

SUGGESTIONS FOR A SIMPLE PORTABLE—See page 67

Practical and Amateur Wireless

3^d
EVERY
WEDNESDAY

Edited by F.J. CAMM

A GEORGE
NEWNES
Publication

Vol. 8. No. 185.
April 4th, 1936.

AND PRACTICAL TELEVISION

F.J. Camm's

TUTOR THREE

*Final
Adjustments*



THE HOME MECHANIC ENCYCLOPÆDIA

With
627

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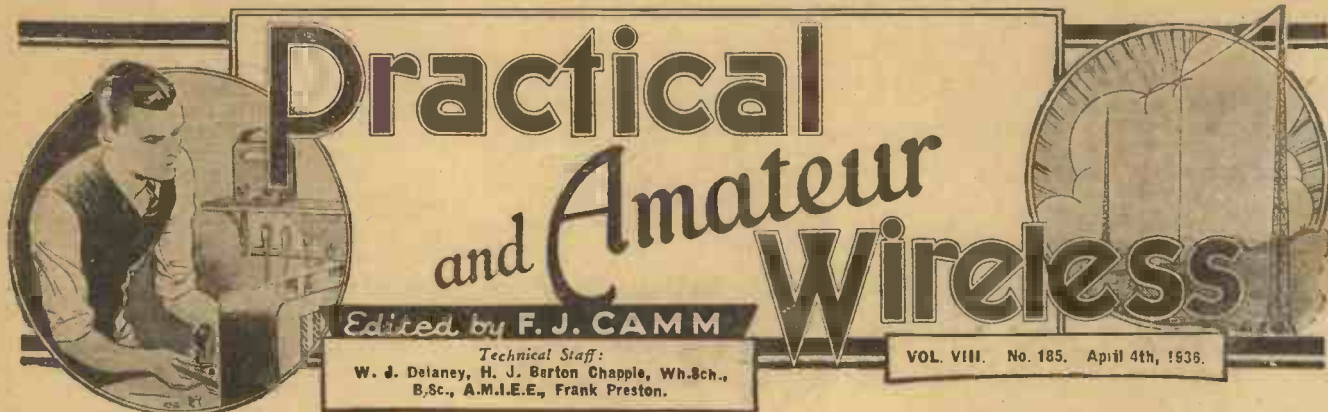
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THE LEADING WIRELESS WEEKLY!



Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Berton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VIII. No. 185. April 4th, 1936.

ROUND *the* WORLD of WIRELESS

Marseilles P.T.T.

IT is now reported from Paris that the official opening of the new high-power station at Realtor will take place towards the beginning of April. The transmitter is already on the air, and the power will be gradually increased from 30 to its ultimate 100 kilowatts.

Another Newcomer

RADIO MARCONI, a new station installed at Bologna (Italy), will be formally inaugurated by Signor Mussolini on April 21st.

Another Radio Conference in Sight

THE next meeting of the U.I.R. (Union Internationale de Radiodiffusion) to deal with intercontinental and other broadcasting matters will take place at Lausanne-Ouchy during the period June 22nd—July 1st, 1936.

Germany's Synchronised Transmitters

THE result of using the Berlin channel, during the period March 2nd-7th, for broadcasts through the Berlin, Breslau and Heilsberg transmitters, has proved an unqualified success. There is, therefore, a possibility that at a future date, in order to secure two exclusive channels, the stations may return to this common wavelength.

Belgium's New Broadcasting House

IN view of the possibility of establishing a television programme service in Brussels, the new radio headquarters at Ixelles are to be extended far beyond the original plan which provided for eighteen studios. The building may be ready by the end of 1936.

Short-wave Station for Syria

SUBSCRIPTIONS are to be raised by a group of wealthy Syrians resident in the United States of America, to provide the necessary capital for the installation of a powerful short-wave station in the French mandated territories of the Levant, in order that programmes from the homeland may be broadcast overseas. The site of the transmitter would be Homs, to the north-east of Beyrouth.

Relays from the Far East

ON one or two occasions listeners on short waves have picked up Chinese programmes relayed through the N.B.C. or C.B.S. network. In the not-too-distant future, we may be given samples of radio programmes broadcast by the Shanghai stations, as the B.B.C. may be given opportunities of taking these when the radio telephony system between London and China is opened.

B.B.C. Interval Signal

THE ringing of the bells of St. Mary, Cheapside, which constitute the interval signal, will shortly provide more melodious sounds, as a new record has been made for the purpose. Since the last recording was carried out several of the bells have been replaced.

THE "TUTOR"

TEACHES

WHILE YOU

BUILD!

Start Building To-day!

World Programmes

AS an outcome of the recent U.I.R. Conference at Paris, European listeners may expect to be given, at frequent intervals, broadcasts from more distant countries than hitherto. Arrangements are already being made for the first transmission in this series to take place in September next. It will be furnished by the United States. This broadcast will be followed at later dates by relays of programmes from the Argentine Republic and the Belgian Congo.

An Alternative to Motala

INTERFERENCE on the long waves renders reception of such stations as Motala and Warsaw occasionally very fitful. As a rule broadcasts through Stockholm are easier to hold. Better still on many occasions are the signals obtainable through Horby, 265.3 metres (1,131 kc/s). Such relays as Goteborg and Sundsvall are unreliable inasmuch as the stations share channels with, respectively, Algiers and Rabat.

The Swiss Signature Tunes

NO difficulty should be encountered in identifying Monte Ceneri (257.1 metres, 1,167 kc/s), in view of its peal of five bells and the fact that all broadcasts are in the Italian language. From Sottens (443.1 m., 677 kc/s) announcements are made in the French language; if from the Geneva studio a short musical phrase is played, if from Lausanne, four chords only. From Beromuenster (539.6 metres, 556 kc/s) German only is heard. The transmitter takes its programmes from Berne, Zurich and Basle, and different interval signals are used to denote origin of broadcast. Berne adopts a musical box, Zurich a carillon, and Basle Westminster chimes. Each Swiss station therefore possesses its characteristic signature tune.

Siam Calling

A REPORT from British India states that a new transmitter has been installed at Bangkok (Siam). Under call letters HSTPJ, it broadcasts on 400 metres (750 kc/s) with a power of 15 kilowatts every Wednesday and Saturday from G.M.T. 14.00-17.00. The station has taken over the duties of the one originally installed in the Royal Palace at Phya Thai.

South African Stations

BY a recent Parliamentary vote, the Broadcasting System is to be taken over by the Union of South Africa. The network involved includes transmitters at Grahamstown (535.7 metres), Capetown (500 metres), Johannesburg (465.1 metres), Pietermaritzburg (430 metres), Durban (400 metres), Bloemfontein (371 metres), and Pretoria (315 metres). ZTJ, Johannesburg, is the most important station; it is rated at 15 kilowatts.

ROUND the WORLD of WIRELESS (Contd.)

Recital at Cheltenham College

MARIE HALL, the violinist, who has toured most parts of the Empire, and Philip Taylor, music director and organist of Cheltenham College, give a recital from this well-known public school. This programme, which will be given from the Midland Regional on April 8th, will also be broadcast to the Empire.

"The Lady of Shalott"

ON April 8th this cantata for women's voices is to be sung by the B.B.C. Midland Chorus, accompanied by a string orchestra, led by Norris Stanley, and with Edgar Morgan conducting. It has been broadcast once before. Chris Edmunds, who wrote it, was a member of Sir Granville Bantock's composition circle at Birmingham. He is the composer of four operas, an octet, a pianoforte quintet, and orchestral and vocal music. In the early days of broadcasting in Birmingham, he was attached to the station as Chorus Master.

Songs of the Open Country

THIS programme of songs for the Easter week-end will be given by Charles Dean, the Birmingham baritone, and the B.B.C. Midland Singers, conducted by Edgar Morgan. Mr. Dean first broadcast in the days when Birmingham had its transmitter at Witton. Later in the evening there is a programme of records, entitled "In Holiday Mood," revised and presented by Robert Tredinnick.

"Easter Cruise."

"EASTER Cruise" is described as "A Personally Conducted Revue" by Gerald Morrison, and will be broadcast on April 8th. Listeners will be able to imagine themselves as being taken musically from Northern Ireland to the South of England, to the Continent, and back again. Gerald Morrison, the popular manager of the Empire Theatre, is the author of this revue, and it contains many attractive numbers, whose settings successively build up an Easter cruise on a very fascinating route.

Paul Robeson

THERE has always been considerable interest in Northern Ireland in the remarkable voice of Paul Robeson, but this interest has been greatly stimulated by his recent visit during which he gave recitals in Belfast and Londonderry. On April 10th a gramophone recital of Paul Robeson's Spirituals will be broadcast, and there is little doubt that many listeners will be glad to welcome such a programme.

"Party Pieces"

"PARTY Pieces, or Obliging the Company" is the title of a programme based on some of the old Victorian parties when all the musical guests were expected to help to entertain. "Party Pieces" will be heard on April 7th, when David Kean will give a burlesque monologue, George Holloway a sketch about Henry Morgan, which has been specially written for the occasion by Cyril Roberts, and

INTERESTING and TOPICAL PARAGRAPHS

Harry Hemsley will compère the other items, which include variety acts, songs, and instrumental items.

CLOSE HARMONY



The Carlyle Cousins, well known to broadcast listeners, now have another close companion in their new Pye T. 10 all-wave receiver.

Bristol Choir and Trio

THE Choir of the Bristol Musical Society, conducted by Graham Harris, and the Bristol Chamber Trio will give a concert from the studios on April 8th. The Bristol Musical Society was formed in 1934. Its conductor, Graham Harris, was for twenty-one years a pupil and constant friend of the late George Riseley. Mr. Harris is also conductor of the Bristol Royal Orpheus Glee Society, Bristol Ladies Choir, and Bristol Co-operative Choral Society, as well as organist of Christ Church, Clifton.

"Caesar's Friend"

THIS play by Campbell Dixon and Dermot Morrah was broadcast last August; it is being especially revived for Good Friday, as it deals with the events surrounding the Trial before Pilate. The Northern Repertory Company will again provide the players, under the direction of Bladon Peake, who went to Northampton from the Abbey Theatre, Dublin; he was formerly at the Crescent Theatre, Birmingham. The broadcast is from a studio, and the producer is Howard Rose, who in April exchanges with the Midland producer, Owen Reed, for three months. The Repertory movement at Northampton is now in its ninth year. Another Midland programme for Good Friday is a Chopin recital by Michael Mullinar, the Birmingham pianist and composer.

Game Fishing

APPEALING especially to fly-fishermen, but also by their pictorial quality to the general listener, a series of fortnightly talks are to be given in the Midland Regional programmes. They will describe fly-fishing on stretches of river which are accessible by Midland townspeople in a week-end. The first, to be

broadcast on April 7th, is designed especially for Easter, and is entitled "Welsh Week-End." It will be given by L. C. Hill, a Birmingham business man who has been an enthusiastic fly fisherman for fifteen years. There will be one talk on salmon; the other half-dozen will deal with trout in Shropshire, Herefordshire, a Welsh stream, and also on the Dove, which Walton and Cotton loved.

"Under the Greenwood Tree"

THOMAS HARDY'S great novel of Wessex, "Under the Greenwood Tree," has been chosen by Cyril Wood as the first to be adapted as a radio play to represent the country of Dorset. Auditions have been going on for some time with a view to finding just the right people for Hardy's story, and it is hoped that sufficient people who are Dorset bred and born will be found for all dialect parts so that the cast for "Under the Greenwood Tree," to be given in the Western Regional programme on April 4th, will be representative of the whole county. The carols which every Dorset man associates with "Under the Greenwood Tree" will be likewise sung by Dorset voices, and care is being taken to ensure that the music of the carols is as faithful to tradition as the dialect in which they will be sung. This play should be worth hearing.

SOLVE THIS!

PROBLEM No. 185.

Hollis had been told that an energised moving-coil speaker would give better quality of reproduction than his permanent magnet model, so he decided to fit one in his all-mains set. As the H.T. current consumption of the set was 60 m/A, he chose a speaker that required an energising current of this value and connected its field winding in the common H.T. + lead in the usual manner. He found, however, that the substitution caused a reduction in the volume and the quality was inferior to that obtainable from the P.M. model. Why was this? Three books will be awarded for the first three correct solutions opened. Address your letters to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Envelopes must be marked Problem No. 185 in the left-hand corner, and must be posted to reach this office not later than the first post Monday, April 6th, 1936.

