This club also celebrated its second birthday last month, and Mr. A. R. White and Master A. MacLachlan were the guests of honour. Other activities for last month included a broadcast by the club members over 425B, Dunedin. A surprise night and a social evening. A photograph was taken of the club and its members. Unfortunately owing to our notes arriving late in Wellington, all radio articles for August and September were cut out. I am sorry, Rahobs. My apologies to Wellington also, owing to busy arrangements of activities we shall sign off now, wishing our sister clubs all the best.

A. R. WHITE.
Instructor and Organiser.

MOTUEKA.
Meetings of the Motueka Radio Hobbies Club are held fortnightly in the St. Thomas's Hall. Attendances have been excellent and members are very keen.

Mr. Kelly donated some old Sets and Speakers and we are going to do some experimenting with these.

Subscription rates have been fixed at 25/- for Juniors and 12/6 for Juniors B.A., or 6d, a meeting.

The Club hopes to arrange for a visit to 2YN in the near future and to purchase an A.C. Oscillator for Morse practice.

Rahobs who have not joined the local Club are requested to come along and bring their friends.

B. F. MACKAY, Secretary.

AUCKLAND.
We have to report that the judging of our present competition has been extended till the end of October, due to several reasons.

Club membership is still on the increase with 122 at the time of writing. We regret that one of our keenest members, Ron Rhodes, is at present in the Auckland Hospital, and we all wish him a speedy recovery to his former good health.

To the following we extend our sincere thanks for their kind donations:

Radio 1936, Ltd.,
S.O.S. Radio,
J. F. Henderson,
R. R. Gattfield.

On a recent evening we had an auction sale of parts and some very keen bidding resulted. Nearly everyone had bargains to carry home and more equipment to play about with.

To intending members and anyone interested, you will find us at the Clubrooms, 5 Abbotts Chambers, Karangahape Road, every Friday evening. Supper is provided for all.

J. FORREST, Secretary.

THE N.Z. RADIOGRAH
November 1, 1944.

USEFUL RADIO LINES
AVAILABLE FROM STOCK.

SPAGHETTI TUBING, for insulation wires, etc.---1 Mil. diam. Cat. MS1 4½d. yd.
diţto.—2 Mil. diam. Cat. MS2 5d. yd.
diţto.—3 Mil. diam. Cat. MS3 6d. yd.
diţto.—4 Mil. diam. Cat. MS4 8d. yd.
diţto.—6 Mil. diam. Cat. MS6 1/- yd.

500,000 OHM POTENTIOMETERS WITH SWITCH.
Cat. No. MP64 3/6 each
diţto. WITHOUT SWITCH—
Cat. No. MP54 2/6 each

WAFER TYPE VALVE SOCKETS—
4 pin. Cat. No. MS631 1/- each
5 pin. Cat. No. MS632 1½/- each
6 pin. Cat. No. MS633 2/- each
8 pin (Octal). Cat. No. MS65 2½/- each

MIDGET VALVES for Pocket Portables and Similar Receivers—
1R3 12/- each
1R4 12/- each
1R5 12/- each
1R7 12/- each

SOCKETS for above Valves—
Cat. No. MS637 1/- each

SPEAKER PLUGS, with Metal Cap—
4 pin. Cat. No. MP255A 1½/- each
5 pin. Cat. No. MP253A 1½/- each
8 pin (Octal). Cat. No. MP251A 1½ each

TWIN TIP JACKS, on Bakelite Strip.
Cat. No. MJ8 8d. each

COILS FOR HIKER'S ONE SETS, ready wound.
Cat. No. MCG6 10/- each

COILS FOR CRYSTAL SETS, tapped.
Cat. No. MC266 4/- each

WINDBERG FOR SPEAKER TRANSFORMER COILS, 7000 o.m. (single pentode), Cat. No. MT730 6/10 each

RESISTORS—Practically all sizes of 1 watt are available.

EVERREADY 4½-volt SUPERRYNE (Heavy Duty B. Batteries), Cat. No. MB42 24/1 each

EVERREADY 4½-volt STANDARD B. BATTERIES, Cat. No. MB43 19½/- each

EVERREADY No. 6 11½-volt DRY CELLS, Cat. No. MB40 3½/- each

EVERREADY 4½-volt G. D. BATTERIES, Cat. No. MB50 3½/- each

DISTRIBUTOR TYPE SUPPRESSORS, Cat. No. MR228 2/- each

SPARK PLUG TYPE SUPPRESSORS, Cat. No. MR229 3½/- each

GENERAL ELECTRIC CO. HEADPHONES, 4000 ohm, British.
Cat. No. C244 36/- pair

PLUGS, DOUBLE THREE-PIN

A useful plug where it is desired to take two leads from one three-pin socket. The plug illustrated is fitted to the appliance or radio cord. A standard 3-pin plug cap can then be inserted into the top of it.

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DISPENSER BATTERY WELDER

A Welding, Bending and Soldering Tool, which will save you time and money. Works from any 6 or 12 Volt storage battery, providing instant, concentrated, even heat. You can do all your own soldering, brazing and welding with this indispensable tool.

Rugged construction. Battery leads are specially heavy flexible connectors giving maximum transfer of power to the Welder. The Ensign Welder is especially applicable for Auto repairs (mudguards, radiators, etc.), also for light inside work. For the farm it is invaluable for mending hitches, cans and light farm implements. Battery fans fit them for lead burning, and they are especially useful for battery repairs on the roadsides. The Radio man finds them invaluable for quick soldering.

Supplied complete with electrodes, flux and full instructions.

Cat. No. MB6 5/-

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.
GIRDLING THE GLOBE

The Nz RadioGram November 1, 1944

GIRDLING THE GLOBE

DX observations of the month by Arthur T. Coshen, 105 Princes St., Invercargill, DX advisor to the Radio Hobbies Club, and Short Wave Editor of the New Zealand DX Club's bulletin, New Zealand DX-TRA. All communications to the above address will receive prompt attention.

BROADCAST

North America.—These are the best North American signals at 7 p.m.: KFBB (1550), KEGA (1510), KSTP (1500), KQAM (1470), KGER (1590), KIT (1280 off 7), KFVD (1620), KYA (1260), KKL (640), KOMO (910), KOA (1140), KOL (910), KOMO (1000), KIRO (710), KDYL (1120), KPAS (1110), KJBS (1100), and XEG (1050).

The best 250 watters are KTOH (1490, 7.8 p.m.), KFMB (1450), and KCKN, KFER, both on 1340, the former being all night, and the latter best at 7 p.m. KLRA has the "Swing Shift" at 6:30 p.m. Sundays on 1010, and it well received, while WDSU now operates all night and is being on 990. KOMO has switched frequency with KJR, and is now heard on 1590. KNBC at present a 230 watter on 1450 kcs., plans to purchase the equipment formerly used by XENT at the cost of 400,000, and hopes to operate on 680 kcs. with 50,000 watts.

The early-morning and midnight reception near its peak, so here is a full list of the stations which should be received when conditions are good. Conditions indicates open at this time.

8.30 p.m.—WWVA (a), WJR (c), WDSU, WTAM (a), WRE (c).
9.15 p.m.—WCKY (c).
10.00 p.m.—KSTP (c), WSB (c), WLCR (a), WKBV (c), WAKR (c), KMA, KXEL, KXMO (c).

SHORT WAVE

India.—The latest list from Delhi gives these frequencies and calls now in operation: VUDE 4, 9,960 VUDE 7, 7,300, 11,760, 15,190, 17,830; VUDE 6 on 11,810, 7,215; VUDE 7 on 6,190, 11,790, 9,650; VUDE 8 on 15,550, 11,870; VUDE 15 on 19,150. VUDE 15 (19.5 m.) has news in England at 3:30 p.m., followed at 3:45 p.m. by a Chinese programme. At 7:30, news at dictation speed is now broadcast by VUDE (11,870), VUDE 5 (9,590), VUDE 4 (9,590), VUDE 7 (7,30), VUDE 6 (7,275), VUDE 5 (7,215), VUDE 4 (4,960), VUDE 8 (11,870), and VUDE 3 (15,19) test at 10:45 p.m.

United States.—Further additions this month include two more N.B.C. stations, WXNN and WGNRA. WGNRA 555, 7,565, 12,600, 11,760, 15,190, 17,830, 11,790, 9,650, 15,550, 11,870, 9,590, 7,300, 7,215, 5,910, 4,960, 3,910, 2,750.