Solution to Problem No. 184.

L.F. instability in a push-pull output stage is generally due to the use of unmatched valves, and may be cured in most cases by connecting a resistance of approximately 50,000 ohms between the G.B. terminal of the input push-pull transformer and the lead normally joined between this terminal and the H.T.—or G.B.—line.

The following three readers successfully solved Problem No. 183, and books are accordingly being forwarded to them:—

R. S. A Larnuth, Lost Horizon, Styal Road, Heald Green, Cheshire; Frank Johnson, 52, Amos Ave., Newton Heath, Manchester; A. W. Edwidge, 25, Oak Hill Crescent, Woodford Green, Essex.

SUGGESTIONS *for a* SIMPLE PORTABLE

A Number of Ideas for the Construction of Inexpensive Portable Receivers are Put Forward in this Article, and Details are Given of a Two-valve Reflex Arrangement which can be Built from Standard Parts

AT this time of the year most constructors give some thought to the question of building a portable set of some kind for the coming spring and summer. Complete constructional details

The reader may ask why two L.F. pentodes are used instead of the more usual S.G. and triode valves. The answer is that this type of valve has been found most satisfactory in the circuit illustrated. For

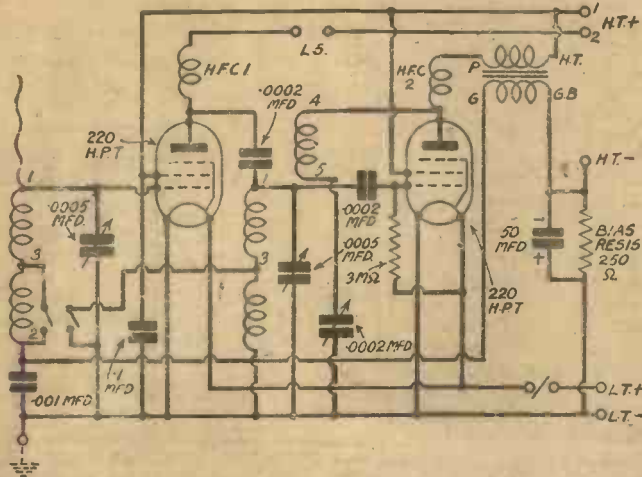
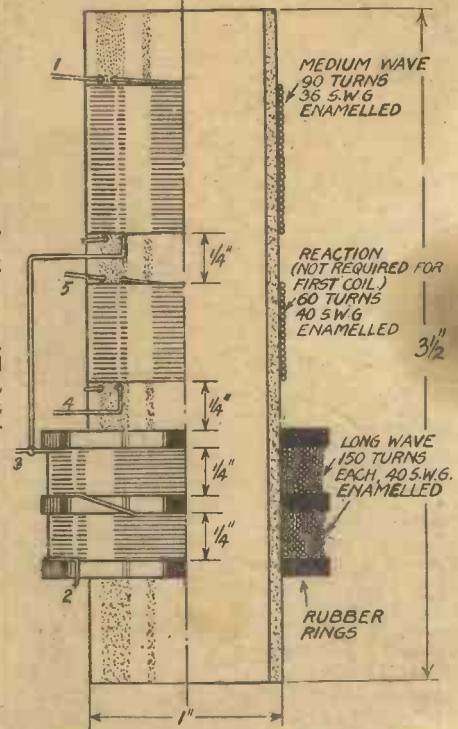


Fig. 3.—(Right) Constructional details of suitable coils.

Fig. 1.—(Left) Theoretical circuit diagram of the two-valve reflex portable described in the text.



experience, that it is possible to obtain passably good loud-speaker reception from a single pentode valve used in a regenerative detector circuit.

A Simple Aerial Scheme

It will be seen from the circuit diagram that, contrary to usual practice with a portable, a frame aerial is not employed; in its place is a temporary "throw-out" aerial which may consist of a short length of insulated wire. A more convenient system is to employ one of those spring-loaded steel tape measures which can be bought from most sixpenny stores. This is actually shown in the suggested component layout illustrated in Fig. 2. The "aerial" is naturally short, but has proved satisfactory for short-range reception, and has the advantage that it can quickly be "erected" and rolled up when necessary.

of at least one portable receiver will later be given in this journal, but there are probably many readers who would like to make a simple type of portable to their own design. It is with the object of catering for these that the present article is being written, and the purpose is not so much to supply full constructional particulars for any one instrument as to make suggestions which may be applied to almost any type of receiver using standard components.

It is, of course, possible to obtain special mid-gadget components and valves which are ideal for use in the construction of a really modern portable set, but there are no doubt many readers who would prefer to make use of odd parts which may be on hand. In any case, a set can be made up in this way, and it can then be modified at a later date, after the preliminary experimental period, by obtaining special mid-gadget parts.

Besides, the initial experiments will give an indication of the type of circuit which is most likely to prove suitable for the particular requirements. Afterwards, a new and more refined receiver can be assembled without there being any misgivings as to the kind of results which should be obtainable. The complete holiday portable can then be built as a result of the experiments which have been made.

A Two-valve Reflex

A circuit of rather unusual form, but which has proved very satisfactory in practice, is shown in Fig. 1. Two high-efficiency low-frequency pentodes are used in a reflex circuit, and this combination is very economical and can be operated quite well from low-voltage H.T. batteries, whilst full advantage can be taken of the high degree of amplification afforded by the pentode valves.

one thing, the L.F. pentode of the high-efficiency type (Cossor type 220 H.P.T. is recommended for both positions) gives a remarkable degree of H.F. amplification and at the same time gives the utmost degree of efficiency at the low-frequency end of the scale. Added to this, the fact that the pentode detector gives a high degree of amplification with a comparatively small H.T. voltage must be borne in mind. Many readers are probably aware, from past

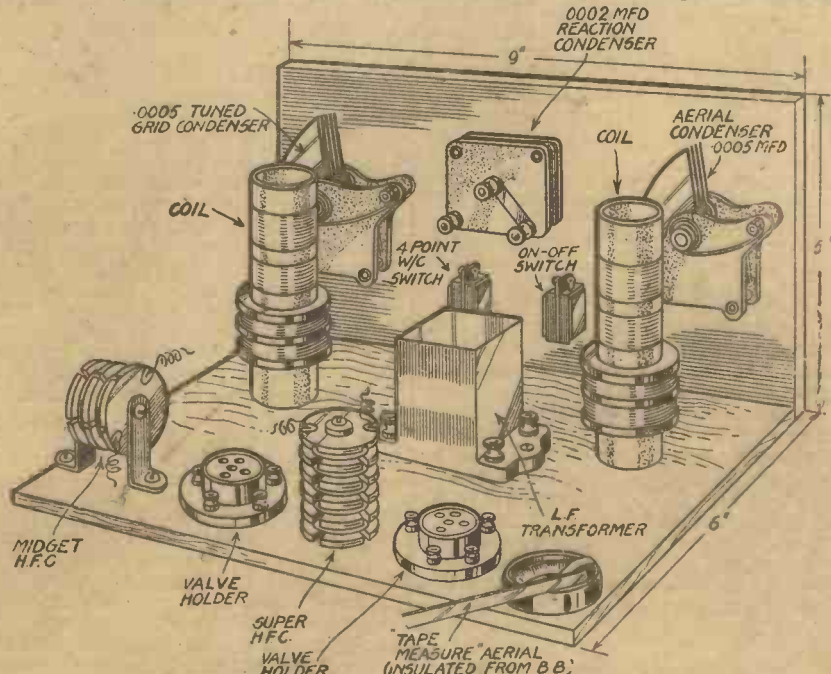


Fig. 2.—Suggested component arrangement for the two-valve.

Should a longer aerial ever be required it is an easy matter to connect it to the end of the steel tape or to a terminal mounted on the baseboard.

Automatic Grid-bias

Another refinement in the circuit illustrated is the provision of automatic grid bias; this obviates the need for a grid-bias battery and ensures that the bias voltage is always correct regardless of the condition of the H.T. supply. This, in turn, prevents distortion which often occurs when the battery is running down. The 250-ohm fixed resistance shown for bias purposes is correct for the two pentodes previously mentioned, but its value must, of course, be modified if alternative valves of entirely different type are employed.

The earth connection is shown in broken lines, since this will not generally be employed, and if a metallised baseboard—or even a metal chassis—is used, this will provide a fairly satisfactory "counter-poise" earth.

Apart from the points referred to, the circuit is of standard form, and the construction of a simple receiver incorporating it does not present any difficulty. A suggested layout for the various components is illustrated in Fig. 2, from which it will be seen that the little set can be assembled on a baseboard measuring only 9in. by 6in., the panel being 5in. high.

Making the Coils

The two .0005-mfd. tuning condensers and the reaction condenser are all of the bakelite-dielectric type, and may be of any good make. It is evident that the coils must be small, but it has been found that they do not need to be screened. They may thus be

of a standard type, such as those made by Bulgin or B.T.S., or alternatively they can be made at home by following the details given in Fig. 3. A lin.-diameter paxolin former is used and the connecting leads (which are rather more convenient than terminals in the present instance) consists of short lengths of rubber-covered flex anchored to the former by passing their ends through pairs of holes.

The constructional details are fairly evident from the illustration, but reference might be made to the provision of slots for the long-wave windings. These are formed by slipping three stout rubber rings on the former, the rings being $\frac{1}{2}$ in. apart. If suitable rubber bands are not available it is possible to make cardboard washers which may be used instead and attached by means of seecotine or "tacky" glue. All connections are numbered to agree with those shown in Fig. 1.

The high-frequency chokes shown are not of the usual type, but are the disc-shaped ones made by Bulgin and intended primarily for set manufacturers. They are mounted with their axes at right angles. There is no need to specify any particular make or type of low-frequency transformer, since there are now several compact components on the market, all of which are suitable.

The Carrying Case

It is not proposed to describe the fitting of the finished set into a cabinet, for the constructor will no doubt have his own ideas on this subject, and will probably wish to make use of a small attache case or box that he has on hand. It will suffice to say that the complete receiver can, if desired, be built into a light cabinet measuring 11in. by 9in. by 6in. (inside) if use is made

of one of the midget speakers on the market which has a 5in. cone. Phones will generally be used, however, and can easily be accommodated. This does not allow a very great amount of space for the batteries, but it is now possible to obtain a 33-volt battery (Drydex) measuring only $5\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by 1in., and two of these will easily provide the necessary voltage. Several very small accumulators are on the market, so there is no difficulty in finding a suitable one. A model such as the Exide LCJ1 is suitable. Other components are as follows: two Graham Farish .0005-mfd. "Litlos" condensers (for tuning); one Graham Farish .0002-mfd. "Litlos" condenser (reaction); one Bulgin S.87 four-point switch (wave-change); one Bulgin S.80 Q.M.B. on-off switch; four tubular fixed condensers—one .001-mfd., one .1-mfd., and two .0002-mfd., one T.C.C. type 501 50-mfd. electrolytic condenser; two 1-watt fixed resistances, 250 ohms and 3 megohms.

THE WIRELESS CONSTRUCTOR'S

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TELEVISION NOTES

Not An Electric Eye

DESCRIPTIONS of television equipment which appear in the daily press are often very wide of the mark owing to the confused ideas of their correspondents on technical matters. One quite frequent mistake is to refer to both the Iconoscope and the image dissector tube as "electric eyes." This was the term which in the early days was applied to the ordinary photo-electric cell, but in the strict sense of the term it is impossible for this cell to see anything. It merely responds in an electrical sense to changes of light in order to produce an intelligible signal. In the case of the Iconoscope this is the nearest approach to the human eye which has so far been attempted. The similarity exists in the retina which consists of millions of optic nerve cells resembling a fine mesh-work of mosaic, and the plate at the back of the Iconoscope which is made up from a mosaic of millions of tiny separate and distinct photo-electric cell surfaces. Due to their special construction and assembly, each cell acts as a condenser, and acquires an individual electric charge corresponding to the degree of light in that section of the optical image which is focused on to it. The resultant signal is then produced by each cell condenser discharging through the action of a scanning beam of electrons. With the image dissector tube, however, there is no acquired charge since the cathode consists of a uniform coating of photo-electric material of unvarying thickness. The action of focusing an optical image on to this is to produce a corre-

sponding electron image which, by electrical methods, is moved over a fixed aperture to generate the line dissected image signal. In every case, therefore, the eye action is not copied completely, but one is justified in drawing an analogy between the Iconoscope and the human eye, but not for the other two cases.

A Demountable C.R. Tube

IN order to allow certain investigations in connection with the electrode systems of cathode-ray tubes for television to be carried out both rapidly and conveniently, the G.E.C. use a demountable tube. Just the same as optical systems can be examined on an optical bench, so this scheme allows relative adjustments of the electrodes to be undertaken and data dealing with brightness, spot size, distortion, etc., is obtained very readily. According to a published description the detachable part carries a cap with twelve contacts which connect with rods in the tube neck. Axial alignment is obtained quite easily while the time taken to open the tube, readjust and repump is only half an hour, the cathode retaining its emission even after several exposures to the air.

A Conference Opinion

QUITE recently the Intercontinental Radio Conference held at Paris discussed the question of television. The delegates represented various broadcasting organisations of the world and according to one report the conference decided that while it appears premature to envisage at the moment a complete standardisation of

the various television systems now being developed, there remain certain characteristics which can be uniformly adopted whenever there is no risk of compromising progress already achieved. It is quite certain that before any universal service is adopted certain items will have to be standardised and amongst these the most important are direction of scan, degree of definition, pictures per second, sequential or interlaced scanning, and ratio of total modulation to be occupied by the synchronising and vision signals which are combined to be radiated on one wavelength.

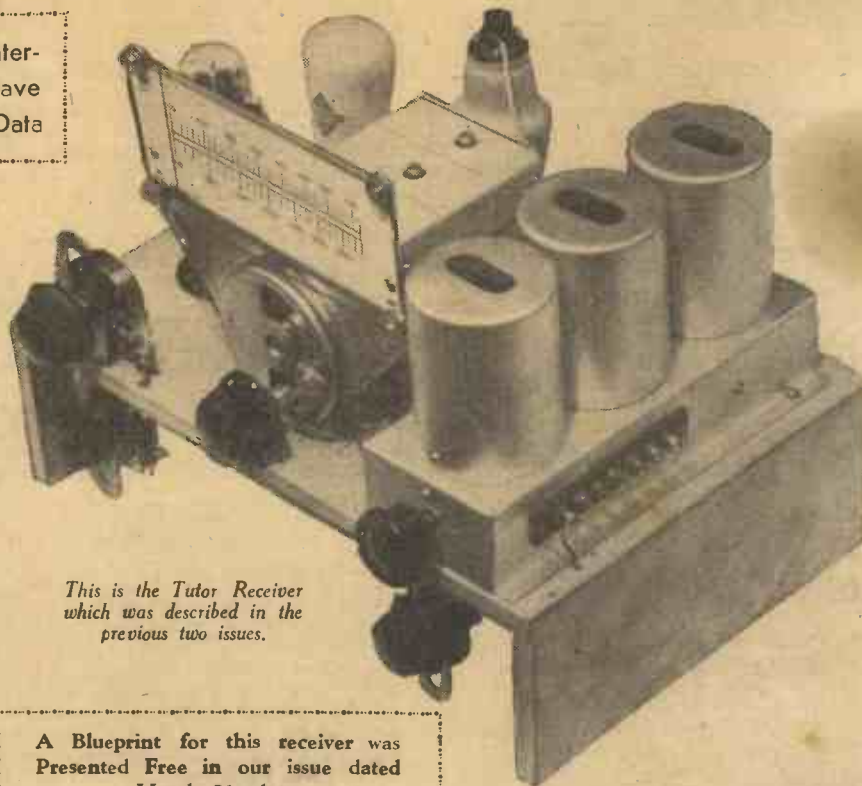
Outside Broadcasts

FROM the way the B.B.C. are laying out the Alexandra Palace it would seem that they are making ample provision for outside broadcasts as distinct from those effected in the studios under conditions of artificial light. There is a terrace outside the studios and also a special area in the grounds itself. Bearing in mind the disclosures of Mr. Gerald Cock concerning his programme plans it seems quite certain that, when the weather permits, bands playing in the open will be televised, while large objects which are too bulky to be accommodated in any of the studios will be placed on the terrace to be scanned by any of the well-known methods, such as the electron camera or the intermediate-film process. Added to this, there is the possibility of outdoor scenes much farther away being scanned on site, and relayed to the Alexandra Palace transmitter by directional micro-wave links for subsequent re-radiation by the broadcast aerial. It is known that beam equipment of this nature is being brought to a high stage of perfection, and it possesses the additional merit of being relatively inexpensive, and very portable in character.

THE TUTOR—*Final Adjustments*

Some Additional Notes on this Interesting Three-valver and its Short-wave Adapter, with Some Working Data

ALL of the information which has now been given should have enabled even the veriest tyro to have completed the set and the adapter and to have obtained good results on all wavebands. It appears, however, from one or two queries which have so far been received, that there are some points which are not exactly clear to those who have not previously constructed a receiver, and these will now be dealt with. Firstly, in the theoretical diagram of the Tutor which was given on page 5 of our issue dated March 21st last, a condenser is shown between the first two coils and is given the reference C5. One or two readers have claimed that our list of components is inaccurate as this condenser is not included, but a study of the blueprint which was presented in that issue will show that this condenser is of the home-made type and is made up simply by twisting two lengths of wire together. The wire should be the ordinary insulated wire which is employed for wiring the receiver, and not rubber-covered flex which is provided with too thick an insulated covering. A length of about 3in. should be attached to the first two terminals on the coil unit and then the two wires should simply be twisted round each other. Of course, care must be taken to prevent the ends of the wires from touching and also to avoid breaking the insulated covering, as this would short-circuit the small condenser formed by the capacity between the two wires. The degree of twist which is employed will depend upon the selectivity which is required, and if only one or two

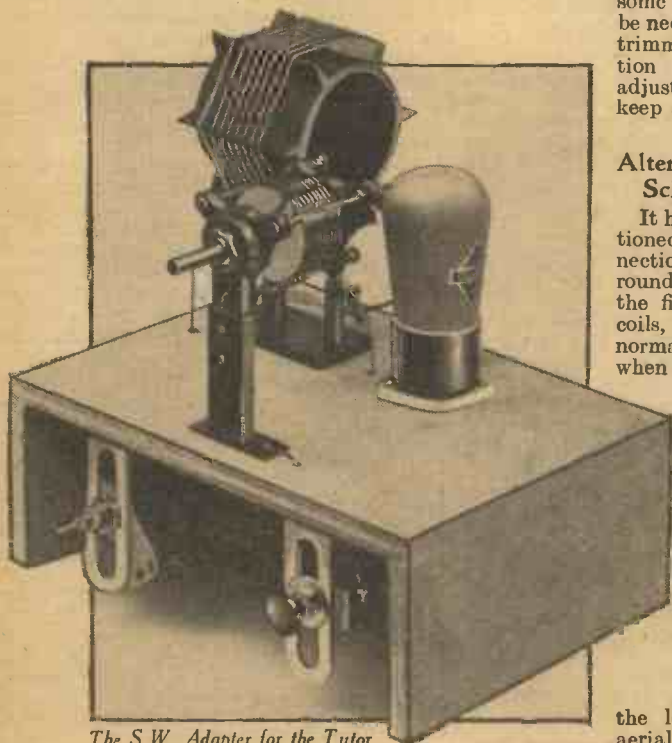


This is the Tutor Receiver which was described in the previous two issues.

A Blueprint for this receiver was Presented Free in our issue dated March 21st last.

turns are given to the wires the selectivity will be highest and signal strength will be reduced slightly. It is important to remember that any adjustment in the capacity of this condenser must be compensated by a readjustment of the trimmers on condensers C1 and probably C2. In some cases it may only be necessary to adjust one trimmer, but the precaution should be taken of adjusting both in order to keep all circuits in step.

used, and the requirements of the user. It must always be borne in mind that selectivity is only obtained at the expense of sensitivity and thus a compromise is desired in every case and it will often be found that the bandpass scheme may be omitted in order to give a more flatly-tuned circuit and thus preserve quality on the local. To obtain a degree of selectivity then without replacing the first tuned circuit, the H.F. volume control may be set to a low value, and signal strength then increased by means of the reaction control. This will sharpen tuning in the detector stage and give quite a good measure of selectivity.



The S.W. Adapter for the Tutor.

Alternative Aerial Schemes

It has already been mentioned that the aerial connection may be changed round in order to eliminate the first of the bandpass coils, and although this is normally only desirable when the listener is a long way from a powerful station, or when listening to long-distance stations when no local broadcast is being transmitted, it will also be found desirable to use this alternative connection when the short-wave adapter is employed. In this connection much depends upon the locality, the type of aerial and earth which is

Extension Speakers

There should be no other points in the circuit about which explanation is required, but for those who wish to fit refinements an output filter may be included so that an extension speaker may be employed, or for listening at a distance without the risk of voltage loss through the speaker leads. In this case all that is required is a good iron-cored choke, preferably designed for use with a pentode valve, and this should be joined to the loud-speaker sockets. A fixed condenser of 2 mfd. capacity should then be joined to the loud-speaker socket, which is connected to the anode of the output valve, and the speaker joined between the condenser and any earthed point. If two loud-speakers are required, one with the actual set and one at a distance, the iron-cored choke may be omitted, but the condenser should be included as above mentioned, and the additional speaker should be of the type provided with a tapped primary winding to the transformer so that the correct impedance may be selected and maximum volume and best quality thereby obtained.

The Latest B.B.C. High-Power Station

Some Interesting Details of the New Irish Station which was Recently Opened by the B.B.C.

THE new Northern Ireland B.B.C. station is unique among the Regional stations, as it is situated in a country having a separate government and is divided from the homeland by sea. It is also unique in design, and is the first of the B.B.C. stations of high power to be built without the usual type of multi-wire aerial system. As may be seen from the illustration at the foot of the page, the aerial system utilises a single insulated steel mast 475 feet in height, and three sets of stays, spaced at 120 degrees, are used. Each set consists of two separate pairs of parallel stays, attached to the mast at half its height and at two-thirds of its height, respectively. For the purpose of adjusting the electrical constants of the mast to the appropriate wavelength, a sliding top mast is provided. This consists of a steel tube, 75ft. in length, which is raised by means of a winch situated on a platform half-way up the main mast. The mast is tuned by circuits which are situated in the aerial transformer house at its base, and which are coupled to the feeder system. A duplicate feeder system and aerial-tuning circuits are provided, and these can be switched into circuit immediately in the event of damage by lightning or any other cause.

The Transmitter

The circuit is similar in general design to that of the long-wave National transmitter at Droitwich, the Marconi system of series modulation being employed. The programme input reaches the transmitter from the Control Room, and first passes through two low-power stages

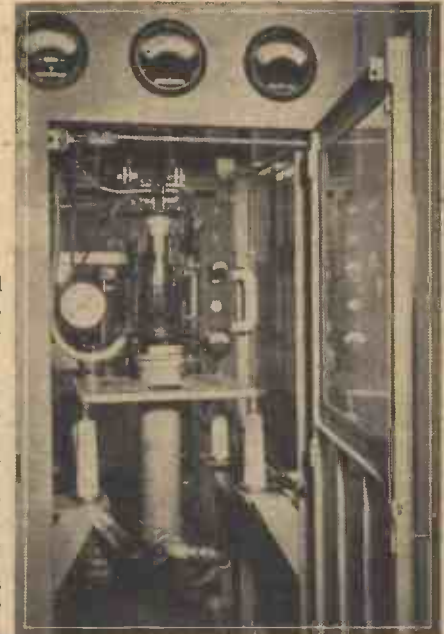
of low-frequency amplification, the second of which feeds into the modulator stage, which consists of two C.A.M.3 valves in parallel.