NEW Stations of the month

Megacycles | CALL | LOCATION OF INTEREST
--- | --- | ---
15,190 | VUD5 | Delhi, India.
15,190 | KGEI | Sun Francisco.
14,550 | WXNN | New York.
13,050 | WNAV | New York.
12,090 | WLR | Cincinnati.
11,840 | WLGC | Shepperton.
11,770 | KGEI | San Francisco.
11,600 | KMA | Port Mosley.
11,600 | KXEL | New York.
11,000 | WNBC | Delhi.
9,897 | WRL | Cincinnati.
9,855 | WNBX | New York.
9,590 | DX9 | San Francisco.
7,950 | DX9 | Berlin.
7,215 | VUD6 | Berlin.
6,425 | WAKR | Noyo, Fiji.
6,130 | VPD2 | Delaware.

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TOWN ___________________________

(Received November, '44)

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.
HINTS AND KINKS

The following Hints and Kinks have been sent in by Readers. Rahobs, help your Club by contributing to this column.

HANDY CONDENSER SHIELD.

A round tin as used to pack 50 cigarettes is ideal for shielding midget condenser in short-wave receivers. Drill a hole in the lid large enough to admit condenser spindle. Fasten lid to panel by means of two small nuts and bolts. A small slot in tin will allow the leads from the fixed plates to pass through.

A POLARITY INDICATOR.

A neat form of indicator may be constructed in a glass test tube. A rubber cork is fitted to the tube through which two small terminals pass. These each have soldered to them ends of a length of thin copper wire. The accompanying sketch will make the construction clear. It is advisable to drill a small hole through the stopper to allow the gas to escape.

A SIMPLE POLARITY INDICATOR.

When charging accumulators it is always necessary to know which terminal of the mains is positive and which is negative. This may be determined very simply by placing two leads from these terminals in water. The wire on which most gas is formed is the negative, and should be connected to the negative terminal of the accumulator. The reaction is increased if a little sulphuric acid is added to the water. Vinegar will do in the absence of other acid.

SUBSTITUTE MIKE TRANSFORMER.

A bell ringing transformer can be pressed into service as a microphone transformer. The primary (240 volt winding) is connected to the amplifier, the secondary (6 or 8 volt winding) to the microphone.—Rahob A145.

THE LAMPHOUSE, 11 Manners Street, Wellington, C.I.

November 1, 1944.

By H. VERNON WHEATLEY.

JUNIOR WITTQUIZ.

(Answers on page 25).

Five questions with a value of 20 points each. Using both hands and taking off our boots to make counting easier, we find that five right gives you a top score of 100 points. Consequently four right gives you 80 points and this isn’t bad at all. 60 points means that you should try harder, and under this score, you should try harder still.

1. Our first question deals with a popular theory, and, at a first glance we seem to explode this theory very noisily—but we don’t. If we remove the grid leak from a detector tube circuit, it should “blot itself out,” or, in other words, stop operating, as there is a component to return the grid to “zero.” But in quite a lot of cases, the tube goes merely to through the regeneration is impaired. Why?

2. A comparatively simple action allowed the science of radio to make tremendous strides. This concerned the internal component of a vacuum tube, and was (a) the construction of a carbon plate to dissipate heat easier; (b) the introduction of a grid into a diode; (c) the perfection of a cathode element to give us better a.c. tubes; (d) the use of thorium coated filaments; (e) the insertion of an extra grid into a triode; (f) ditto, pentode.

3. This one is easy. If you had a variable condenser whose moving plates were half circular in shape, you’d know that the type was (a) straight-line capacity; (b) straight-line frequency; (c) straight-line wavelength; (d) compression.

4. You have heard the term “inter-electrode capacity.” This denotes the small capacity which exists between the elements in a tube. If a diode tube has only one inter-electrode capacity, a pentode has (a) three; (b) four; (c) five; (d) six; (e) seven; (f) two.

5. Is this inter-electrode capacitance constant in all cases? If the tube (any type) is in an operating condition? Yes or no. Be careful during the 10 seconds allowed to think it out.

THE LAMPHOUSE, 11 Manners Street, Wellington, C.I.
TELEVISION

By Rahob 6792.

2. Interlacing.—See Fig. 2. As is seen the scan does every second line then starts again and does the others. This reduces flicker to a negligible amount.

So much for scanning. Now I will explain the apparatus which converts light into electrical energy and vice versa, the heart of the transmitter. Two types of camera are used nowadays. The "emitter" and the "Baird Electron" camera.

The Emitter.