The high-frequency input is provided by a Marconi constant-frequency oscillator, which is a valve oscillator having its circuits enclosed in a temperature-controlled chamber. The high-frequency input is fed through an amplifying stage to the modulated-amplifier stage, consisting of two C.A.T.6 valves. These are connected in series with the two modulator valves and with the source of high-tension supply. The anode circuit of the modulator stage is connected to the filament circuit of the



The Governor of Northern Ireland, Sir John Reith, the Lord Mayor of Belfast and other officials at the opening ceremony.

modulated-amplifier stage. Consequently, variations in the impedance of the modulator anode circuit, due to low-frequency



One of the cubicles containing a water-cooled valve showing the various mounting details.

variations in grid voltage cause the effective high-tension voltage applied to the modulated amplifier anodes to vary in sympathy, thus effecting the modulation process.

The next stage in the transmitter is the main amplifying stage, which is designed for a maximum power output of 100 kilowatts at a depth of modulation of 90 per cent. with a total harmonic content not exceeding 4 per cent. Four 25-kilowatt water-cooled valves of the C.A.T.12A type are employed, two being connected in parallel on each side of a push-pull circuit. The output circuit consists of a radio-frequency transformer, coupling the balanced anode circuit to a concentric tubular feeder, having a characteristic impedance of 75 to 80 ohms, which convey the high-frequency energy to the aerial transformer house.

The valve-cooling system consists of a large water-cooled radiator, mounted over a reservoir about 100ft. from the main building. Distilled water is used in the closed cooling circuits, while mains water is used as the cooling agent. In order to avoid failures due to the possible stoppage of a pump, two pumps are provided, each of which is capable of taking the whole of the load.

Power Supply

The power input to the station is taken from the mains of the Northern Ireland Electricity Board through a sub-station on the site.

The various power supplies required by the transmitter are derived entirely from motor-generator sets driven from the main power supply. The principal high-tension plant consists of three motor-generators, each having a maximum output of 300 kilowatts at 12,000 volts. Under normal circumstances, two generators are connected in series, giving the required output of 400 kilowatts at 18,500/20,000 volts.

Arrangements for supplying filament-

(Continued on page 83)



Above may be seen a general view of the transmitter, and on the right a general view of the building and the novel mast aerial.

PLANNING THE OUTPUT STAGE

The Importance of Matching is Here Explained, and a Number of Practical Output Circuits are Analysed which, between them, cover most of the Standard Arrangements found in Modern Receivers

By H. BEAT HEAVYCHURCH

COMMENCING with the very simplest forms, Fig. 1 shows the arrangement of a simple output stage for a battery receiver, and may be considered as the basic circuit from which all the later circuits are derived. The input to the stage is shown as the secondary winding of an intervalve transformer, but the grid leak of a resistance capacity arrangement

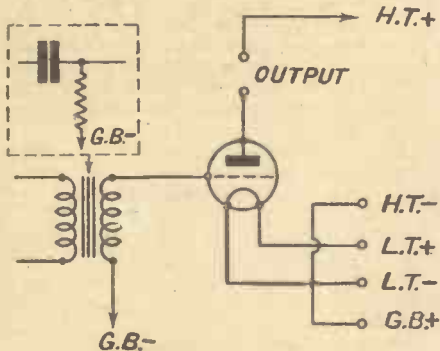


Fig. 1.—The basic output circuit for battery triodes.

can, of course, be substituted. It will be seen that the lower end of the input circuit is in each case connected to the appropriate negative grid-bias tapping—and it is important that the correct value of grid bias be applied in accordance with the table supplied by the valve maker. Incorrect bias leads to distortion, and if the biasing voltage is too small the valve will take excessive anode current in addition, thus shortening the life of both the high-tension battery and the valve.

The output valve in this case would be either a power or a super-power triode; the relative merits of each have been discussed in a previous instalment. As such valves take a comparatively small anode current, the output can be taken straight to the loud-speaker, provided that this instrument (together with its transformer, if fitted) represents a "load" of the correct impedance for the valve used.

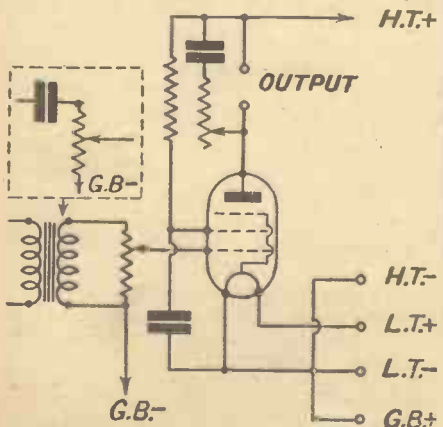


Fig. 2.—The basic output circuit for battery pentodes.

Matching

This matter of matching the speaker impedance to the valve will be referred to later on, but it should be remarked here that a certain valve with a certain input signal will give an output depending upon the impedance of the load, that is, the speaker circuit. It is possible to calculate, and also to measure, the output with different loads. Similarly, the amount of distortion varies with the load impedance. Valve manufacturers now specify in their catalogues the "optimum" or best value of load impedance for each type of output valve, this value being that which gives the largest output for a reasonably small amount of distortion—usually 5 per cent. second harmonic distortion.

The correct matching of the speaker impedance to meet optimum conditions is done usually by selecting the correct

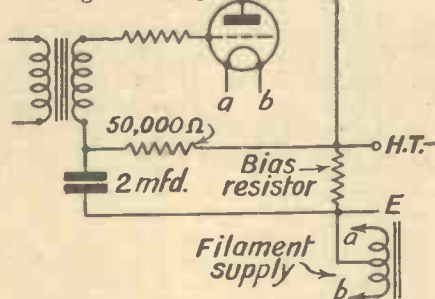


Fig. 3.—An output circuit for a directly-heated mains triode.

ratio for the speaker transformer. Suitable ratios for the ordinary battery triodes and pentodes are standard, and most makes of moving-coil speakers are either obtainable with transformers having one of a number of ratios, or with universal transformers, the tapings of which can be adjusted to give practically any desired load value. In the diagram shown in Fig. 1, however, it is assumed that a speaker of correct impedance is available.

Using Pentodes

The circuit for an output stage using a battery pentode is shown in Fig. 2. It does not differ very much, basically, from that given in Fig. 1, but two or three points are worthy of note. In the first place, a volume control is shown in the input circuit. This is not essential, but has been included to indicate how such a control should be arranged, if wanted, in order to avoid overloading the more sensitive pentode. The transformer coupled stage has a potentiometer across the secondary for volume control purposes;

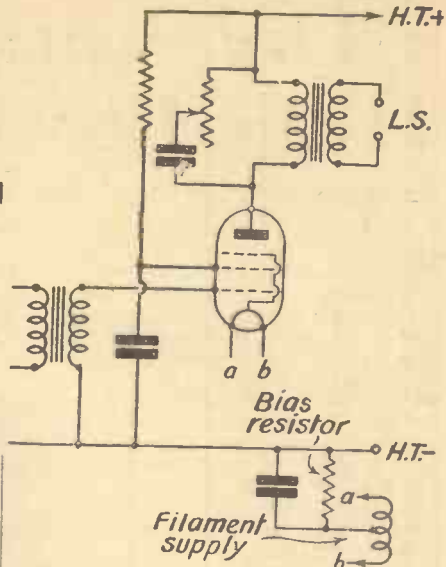


Fig. 4.—Using a directly-heated mains output pentode.

for the resistance capacity coupling arrangement a potentiometer is substituted for the fixed value grid leak.

The next point for consideration is the decoupling in the auxiliary grid circuit of the pentode. This, again, is not an essential refinement, and normal battery pentodes are so designed that the auxiliary grid may be connected to the same high-tension voltage as the anode supply. Some of the larger mains pentodes, however, require lower auxiliary grid voltages, and the arrangement shown may be employed as a voltage-dropping resistance and decoupling circuit.

Lastly, in this diagram, it will be seen

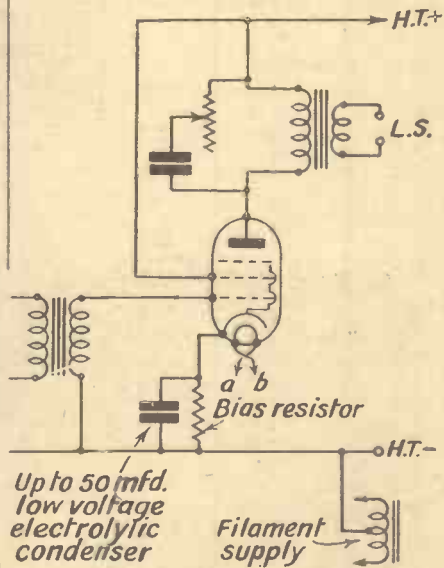


Fig. 5.—The modifications for an indirectly-heated mains pentode.

that a small condenser and variable resistance in series with it is connected across the output terminals. This should be done always with a pentode stage, and fulfils two functions. In the first place it serves to limit the serious rise in voltage which would occur if the load across the output terminals was inadvertently disconnected while the set was switched on. This voltage rise might easily be sufficient to cause a breakdown in the insulation of the speaker

transformer, and might even crack the foot of the valve. Secondly, the condenser and resistance can be used as a form of tone control to reduce the high note response, and give what many listeners feel is a more balanced reproduction. The condenser may be of .01 mfd., and the resistance should have a maximum value of 50,000 ohms for small battery pentodes or 25,000 ohms for the mains pentodes.

Similarity

We now come to directly-heated A.C. mains output valves, Fig. 3 showing a triode stage and Fig. 4 a directly-heated pentode. The main details are similar to those of the corresponding battery stages, and the reader will have little difficulty in identifying those which are merely refinements. Two alternative methods of applying automatic grid bias are shown. That in Fig. 3, with a decoupling resistance, is the ideal case, but in practice the Fig. 4 arrangement, with a large, low voltage electrolytic by-pass condenser, will be found perfectly satisfactory.

The two resistances, one in the grid circuit and one in the anode circuit of the triode version, are of interest. They are high-frequency oscillation stoppers, and should always be used with the larger A.C. mains valves of the 5-watt output class and above, and always in push-pull arrange-

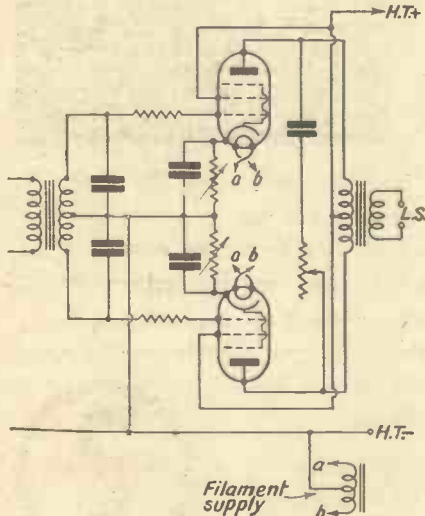


Fig. 8.—Using indirectly-heated pentodes in a push-pull stage.

ments. The grid stopper may be of from 5,000 ohms to 10,000 ohms resistance, and the anode stopper (which must be rated to carry the full anode current of the valve and arranged as close to the anode terminal of the valve as possible), should be of 80 to 100 ohms.

In Fig. 3, also, is shown an alternative to the transformer output, namely a choke-capacity filter feed. This has the advantage that the primary of the output transformer, and also the extension leads, if any, are isolated from the anode supply, and no D.C. component flows through the transformer winding.

Fig. 5 shows an amplifier using an indirectly-heated mains output pentode, and the simpler form of grid bias circuit, namely a resistance in the cathode lead with large by-pass condenser, should be noted. Otherwise

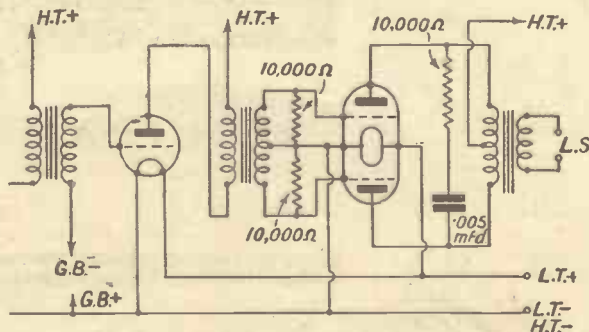


Fig. 9.—A typical class B output circuit.

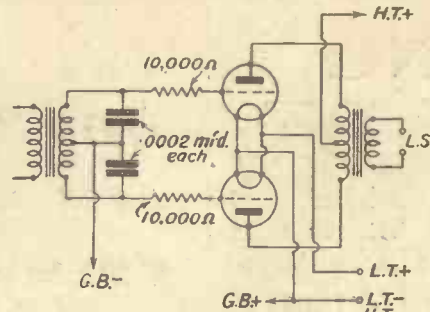


Fig. 6.—Using battery triodes in a push-pull output stage.

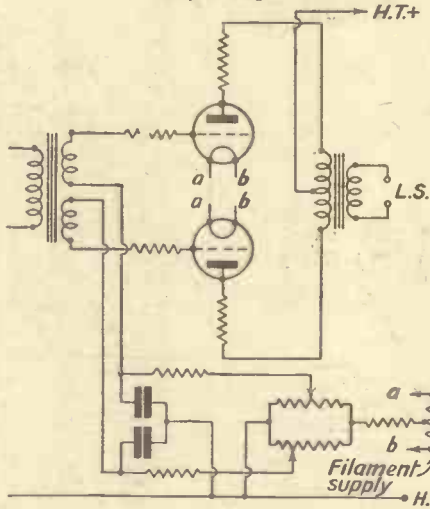


Fig. 7.—A pair of directly-heated mains triodes in push-pull showing independent variable bias.

the arrangement is identical with that shown in Fig. 4.

Push-pull Schemes

We now come to ordinary push-pull circuits, and the basic arrangement for two battery valves (triode or pentode) is shown in Fig. 6. The very complete grid oscillation stoppers provided should be noted. They consist of a 10,000-ohm resistance in each grid lead, and a .0002 condenser across each half of the push-pull input transformer. It will be observed that a centre-tapped input transformer is employed, so that the two valves share a common grid-bias tapping. The ideal arrangement is to use a double-secondary transformer so that the two valves may be independently biased and their anode currents adjusted to equality. This type of transformer should certainly be used with mains valves, and Fig. 7 shows the circuit for two directly-heated mains valves in push-pull, and in particular the arrangement for individually adjustable grid bias. The circuit for a pair of indirectly-heated mains pentodes

is given in Fig. 8, and here again certain items, such as the auxiliary grid decoupling, are merely refinements.

Finally, there are the various quiescent output schemes. A Class "B" arrangement is shown in Fig. 9. The arrangement of two oscillation stoppers in the form of 10,000-ohm resistances connected across the two halves of the Class "B" input transformer should be noted, and also the fact that a suppressor circuit, comprising resistance and condenser in series, is shunted across the primary of the output transformer in the same way as in the pentode circuit in Fig. 2. As explained in a previous article, the input and output transformers for Class "B" are of special type, the former having a step-down ratio and low resistance secondary (about 400 ohms), and the latter having a primary resistance of not exceeding 1,000 ohms.

Q.P.P. Stage

The last circuit, Fig. 10, is of a modern Q.P.P. stage, using the latest type of double pentode valve. It calls for little comment, most of the features being similar to those already described. The component values given, however, represent normal practice, and the circuit may be followed with confidence.

It should be pointed out that both in this type of circuit and in the circuit just mentioned, the anode current is continually varying with the signal, and this variation in the load necessitates the use of a special source of H.T. supply in order to take full advantage of the circuit. A good large battery should be employed, or one of the special H.T. units when the mains are available.

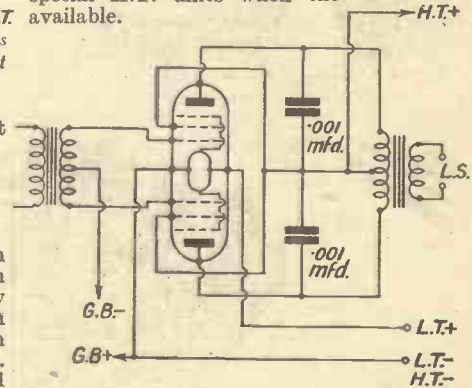
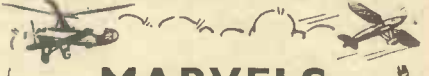


Fig. 10.—The connections for a Q.P.P. output stage.



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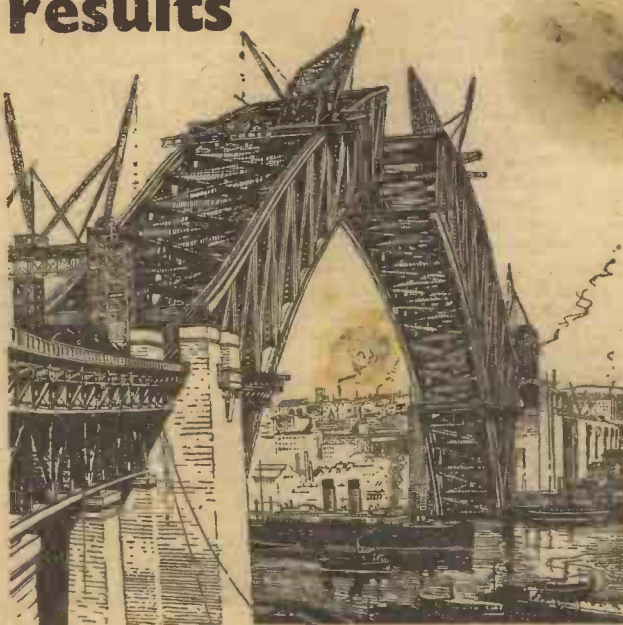
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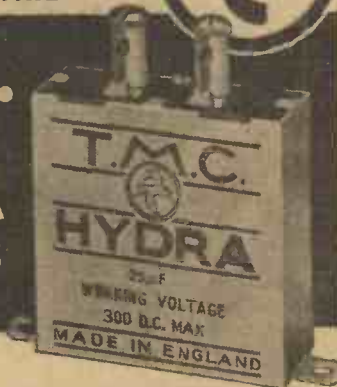
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NEWNES

THE NEW PYE SUPERHET WITH TRAVELIGHT TUNING

A Console Receiver (Model T.12) which "Spotlights" Your Station On a Map

AS a result of several months of research work and testing under conditions of the closest secrecy, a remarkable new superhet has recently been released by Pye Radio, Limited. In appearance it is different from any other receiver we have yet seen, as the control panel is largely occupied by an illuminated map of Europe. As each station is tuned in a small point of light appears on the map in the correct geographical position of the station. How this is achieved is, at the moment, a jealously guarded secret, but there is no doubt that this remarkable feature will become very popular among listeners in the future. Very appropriately this unique device is called "Travelight" Tuning.

This new tuning arrangement is undoubtedly unique, and makes tuning extremely simple, as it identifies immediately any programme.

Input Circuits

In this new superhet the two tuned circuits preceding the frequency changer, in conjunction with the exceptionally complete screening employed, effectively remove all traces of interference due to frequency changing. Alternative aerial tappings are available, and particular care has been taken to arrange the aerial coupling so that its efficiency is independent of the length of the aerial.

Frequency Changer

An octode valve (Ever Ready A80A) is used, functioning as an electron-coupled

frequency changer of high sensitivity and efficiency. The amplifier section of the valve has a variable-mu characteristic that is controlled by the automatic volume control.

I.F. Amplifier

A variable-mu pentode (Ever Ready A50N) is used for this, the coupling between it and the frequency changer consisting of two tuned circuits with band filter characteristics, designed to give maximum gain and adjacent channel selectivity without appreciable side-band cutting. The transformer coupling of this stage to the diode detector is of similar design. The I.F. amplifier valve is controlled by the automatic volume control. The I.F. transformers are wound in a new way that ensures a high performance and excellent band-pass characteristics. The I.F. frequency is 127 kc/s.

Variable Interference Filter

In designing a superhet, two of the most difficult problems are to obtain sufficient high note response without excessive side-band "splash" and to obtain a good signal-to-noise ratio. In this new super-

het the problem has been practically solved. A special type of audio frequency transformer is fitted, enabling a sharp filtering effect to be obtained for a frequency above a limit which is determined by the setting of the control knob. The knob also has a push-pull movement, and in the pulled-out position the low note response is reduced.

Duo-diode-triode

An Ever Ready valve is used (A23A), one diode for distortionless signal rectification, the other one for the generation of the requisite voltage for the fully delayed q.a.v.c., and the triode stage as an L.F. amplifier.

A fully delayed quiet automatic volume control is employed, with a new compensating circuit designed to remove the tendency to distortion which sometimes happens on heavily modulated passages of speech or music.

Another important feature is a device which enables the sensitivity of the receiver to be varied in a ratio of about 33 to 1, and to be pre-set for the reception of stations of any desired strength with the complete suppression of all weaker stations or background noises.

Output Stage

A power triode valve (Ever Ready S30C) is used having an anode dissipation of 19 watts. This valve introduces considerably less harmonic distortion than a pentode, and gives a much better reproduction of transient sounds.

The loud-speaker has a specially large field coil, and the response curve has as nearly a straight line as it is possible to obtain to-day in a commercial receiver, so that the reproduction of speech and music is extremely good.

This remarkable receiver, which is housed in a finely grained and figured walnut cabinet, is priced at 21 guineas. It can also be obtained for twelve monthly payments of £1 16s. 6d.



This illustration shows the attractive appearance of the new Pye console superhet (Model T.12) with Travelight tuning.



The tuning dial on the new T.12 superhet. A spot of light indicates on the map the position of the station to which the receiver is tuned.

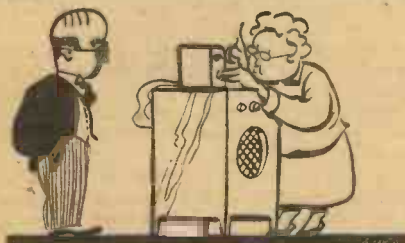
On Your Wavelength

The Romance of Short Waves

I HAVE been reading some of the interesting letters received by the Editor from builders of short-wave receivers, and it is really surprising at the results which are obtained with the simplest of apparatus. It seems that there is no country in the world which cannot be heard on even a simple one-valve set, and the list of stations which some readers send in forms a most imposing document. The subject cropped up as a result of the various references I have made in these columns to my dear and respected aunt. She had seen that I was rather peeved at her ignorance of wireless matters, and when I called round the other evening to pay my respects I was surprised, nay, even dumb-founded, to see her tinkering with a small box affair on top of her radio-gram. I walked in and was going to offer my customary salutation, when she hushed me with a "Sssh," and the next moment from the loud-speaker I was surprised to hear a Canadian station announcement, and, after some while, when she had finished tuning in various stations, she revealed the fact that she had purchased a short-wave adapter advertised in these pages and had been spending a lot of time with it. She got really remarkable results, and I must congratulate her on now passing into the realms of real radio experimenting. I hope I shall never have to refer again to her ignorance of wireless matters.

Radio Out of Place

WE have radio in the home, radio in the car, and in some hotels they are also fitting radio in the bedrooms. I thought they were going too far and were



Aunt Agatha on the short waves.

overdoing things, but when I called on my barber the other day and found that a set had been installed in his operating theatre, I thought at first, whilst I patiently waited my turn, that it was rather a good idea. But when my turn came—well, I am afraid Thermion has only been seen recently complete with hat. You will see from the artist's attempts at illustrating my poor cranium that I am not at the moment favourably bestowed by nature with hirsute adornment. The barber generally manages to make things look fairly presentable, however, but whilst he was operating upon me the well-known B.B.C. dance band came on the air, and it appears that he is a dance fan and he could not keep still. He trimmed my few hairs to the gentle rhythm of "Rhythm with my Nursery Rhymes" and the result—

By Thermion

Well, he sold me a bottle of stuff which he guarantees to repair things within a few months, but I do feel naked and ashamed when I have to take off my hat.