The Photocell mosaic is the secret of the Emitter. It consists of a thin flat mica plate about 4in. x 6in. covered on the side remote from the lens by a continuous layer of some good conductor such as silver. This is connected to the grid of the first amplifier. On the other side of the plate is a mosaic of silver globules completely isolated from one another and have a density of hundreds of thousands per square inch. The silver globules are slightly oxidised and covered with a coating of some photo-active metal such as cadmium or tungsten. The mosaic thus consists of millions of microscopic photo-electric globules forming condensers with a mica dielectric, the second plate on the other side being common to all. When light is thrown on to the screen, different condensers on different parts acquire different charges, depending on the intensity of the light. The main feature of the emitter is that the whole screen is illuminated, being very sensitive so that the light required is not any more than for the modern photographic studio. The most complicated part of the tube is the scanning system. The cathode ray beam is deflected by means of the plates to the paths over the screen as required by the types of scanning previously described. The ray neutralises the charges on the condensers as it passes over them, and thus a definite quantity of current flows off the other plate to be amplified, its value depending on the intensity of the light which fell on to the mosaic. To enable the receiver of television to reassemble the pictures in the correct order at the other end, synchronising signals are sent along with the carrier. These are made by the apparatus which makes the time base for scanning. Their separation will be explained later.

THE BARD ELECTRON CAMERA.

This operates very differently to the Emitter. It consists of a cylindrical high vacuum tube and contains a normal photo-cathode at the end remote from the screen.

The accelerator electrode is a thin film of silver on the inside of the tube. The photo-electric cathode is continuous like an ordinary photo-cell to the image being televised focused on to this and the photo-electrons leave the plate, the density being proportional to the intensity of the light. As a result of the accelerator and deflector plates the electrons leaving the plate trace a vertical path down the tube. The electron image thus formed is scanned in an extraordinary manner. The scanning aperture remains fixed, the small hole in the electrode being in the focal plane of the image. By means of special coils the whole image is deflected from side to side up and down across the aperture moving forward and passing into the aperture in their turn. They are collected and amplified. The scanning aperture leads to the electron multiplier in which the signal is intensified. If this was not the case the signal ratio would make this camera impracticable.

A special camera combining both these cameras has been developed and is called the "Super Emitter." Also a double-sided mosaic is being tried.

After the currents from the camera have been amplified, they are modulated and transmitted using synchronising signals which are applied to the R.F. Carrier. The wavelength used for television is about seven metres. This does not explain such unwelcome phenomena as atmospheric emission and other hindrances which are cut out by special apparatus such as "tilt and end controls.

TELECEIVERS.

The teleceiver somewhat resembles the audio receiver in the first stages but of course the final stage is totally different. The main part is the cathode-ray tube from which the images are extracted. These are of the high-vacuum type and require plate voltages from 1500—2000. The line synchronising signals are removed from the signal just prior or just after detection, the latter being more common. Teleceivers are of superhet type and have a dual purpose. (Continued on next page.)

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.
CLASS A AMPLIFIER

I have just built a Class A Amplifier, and have had good results with it. According to a Valve Chart the output should be 4.25 watts. The chassis is 6in. x 4in. x 2in. and made of aluminium, while the power pack I built for it is 8in. x 6in. x 2in. and made from steel. I am enclosing the Amplifier circuit.—Habob 7SGT.

Television
(Continued from page 21)

about 16 valves to drive a 5in. or 7in. cathode ray tube. Typical valves complement for a teleceiver is:

- 1851 R.F. Amplifier 6K8 Mixer
- 1851 1851 1851 6H6
- I.F. Amplifiers. Detector
- 1851 6V6G 6H6
- 1st Video Amp. 2nd Video. Synchronising Signals Rectifier
- 6L7G 6F8G
- 2 Pairs

(The 1851 is a special television tube).

The video frequency corresponds to the audio frequency in an audio set. The two pairs of 6L7G and 6F8G feed directly into the cathode ray tube, which in this case is 5in. with a plate voltage of 1500. There are nine controls on this set, but only three are used to any extent.

I.F. Channel Gain; Bias Adjust; I.F. Synchroniser; H.F. Sweep Tuner; L.F. Sweep Tuner; Cath. Ray beam intensity;

thus the cathode rays are shot on to the screen and arranged in the correct positions just as they were transmitted.

The cathode rays are the secret of television at both ends.

The screen may be viewed directly, by means of a mirror, or through a lens, the former being the best.

THE LAMPHOUSE, 11 Manners Street, Wellington, C.I.
I have recently carried out a couple of modifications to my small A.C. set, the "Eagle 2," which have proved quite well worth while on the audio stage by parallel-fed 3:1 Transformer, increased the gain considerably without introducing distortion, Substitution of a variable .0001 mfd. condenser in place of the present regeneration control considerably increases the sensitivity, which is desirable in a station-crammed city area.
-F.G.G., Auckland.

The criticism of the "RadioGRAM" that appears from time to time is quite a healthy sign as it shows interest, and the Editor can always be trusted to sift the grain from the chaff, and so effect improvements. I have not had cause yet to complain of needless repetition in the "RadioGRAM," and the contributions by amateurs are not stretched beyond the point of general interest. I started radio 18 years ago when we had to make nearly everything but the tools. Qamaru, Rahob 6459.

Some of the Rahobs may be interested to know that I applied the Salying process described in the 1943 Annual to an accumulator that had been left in a discharged state for about two years. It restored it with quite some success.—Paraparumau, Rahob 7040.

I am a very keen DX'er, using a 1926 7-valve Ultimate, and in my good city locality I have an inverted L aerial 90ft, x 50ft high. If you looked at N.Z. DX'er you would see the extent of my broadcast activities, and the point of selling you all this is, that I find the Ultimate (bottled up) has not very many advantages for straight-out DX over my Hikers Two. Of course, the dial of the Ultimate is half the battle in DX-ing, but you may be interested to know I have 12 U.S.A. stations verified on the Hikers. I logged CHOC, 1 kw. Canadian recently, and the next morning I heard this catch very well on the two valve. As I say I do not have to rely on the two valve, but as it is at my bed side I often have a listen in to see what it can get. It was 3X127, but by no means as selective as the aerial lead to give selectivity on the locals, but when the locals go off the air, I switch over off the trimmer and the Hikers really "goes."

I can understand that other Rahobs really do not realise what small sets can really bring in, but my DX experience starts from me at the right time and dial position.

I will not bore you further with a list of fifty Pacific Coast stations heard on the Hikers. In a country locality away from the locals I'm sure lots of these would be heard early in the evening, and I've heard these large ones like KVFO, KSJ, KWH, KHOX, WBT, KNX, KIRO, and KFI during the silent period. I still use 18 volts B, 41 A and 33A These valves chew the current, but it's worth the fun indeed.

When I am DX-ing on the big set, I have a lead from the filament circuit which gives me ample light to read call books and jot down reception notes, so perhaps you could pass this tip on to other DX-ing Rahobs, as this helps encourage the others in these days.—Auckland, Rahob 19450.

SHORT-WAVE MIDGET TWO.

With reference to the description of the above receiver in the September "RadioGRAM," I would like to point out that the design referred to is the Miller. This receiver is referred to as R5, when it should, of course, be R6, as shown in the Circuit Diagram. This error occurs twice on page 2. Another point is that CS was not shown in the wiring diagram. However, its position is exactly as indicated in the circuit diagram.—F. H. Adams.

In my Hiker's Two I am using a 1B4 in place of the Miller 2A7 amplifier, which I can truthfully say that it is as good or even better, than the 49 Amplifier, so I would not suggest changing it. I also have 11 and 15 volt grids to give the best results.—Rahob 11449.

Two articles I have read in the Annual are "Reporting DX Stations" and "Getting Started" and only wish I had known about the club years ago. I certainly have been missing out on something.—Sydney Rahob A590.

P.S.—Please don't miss this missile at all personal. If you should, please feel free to write me again.

TALKING ABOUT BEING UP TO DATE. Rahob 11328 apparently does not know that the "Australasian Radio World" has ceased publication.—Rahob 1.

I wish to acknowledge receipt of the "Lamphouse Annual" and the "Radio..." greatest care. I hope I shall receive this book in a good shape and consider the "Radio..." one of the greatest little books I have ever read, and read, and read until the Annual has a mine of information. Here's wishing the Club the very best.—Rahob A344, Australia.

A letter received from a bored Rahob No. 11048 (Auckland).

Among other uncompromising remarks he states that the "RadioGRAM" is a morbid piece of paper that choffers his letter box.