A Social Pest

DO you remember in the days of the silent pictures how one's pleasure was often spoiled by the person who would persist in reading out the sub-titles in a loud whisper? There are dozens of these people about who, either from ignorance, or because they want to show their knowledge, will try and let everyone else know what they know. I met one of a similar kind the other day, and, although I did once class him amongst my friends, I am afraid that it will now be a long time before I again have him round for a spot of tea and a chat. It appears that he had recently been to the cinema and had seen there a film showing the B.B.C. at work and play, and one of the features of this picture would appear to be the Effects Department. The film, so I understand (for I am not a film fan), shows how the Effects Department produces various sounds and how they are blended into the actors' parts in order to lend colour, and whilst we sat and listened to a play which I particularly wanted to hear, he would keep butting in with an explanation of how the sounds were made. It seemed that he had heard every sound which was being broadcast in this particular item and had seen exactly how they did it, and my enjoyment was entirely ruined. For instance, when the hero was supposed to be punting the heroine gently down the river we could hear the gentle plashing of the wavelets against the side of the punt and I visualised the scene on a lovely summer's day, with the birds singing and the love-light shining in their eyes, when my friend suddenly brought me abruptly to earth by saying that one of the engineers was moving his hand backwards and forwards in a bath of water. The whole illusion was ruined.

The B.B.C. and Opera

THERE is a suggestion on foot that the B.B.C. should build an opera house, but it seems that in this country opera does not have the hold on the public that it should. For years people have tried to make money out of opera, and in 1930 the B.B.C. agreed to pay the sum of £7,500 to the Covent Garden Syndicate for the privilege of broadcasting the various operas performed there. In 1931 the Government granted a subsidy of £17,000 a year, but the following year the offer was withdrawn, and the B.B.C. paid the extra sum itself. Since that date I understand that the B.B.C. has been paying nearly £30,000 a year for opera broadcasts, but now that more transmitters are going to be built and the money can be spent in other directions, the offer has been with-

drawn until a Committee can consider the whole matter. One of the questions on the agenda is: Shall there be a B.B.C. Opera House? I say "No." There is nothing more boring to my mind than the "Ride of the Valkyries," unless it is the Ride of Dick Turpin as recounted by a crooner. Some of the operas are admittedly tuneful, but there are many which are terribly dull and seem to last for days and days. And much of the enjoyment is surely ruined when these old operas are abridged in order to enable them to be broadcast during the normal listening hours.

A New Game

IT would appear that there are other uses than simply tuning to a station on your wireless set, and I have received a letter from a reader in Cornwall who writes as follows. I do not know whether he is just being funny, or whether the effect which he refers to actually occurred, but personally I think he is just having a small joke, although it seems that it is within the bounds of possibility to play tunes in the manner outlined. Here is his letter:—

"We have just bought a one stage seven valve super redundant set of the anti molo type and were listening to the programme when I grew tired of listening to stock reports and swiftly tuned the dial to 18,027 metres for the fat stock prices (I am a plumber). I found that as I revolved the dial through the range, the result of all the Foreign programs produced a tune of "Annie Laurie" and found that the speed of rotation produced different tunes. In one evening I played John Peel (16 r.p.m.), Good King Wenceslas (181 r.p.m.), Will



Radio at the barbers.

ye no come back again? (72 r.p.m.). Of course, it became tiresome to the elbow after a while (I find I have a blister on it), so my son, who is seventy-three and a budding inventor, thought of an idea which kills two stones with one bird, rod, or perch, as you might say. We have electricity here and my son has quickened up the speed of the revolution counter on the meter and harnessed it by means of wheels and cogs to the dial of the set and has got a speed indicator to control speed of revolution counter, which, as he says, gives us a varying amount of light as well as an exclusive right to crow over our less inventive friends next door. On a jazz piece we have four times as bright a light as we have when we play Finlandia Poem, when we

(Continued overleaf)

(Continued from previous page)

have to light the candle. My son has been to the patents office, but they refuse to see him. The last time he went there were two big chaps there he says with peak caps. I suppose they guard the patents. I write and tell you of this as I thought your readers might like to try and do something of the like. Of course, I know a little of wireless, but not a lot, as I am only a dockyard labourer. My son says it is advisable to set the electric switch to the off position whilst regulating the speed of the controls to obviate shocks. Of course we cannot always prevent these shocks. It was a shock which caused my son to become of an inventive turn of mind."



A social pest.

London Calling—1600

AN impression, a conjecture, a shot in the dark. . . . An Elizabethan listener sits by his wireless receiver, switching eagerly from Elizabethan National to Elizabethan Regional, from ballads to discourses, from contentions to commentaries, from commentaries back to ballads. Herbert Farjeon, the famous dramatic critic, revue writer and editor of the *Nonesuch Shakespeare*, has written and arranged from authentic sources a typical programme that might have been presented to the wireless fans of Gloriana's spacious days. He has managed to find Elizabethan parallels for many of our best known programme items—a short extract from one of Shakespeare's plays, for example, will be given presumably as representing "From the London Theatre"; the only difference being that on this occasion the producer, F. G. Blandford, will give the extract with the contemporary pronunciation, which of course differed from ours. This novel broadcast will be included in the National programme on April 15th.

Shows from the Seaside

SUMMER programmes invariably call to mind the rollicking concert party broadcasts from the seaside. These are popular both with listeners and with the artists themselves. Listeners who have not yet been on holiday can sit out of doors and hear the type of seaside entertainment that they associate with their holidays, and artists distributed round the coast of Britain can keep in touch with their listening public. Harry S. Pepper, of the B.B.C. Light Entertainment Department, is arranging to broadcast between May and August no fewer than eight concert parties from various seaside resorts in England, Scotland and Wales. Harry, who is responsible for the "White Coons" and the "Kentucky Minstrels," has a very wide knowledge of concert parties all over the British Isles. He proposes to visit as many concert parties as time will permit. It is his present intention to supervise all the relays himself, and he will be responsible for seeing that the concert parties and the B.B.C. engineers have every opportunity of displaying their skill. Before each relay he will give listeners a short history of the concert party.



Using Eliminators

SOME eliminators of the cheap type are only fitted with two H.T. + terminals, one for supplying the detector voltage of 60 to 90 volts, and the other for providing the maximum voltage of 120 to 150 volts. We receive numerous inquiries from readers concerning the use of a simple eliminator of this type for supplying a three-valve set using an S.G. or H.F. Pen. in the first stage. It is the screening grid of the S.G. valve that provides the greatest difficulty with this type of set, as the screen consumption is very low and, therefore, the terminal intended for supplying the detector cannot be used, although the voltage thereon (60 to 90 volts) would seem to be the correct value. The current consumption of the average detector is about $1\frac{1}{2}$ m.A., however, and therefore if the screen of the S.G. valve were connected to the detector terminal the voltage actually applied to the screen would be about 110 volts, which is much too high.

It is, therefore, advisable to fit an external potentiometer so that the screen voltage can be controlled to the exact value required. The potentiometer should have a value of approximately 100,000 ohms. Its end terminals should be connected to H.T. 120/150 and H.T.— of the eliminator respectively, and the centre terminal (joined internally to the moving arm) to the screening grid lead of the first valve. The correct screen voltage can then be obtained by rotating the control of the potentiometer.

Threshold Howl

THRESHOLD howl is a very annoying fault in a short-wave receiver of the straight type, as it is necessary to keep the reaction condenser near the oscillation point in order to receive distant stations. There are many possible causes for this annoying trouble. It may be due to incorrect grid potential (this is probably the most common cause), excessive detector-anode voltage, or to the use of an unsuitable detector valve. If threshold howl is experienced another detector valve should be tried, and the detector-anode voltage should be adjusted. If a remedy cannot thus be effected the detector grid-leak should be transferred from the L.T. + socket of the valve-holder to the L.T.— socket this; procedure alters the grid potential and generally effects a complete cure.

Aerial Series Condenser

ANOTHER trouble commonly experienced with the above-mentioned type of set is lack of reaction at various points on the tuning scale. These dead spots are generally due to the damping effect of the aerial, and can be eliminated in most cases by connecting a low-capacity condenser between the aerial lead and the aerial socket. This condenser should have a maximum capacity of approximately .0001 mfd., and it is desirable to choose a component of the low minimum type if the best results are to be obtained. The setting of this should be reduced until reaction can be obtained at all points on the dial.

A Pioneer is Thrilled

QUITE recently two pioneers of the "moving pictures"—Lumière and Gaumont—paid a visit to this country in connection with the fortieth anniversary of the first moving picture show to an English audience. The latter during the course of an interview paid tribute to the progress which had been made in the art of which he was one of the founders. At the same time he revealed that he had witnessed the latest Baird television developments at the Crystal Palace. He was amazed at what he saw, and was unstinting in his praise of the efforts now being made to bring television into the realm of a public service for the purposes of entertainment. He



B.B.C. and opera.

intimated his intention to come over from Paris when the first transmissions are inaugurated, and in spite of his age—he is now seventy-two—is determined to keep in touch with the new science which ultimately must be very closely allied to the film.

The Importance of Films

IT seems that Mr. Gerald Cock is determined to make good use of talking films in the forthcoming television service. In a recent interview he stated that he expects to take news pictures by a cine-camera and project them on to the appropriate scanner in the next available programme. According to the B.B.C. television director, actualities, that is news items, must inevitably play an important part in the televised programme. This seems to envisage the use of the intermediate film method and, although no official statement has been issued by the Baird Company giving the details or the types of scanners it is proposed to install in the Alexandra Palace, it is learned from the Press that an intermediate film, one spot light, and two tele-cine scanners are to be delivered by that company. If this is correct it would seem to support Mr. Cock's comments in connection with the use of films. The "bottling" of events in celluloid form and their subsequent transmission during convenient programme hours is certainly a commendable scheme. It is also stated that illustrated talks, dramatic criticisms, sporting descriptions, and educational matters will also be introduced in a similar manner, but it is to be hoped that education will not loom too largely to the suppression of light entertainment fare.

The Starting Date

IT would seem that many of the newspapers are vying with one another to guess the actual starting date of the public television transmissions from the Alexandra Palace. This is pure conjecture, for quite recently the Postmaster-General himself stated in Parliament that it was not yet possible to give an approximate date for the opening of the broadcasting service. Some time during the summer is the generally anticipated time, but it is known that tests for several weeks will have to be made before the public in any way participate in the results.

The Principles of Tuned Circuits

EVERY experimenter and constructor is well aware that even now, in the fourteenth year of British broadcasting, the over-all efficiency of any receiver depends more upon the tuned circuits employed than upon any other single part of the circuit. Selectivity, for example, is entirely governed by the design and arrangement of the coils and their associated condensers used for the aerial, radio-frequency and intermediate-frequency couplings, while sensitivity is the joint result of efficient valves and efficient tuned circuits. The importance of the last-mentioned is predominant since, in general, the sensitivity of the valves is fixed, and

In This Article the Author Discusses the Principles of Tuned Circuits, and Various Modern Coil Assemblies

indicated by the successive modifications in coil design during the early days of radio, after which the more usual arrangements and combinations used to-day can be considered.

Inductance and Capacity

It is generally understood that any circuit possessing inductance and capacity in parallel is resonant at one particular frequency, that is to say, it possesses a very high impedance at that frequency, so that if a signal of the frequency to which the circuit is resonant is applied, the voltage drop across the tuned circuit will be very high compared with the voltage drop at any other frequency. This means that if a circuit is accurately tuned to the frequency of the wanted stations, signals of that frequency will produce a bigger voltage for application to the receiving valves, than the signals from other stations.

This offers a convenient method of tuning a receiver since it is only necessary to vary the inductance or capacity, or both, to render the circuit resonant to any desired signal, and comparatively insensitive to all other signals.

Progressive Stages

In Figs. 1 to 5 are given the main stages in the successive development of tuning systems, and although, in present-day practice, a number of refinements have been introduced, the principles illustrated remain unchanged. The original tuning system

was simply a variable inductance, either tapped at intervals with a multi-contact switch, or with a sliding contact, and these are shown in Figs. 1 and 2. Although the main tuning was by varying the inductance,

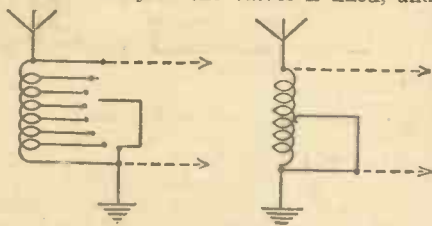


Fig. 1.—A tapped inductance tuner.

Fig. 2.—A slider type tuner.

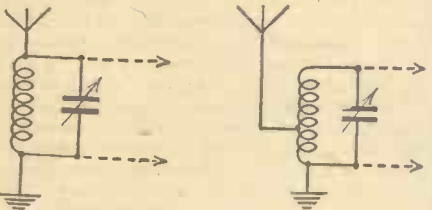


Fig. 3.—Simple coil and condenser tuner.