While we endeavour to publish all criticism of a factual or constructive nature, we have no intention of publishing letters of the type forwarded to us by Rahob 11048.—Rahob 1.

REALM OF LIGHT.

Reference your correspondent, Mr. H. B. Taylor, who commented on my article "The Realm of Light" in your September issue. I stated that Miller was the colleague of Michelson for the very good reason that he was the only authorities for the statement, together with both my article and this letter in general, are: H. G. Gale, F. R. Cutoll, Kaempffert, Heisenberg, Lorentz, Perot, Bourn, Fabry, Compton, and various members of the Case School of Applied Science and the Electrician.

Dayton C. Miller was the original associate of Michelson in the early experiments with the two light rays, and it was Miller who found that the "race" between the two rays was not quite a tie. Professor E. W. Morley entered the two light rays stage too late. At a later stage Michelson was not satisfied, and he made more precise experiments, and the results were confirmed by him and Morley to be an experimental error. This was accepted by most bodies, but not all. As yet, however, Miller's own experiments, regarded with regard to this minute difference are not accounted for and until this happens, so much for the "two light rays experiment).

The partnership of Miller and Michelson did not receive the publicity of the Michelson-Morley team, so therefore was little known. Mr. Taylor was perhaps justified to query this particular statement.

I used the expression "distant stars" in my "Getting Started" article. The average man invariably describes all bodies in the universe as stars and as the article was written for the layman, it was used generally, to indicate all bodies was completely justified.

I trust that this information will be of assistance to both Mr. Taylor and your readers.—H. Vernon Wheatley

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.
HOW THEY WORK

TRANSFORMER COUPLING METHODS

By H. VERNON WHEATLEY.

A transformer is simply a device for changing electrical power at one voltage and current, to power at another voltage and current. A step-down transformer performs its name implies; it delivers a lower voltage but more current at its secondary winding, after a higher voltage and less current has been applied to its primary winding. With an audio or radio frequency transformer, the same action takes place, but in this case the components handle microscopic currents and higher frequencies.

Your three winding coils (aerial, grid and reaction) in your favourite "super-blooper" is in reality a transformer, as a transference of energy takes place between the windings.

Dealing with power transformers, the laminated strips of "iron" around which are the windings, play an important part in transformer construction. The cores appear in several styles, the most efficient being the closed core H type. The sketches given show three styles, one half, one full and the H type.

The ideal transformer would be a closed core "H" type, pie wound. Pie wound indicates that the primary and secondary windings are wound in sections in slots alternating with each other.

The closed core type as depicted could be improved considerably by winding the secondary over the primary winding and even more so by winding half the primary on one side and the other half on the other side, doing the same with the secondary. However, this is not a transformer constructional article, so we'll leave the headaches to the designers.

The primary and secondary windings act in a very peculiar way. If we place a resistor in either winding, the same effect will occur in the other winding, since the secondary voltage is always 180° out of phase with the primary voltage, whether or not a resistance has been inserted in either winding.

The principle losses to be found in a transformer may be tabulated as follows:

1. Magnetic.
2. Copper (resistance and skin effect).
3. Eddy currents.
4. Hysteresis.

The leakages in the primary and secondary windings are individual. Flux is lost because the hysteresis in the iron core causes heat. So you can see that there are plenty of losses to take into account.

Before we leave this section I'd like to introduce the Auto transformer which is regaining a little of its one-time popularity, principally in the R.F. application. The auto transformer comprises one winding only, but this winding is tapped, to give a primary and secondary winding as shown in the sketch. Used for a power transformer, this type is limited to a small ratio and the disadvantages are:

1. Circuits are not isolated.
2. The wire has to be heavy enough to stand heavy primary current and sufficiently insulated to stand higher secondary voltage. The obvious cure for this is to juggle around with two different gauges of wire, but by the time this is accomplished, it would have been just as well to build the normal type.
3. If the primary becomes open circuited, the secondary is automatically broken also. The advantage is that there are less copper (resistance, skin effect, etc.) losses.

R.F. transformers act in precisely the same way as their power and audio brethren, and to improve their efficiency some L.P. transformers make use of an iron core. This does not mean that the core consists of slabs of stalloy as in the case of power and audio transformers. The core of an L.P. transformer is composed of dust, perhaps impregnated in the former itself or some other such method.

To give you a better idea as to how transformers work, I intend to conclude this discussion with forms of coupling. There are seven principal methods of coupling and all these are shown.