Fig. 4.—A tapped coil or auto-transformer tuner.

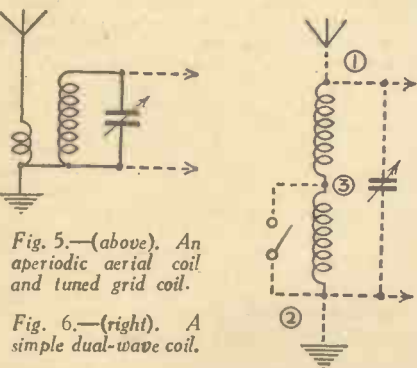


Fig. 5.—(above). An aperiodic aerial coil and tuned grid coil.

Fig. 6.—(right). A simple dual-wave coil.

beyond the control of the constructor, while his wise choice and correct use of tuned circuits is quite a variable quantity.

Inspection of the different types of coil available reveals an extremely wide range, not only in so far as form and application are concerned, but also in the number and arrangement of the various sections of the windings, and it is often a matter of bewilderment to listeners who find it a little difficult to decide which arrangement is the best for their individual needs.

A better understanding of the matter can be obtained by very briefly examining the basic principles of tuned circuits as

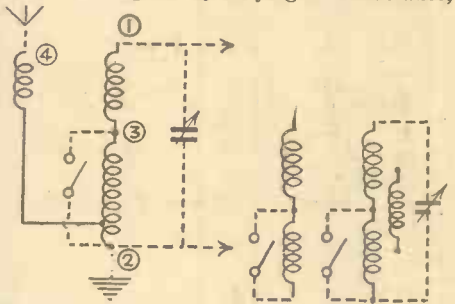


Fig. 7.—A more selective arrangement than that shown in Fig. 6.

Fig. 9.—An H.F. transformer with reaction coil.

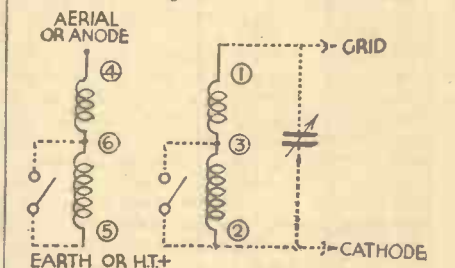


Fig. 8.—Conventional H.F. transformer for aerial or H.F. coupling.

a capacity component was, of course, essential, and this was provided by the distributed, or self-capacity of the windings. The disadvantage of these arrangements was that tuning was very "flat," that is to say, selectivity was poor. This did not matter as long as there were only one or

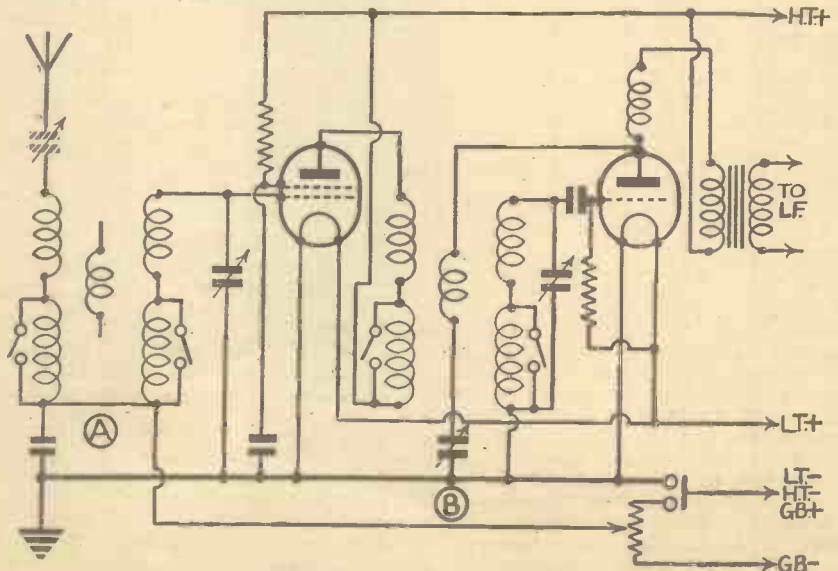


Fig. 10.—Circuit with two H.F. transformers, (a) as aerial transformer with reaction coil not employed, and (b) as H.F. coupling with reaction.

two stations receivable, but as broadcasting stations multiplied, and receivers became sufficiently sensitive to receive them, a more selective circuit was necessary.

Considerable improvement in this direction was achieved by using a coil of fixed inductance with a variable condenser in parallel as in Fig. 3, but, with the necessity of still greater selectivity, the arrangements shown in Figs. 4 and 5 were adopted in which an untuned or aperiodic coil was inductively coupled to the tuned coil. In Fig. 4 the aperiodic coil is actually a part of the main coil, the complete circuit acting as a kind of auto-transformer, while in Fig. 5 we have in effect a high-frequency transformer with untuned primary, and tuned secondary.

As each coil in conjunction with the standard size of tuning condenser could

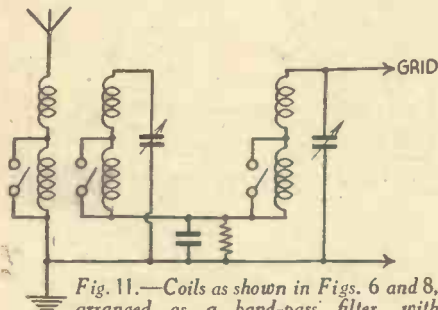


Fig. 11.—Coils as shown in Figs. 6 and 8, arranged as a band-pass filter with bottom capacity coupling.

only cover a limited range of frequencies (wavelengths), separate interchangeable coils were used for the medium and long waves, until dual range coils were introduced in which a large portion of the turns could be short circuited when receiving on the medium-wave bands.

Modern Coil Assemblies

Attention can now be turned to the modern versions of the early prototypes, and a number of typical arrangements are shown in Figs. 6 to 9.

A simple dual-wave coil is shown in Fig. 6. The tuning condenser would be connected between the ends marked 1 and 2, and with the whole coil in circuit the arrangement would cover the long-wave band. A switch connected between terminals 2 and 3 short circuits most of the winding, so that only the part of the coil between terminals 1 and 3 will then be tuned, and will cover the medium waves. A coil of this type is clearly insufficiently selective for use in a receiver having only one or two tuned circuits, but it is still good practice as a tuned anode or tuned grid coil in a set having two high-frequency stages, more particularly if a high degree of selectivity can be sacrificed in favour of high quality. This type of coil is also frequently used as one section of a band-pass filter as described later on.

In Fig. 7 is shown a form of tuning coil which can be considered a combination of

the arrangements shown in Figs. 4 and 5. Here again the connections to terminals 1, 2 and 3 are similar to those of Fig. 6, but the aerial is connected to terminal 4 and the signal is led to a tapping on the long-wave section, via a small coil inductively coupled to the medium-wave section.

The more conventional arrangement, however, is shown at 8, where the tuned coil has the usual three terminals, 1, 2 and 3, and the aperiodic coil also three terminals, 4, 5 and 6, so that wave-change switching can be carried out on both primary and secondary windings. This type of high-frequency transformer is of almost universal application and can be used both for aerial and high-frequency couplings. Although reaction is seldom necessary in a modern receiver employing high-frequency amplification, it may be very useful in the simpler types of set, particularly those having only one high-frequency stage, and standard coils frequently have an additional reaction winding as indicated in Fig. 9.

Band-pass Coupling

It will be observed that in most of these coils the primary and secondary windings are entirely independent, their lower ends not being connected together as in the simple form shown in Fig. 5. This enables the coil to be used as a true transformer in a high-frequency coupling, the primary being included in the anode circuit of the first valve and the secondary in the grid circuit of the next valve. Further, when such a coil is used as an aerial transformer, aerial and earth can be connected to the two ends of the primary winding, while the lower end of the secondary can be connected to the cathode circuit in any desired way to produce the necessary grid bias effect or coupling in a band-pass circuit. The former arrangement is exemplified in Fig. 10, in which it will be seen that while the lower end of the tuning condenser is earthed direct, that of the secondary coil is earthed via a condenser of fairly large capacity to complete the radio frequency circuit, a further connection being taken from the

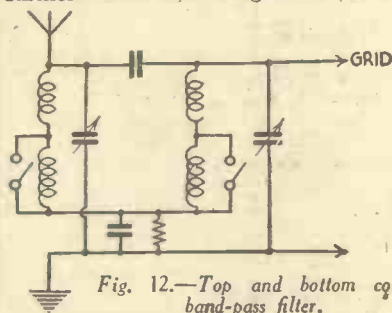


Fig. 12.—Top and bottom coupled band-pass filter.

lower end of the coil for the application of variable negative bias.

Similarly the reaction winding is not invariably connected at one end to the earth side of the coil, mainly because it is usually advisable to interpose the reaction condenser between the coil and earth, so

that the moving plates of this condenser are at earth potential, thus avoiding hand capacity.

Many modern receivers employ in one of the tuned circuits an arrangement known as a band-pass filter. This is a device intended to achieve the necessary degree of selectivity for modern ether-congested conditions while maintaining reasonable quality of reproduction. It aims at providing, instead of knife-edge tuning, a high-frequency response which is substantially constant over a band of frequencies on either side of the true station frequency, with a sharp cut-off beyond. This ensures that, at any rate within the band passed by the filter, there is no serious attenuation of the higher musical frequencies, while the band is kept sufficiently narrow to avoid serious inter-

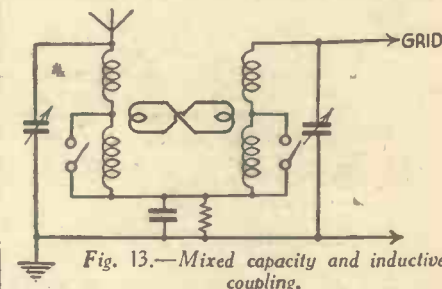


Fig. 13.—Mixed capacity and inductive coupling.

ference from neighbouring stations. A band-pass filter consists essentially of two tuned circuits, one tuned slightly above and the other slightly below the frequency of the desired station, the two circuits being coupled together in one or another of several ways.

A complete discussion of the theory of band-pass action is outside the scope of this article, but a number of typical arrangements are shown in Figs. 11 to 13. It will be seen from these that in each case they form combinations of the types of coil already described, and the diagrams themselves again show why in commercially made coils the lower ends of the various windings are left free and not connected together.

In Fig. 11 the coupling between the two tuned circuits of the band-pass arrangement is by the condenser, which is common to the two circuits. This condenser is shunted by a high resistance to permit the necessary bias on the grid of the H.F. valve. Sometimes a very small condenser is connected between the top ends of the two band-pass coils to provide a part of the coupling, and this is shown in Fig. 12, while Fig. 13 shows another variant in which a small coil coupled to the winding of the first band-pass coil is connected to a similar coil coupled with the second band-pass coil, thus forming an inductive coupling.

The number of combinations is almost endless, but those illustrated represent the most commonly used, for which standard types of commercial coils are quite well adapted.

Interesting Talks

BIRD-WATCHING is not only an intensely fascinating pastime but an important form of research that requires inexhaustible patience and, on occasion, considerable physical endurance. A series of three talks will be given on consecutive Mondays from April 13th by T. H. Harrison, who has not only studied birds all over England but whose work has taken him as far afield as Lapland, St. Kilda, the New Hebrides and Borneo (where he was the leader of the Oxford University Expedition). The aim of the

PROGRAMME NOTES

series is to demonstrate the extreme importance from a scientific point of view of bird-watching—not only by experts but by ordinary observers whose hobby it is. These investigations have a far wider significance than is, perhaps, generally realised, linking up with many other lines of thought and with the study of man himself.

Broadcasts from Russia

THE POLSKIE RADIO, The Polish Broadcasting Co., are now giving short-wave broadcasts from the station Babice, near Warsaw. These broadcasts take place from 4.30 to 5.30 p.m. London time, on Mondays, Wednesdays and Fridays.

The wavelength is 13,635 kc/s, 22 metres, and the power is 10 kW. It should be well heard in England. There will also be broadcasts in the English language.