You will probably recognise some of the above skeleton circuits. In the Auto resistive bracket, A is not the true auto resistive coupling. It is the absolutely correct form, although some publications gave diagram A. A couple did have the grace to make a correction, but others let it stand, which miffed a few people.

The ratio marked on an audio frequency transformer gives a direct indication as to the number of windings on the secondary than the primary has, and so on.

A transformer both transforms and transfers in a single action.

For those sufficiently interested in the construction of a home-made audio transformer.

Bobbin: ---in. in external diameter; 3/4 in. internal diameter; 11/2 in. long; flanges 11/2 in. diameter. (Bobbin may be round.)

Primary winding: ---3,500 turns of 40g. S.S.C. copper wire.

Secondary winding: ---17,500 turns of 47z. enam. copper wire.

The core is built up of narrow strips of stalloy to form a closed H core (see a previous diagram). Fifteen strips are required for the core, eight strips for each of the two sides, and 16 yoke strips, 5/8in. wide.

Each lamination is separately enamelled.

Candidly the trouble taken to make this component is worth ten times the price of an audio transformer, but some of you may care to have a shot at making one.

You will see by the number of turns contained in both the primary and secondary work out that ratio will be 1 to 5. If you start winding the secondary, you can stop at 10,500, alter the stalloy, etc., before assembling, and call it 1 to 5 and a hard job finished.
THE DUAL WAVE MIDGET TWO

By H. ADAMS.

Employing two 1.4 volt midget tubes in a resistance-capacity coupled circuit, this receiver will provide speaker reception of local stations, and phone reception of the more powerful short-wave transmitters.

The use of resistance-capacity coupling for the detector will result in a very compact receiver of small physical dimensions, particularly if the parts are mounted on a board and a small condenser is used for tuning. A solid dielectric type condenser would be suitable for this purpose. If the battery leads are soldered to a plug or a valve base and a suitable socket is mounted on the front panel a complete assembly of straggling leads may be eliminated, and the batteries enclosed in a separate box. Or the receiver may be built up on a regular chassis with all the components mounted underneath. Whichver plan is adopted, it is a good scheme to leave space for an extra valve in case it should be later desired to add an audio amplifier.

Before considering constructional details it is proposed to briefly run over the circuit as familiarity with the electrical circuit helps tremendously when the actual building is undertaken.

DETECTOR.

For this service the R.F. Pentode 174 was chosen. Used as a regenerative Grid-leak Detector in the old, reliable Reimann circuit with plate tickler coil, plenty of sensitivity was obtained. The tickler coil should not be made too close to the grid to avoid the effect of the screen grid G2 which will be excessive. When the reaction control is advanced for maximum regeneration, the sliding arm of the control is at the extreme right end of the resistance element, and R2 also operates in the regenerative grid circuit by forcing any R.F. or A.F. currents back through condenser C5 to ground.

POWER AMPLIFIER.

The power pentode 184 is an excellent performer in this stage. It delivers sufficient power to drive a small speaker and is capable of handling a reasonable amount of stray capacitance.

Adjustment of the reaction tuning may be readily effected by winding an extra turn or two at the start and then removing any excessive turns from the bottom of the coil. A 184A or any similar coil should be suitable for broadcast. When winding the short-wave coil on the bottom of the reaction winding may be scarped and cleaned, and then wound tightly around the top end of the appropriate former pin. The coil may then be plugged in and used. Starting off with 12 turns, if necessary, remove the end of the reaction winding from the former pin, unwind one turn, cut, and attach again to the former pin. With a new B battery the phone turns should be sufficient, but each receiver will need individual adjustment in account of the many variable factors. It is finally desired to solder the end of the winding, the method will depend on the type of connection used. For instance, if a valve base and card board former is used, a short piece of 18 or 20 gauge wire may be soldered to the correct pin and brought out through a hole in the side of the base to serve as a soldering point. Coil adjustment, however, is not at all difficult on account of the action of the reaction control whereby the screen voltage may be varied from zero to maximum voltage, thus providing a very wide range of control.

CONSTRUCTIONAL.

The first job is to mount the coil and valve sockets, tuning condenser, switches, and reaction control. A four-pin valve socket may also be mounted to serve as a terminal for the battery leads. Even if a battery plug is not used, the socket makes a convenient terminal for connecting the internal and external power leads. The battery leads may each be threaded through the socket directly from the respective lugs.

THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.
Commence the wiring by installing the ground system. A length of tuned aerial wire or solid bus wire may be run from the earth terminal across the chassis close to the condenser rotor connection and the coil. All coil and detector ground connections may be made directly to this wire. Another length of wire run across to the second valve socket, and soldered to the first wire at the point of intersection will serve for all ground connections for the 1S4. This method of earthing simplifies wiring and ensures efficient operation. The remainder of the wiring is detailed in the wiring diagram. Aerial and earth terminals are not shown, but may be mounted on the back wall of the chassis if desired.

The most important wiring precaution is to treat the condensers with consideration. If the ends of the connecting wires are well cleaned up before soldering it will help towards doing the job with a minimum of hot iron.

**Testing.**

When the wiring has been completed, look the entire receiver over carefully, taking particular care to identify the battery leads. If everything appears to be in order, plug in the broadcast coil and valve, and connect up the phones, aerial, and earth. Leave the batteries till last and be sure you are not connecting the B+ voltage to the filaments. When the set is switched on, advance the reaction control until a rushing sound is heard in the phones. A station should then be picked up without any difficulty. The broadcast coil will provide a good guide as to whether the set is working with reasonable efficiency, as plenty of headphone volume should be available from the more powerful broadcast transmitters. The short-wave coil should be tried out at night. Slow, careful tuning will be necessary with the detector maintained just on the verge of oscillation. A little experience at the controls will teach the operator how to get the most out of his set. There should be plenty of short-wave stations to be heard at reasonable volume, and the operator will soon locate the different bands, and become acquainted with the best times to listen for particular stations.

Note:—The electrolytic condenser C6 may be switched to ground. Breaking this connection will prevent any possible leakage from the batteries when the receiver is not in use.

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<td>110</td>
<td>25.30</td>
</tr>
<tr>
<td>5</td>
<td>8.10</td>
</tr>
</tbody>
</table>

**Electro-Magnetic Screw-Driver.**

If the shank of your screwdriver has about 50 turns of wire wrapped around it and connected to a 4-volt battery it will become magnetised and hold metal screws and bolts.

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**PANEL LAMPS**

Genuine Westinghouse Radio Panel Lamps.

- Cat. No. ML119—2 volt, .05 amp. special low consumption for battery sets.
- Cat. No. ML120—2.5 volt.
- Cat. No. ML121—3.8 volt.
- Cat. No. ML122—6 volt.
- Cat. No. ML123—6 volt, with small bayonet base.

**Morse Practice Sets**

British-made Morse Practice Set has Morse Code engraved on base. Stroke of key is adjusted to individual requirements. Terminals are provided so that the set can be used in conjunction with another set. Contains Key and Tracker on One Base. Light Pattern Measurements 3½in. long, 2½in. wide, 1½in. high.

Cat. No. MH110 8/9

**Radiator Elements**

Spiral Windings. Spiral Element Windings for re-winding Radiator Elements, etc. Made of best British resistance wire.

Cat. No. ME509—230 volt, 600 watt 2/7 each
Cat. No. ME510—230 volt, 750 watt 2/3 each
Cat. No. ME511—230 volt, 1000 watt 2/6 each

**Universal Output Transformers**

These Transformers have been designed to meet the needs of engineers, experimenters, and servicemen, for a single unit so constructed as to provide the correct impedance matching between various types of Audio Output Tubes in a single Push-Pull, Parallel, or Class B Circuits, and any Dynamic Speaker. Full instructions are given with each Transformer.

Cat. No. MT602 17/6 each

**Speedee** Soldering Irons

Consumes 100 watts—no more than a small light bulb. Indispensable to the handy man in workshop or home.

Cat. No. MS406 15/6

**Burgess Batteries**

YES. Genuine imported Burgess Torch Batteries. They cost more but they are worth it.

Cat. No. MB2—Baby Unit Torch Cells 1/7 each
Cat. No. MB3—Standard Unit Torch Cells 1/7 each
Cat. No. MB4—Penlite Unit Torch Cells 10 D, each
(Two required for Pen Torch).

**Ensign Line Filters**

For stopping man-made noises coming over the power mains. Simply plugs into the power point.

Cat. No. MA 298 21/6 each

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**THE LAMPHOUSE, 11 Manners Street, Wellington, C.1.**