A PAGE OF PRACTICAL HINTS

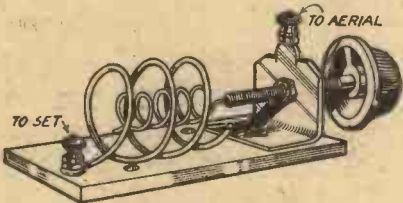
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Small-capacity Variable Condenser

THE accompanying sketch shows a device which I am using in place of the usual small-capacity condenser in the



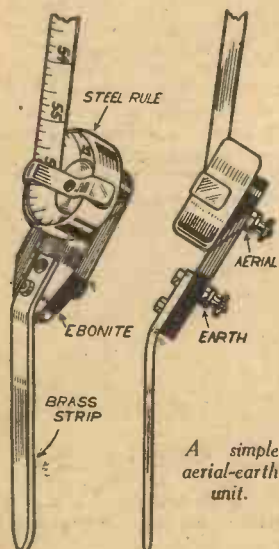
An efficient small-capacity aerial condenser.

aerial lead of my short-wave converter. I find this works excellently, and the necessary parts can be found in any junk box. It consists of two coils of thick copper wire, the coupling being made variable by means of the knob, which allows the smaller coil to enter the larger. The two coils, of course, must not touch. The sizes of the coils are 1in. x 3/4in., and 1in. x 1/2in. Other details can be seen in sketch.—A. J. PARDOE (Exeter).

An Outdoor Aerial-earth Unit

A SIMPLE aerial-earth unit, which is very useful on a short-wave club "field day," or with any set used in the open air, can be constructed as follows:—

A sixpenny six-foot steel rule of the concave-convex cup type is obtained, and the rivet passing through the centre drilled out and replaced by a 4 B.A. terminal, which is used to fix it at the top of a piece of ebonite about 4in. long. At the bottom of the ebonite is fitted a piece of brass strip, 9in. long, of the type sold for curtain valances, secured by a 4 B.A. screw, and another terminal. The strip should be



A simple aerial-earth unit.

filed to a point at the free end, and the terminals should have their heads fitted behind the ebonite. In use, the brass spike is stuck into the ground—which should be damped if it is dry—and the rule extended, whilst leads are taken from the terminals to A and E respectively on the set. If the rule is slightly tilted backwards it will remain rigid in anything

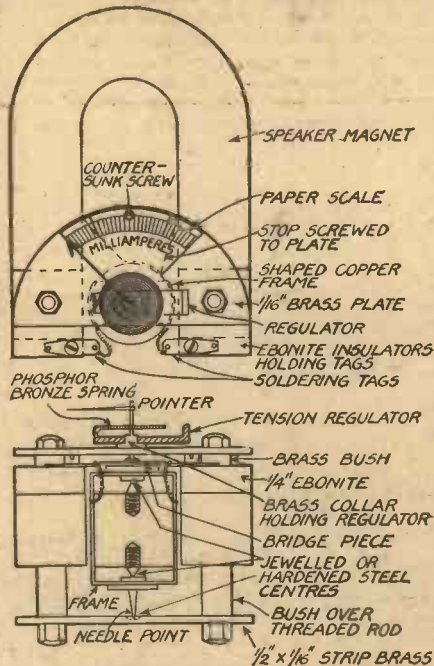
THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

but a very strong wind.—D. L. JOHNSTON (Cambridge).

A "Dead Beat" Meter from Scrap

THE accompanying diagram and data of a useful and practical measuring instrument may be of interest to other readers. The cobalt steel magnet furnishes an admirable means of controlling the moving coil, consisting of 20ft. of No. 47 s.w.g. instrument wire wound on a thin copper frame or former. This former is shaped to embrace, without touching,

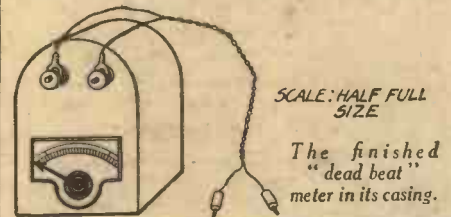


Elevation and plan of the mechanism for a "dead beat" meter.

a mild steel cylinder which is pivoted to revolve freely inside the former. The movement is beautifully even, provided the greatest care is exercised in reducing friction to a minimum. It is, of course, the copper former which gives the title of "dead beat" to the instrument. The means of introducing current into the coil is rather a delicate one, and consists of forming two spiral coils about 3/4in. in

length from two 6in. pieces of the 47 gauge wire, as used for the former. If wound on a length of 1/8in. dia. cycle spoke, this will provide about the correct tension. The enamelled ends are then bared and soldered, one end of each to the coil ends on the former, the opposite ends to the soldering tags mounted on the ebonite distance pieces bolted on the magnet poles. A phosphor bronze controlling spring will be found essential, since the steel variety is distorted by the close proximity of the concentrated magnetic field.

The temperature error of the spring



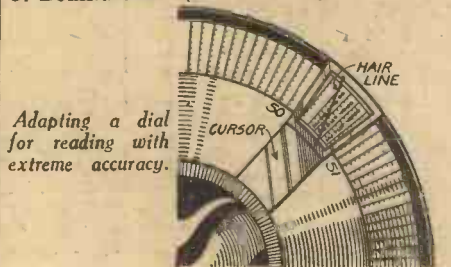
could be overcome by inserting a second wound counter clockwise, and lightly soldered to the bottom pivot needle, the effect being to balance the zero error of the first spring.

A case to hold the finished meter is suggested in the sketch, and provides an almost portable instrument, but, of course, there are a variety of ways and means of housing such an instrument.

Calibrating the instrument, and the inclusion of any resistances required by the constructor, will prolong the interest found in building this novel and inexpensive milliammeter.—J. R. G. HILL (New Cross)

A Dial with Micrometer Reading

MANY amateur radio enthusiasts have wanted a dial which can be read to a greater degree of accuracy than is obtainable with most commercial dials. The accompanying sketch shows how an ordinary flat scale and cursor can be made to read with extreme accuracy. This is accomplished by putting the hair line diagonally, so that the top of one line and the bottom of the next one is joined by it, and each line divided 0-10. As the cursor travels, the hair line will go up each line in turn, so with an ordinary 0-100 dial an accuracy of one in a thousand is obtainable at a glance. This is particularly useful for frequency meters and other apparatus requiring a high degree of accuracy.—J. BOLINGBROKE (St. Leonards).



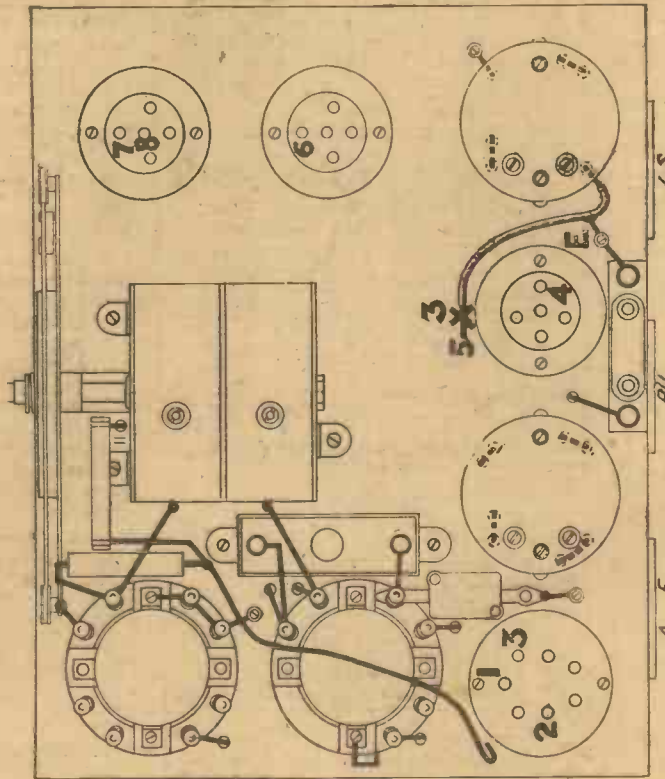
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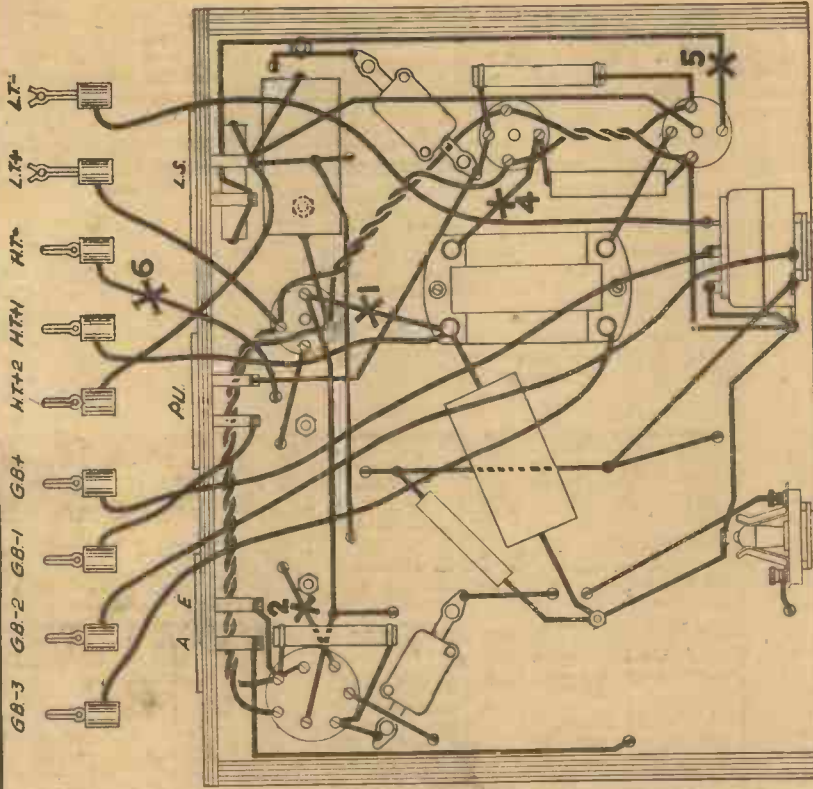
Top of Chassis View

Approximate Voltage Readings

Voltmeter	to E	= 60 volts.
"	to 1	= 60 volts.
"	to 2	= 120 volts.
"	to 3	= 60 volts.
"	to 4	= 120 volts.
"	to 5	= 60 volts.
"	to 7	= 115 volts.
"	to 8	= 120 volts.

Approximate Current Readings

Milliammeter connected at	X1=5 mA.
"	" X2=2 mA.



Underside of Chassis

Milliammeter connected at	X3=3 mA.
"	" X4=2 mA.
"	" X5=8 mA.
"	" X6=21 mA.
"	" X6

With G.B.—3 in —12 socket=15 mA.
With volume control at minimum=10 mA.

Approximate Resistance Readings

Coil BP80.

Ohmmeter across	1 and 3=2 ohms.
"	4 and 5=10 ohms.
"	5 and 6=1 1/2 ohm.

Coil BP87.	
Ohmmeter across	1 and 3=100 ohms.
"	4 and 5=3 1/2 ohms.
"	5 and 6=1 ohm.

L.F. Transformer.

Ohmmeter across G and GB=3,500 ohms.

" P and H.T.=1,250 ohms.

L.F. Transformers.

Ohmmeter connected across	G and GB=3,000 ohms.
"	" P and H.T.=3,000 ohms.



By JACE

Down to the Sea in Ships

ON April 14th, in the National programme, listeners will hear the first of a series of talks explaining how ships are run and how shipping works. In peace and war the life of the British people depends upon sea-borne commerce. The imports we consume and the exports we sell are carried in ships. It is by sea that travellers leave and come back to these islands. We have been, we are, and, in spite of progress in the air, we must remain a seafaring nation dependent upon ships. The shipping industry is, therefore, one of the most important in the country, affecting vitally with its vast needs the prosperity of every kind of trade. In this series men whose lives are spent in the industry will speak about the special problems which confront them day by day. Among the subjects to be touched upon are the Merchant Marine, Ports, Ship Designing, Manning and Handling the Ship and Life on Board, Running the Ship. In the two final talks Sir Alan Anderson, who is the Honorary President of the International Chamber of Commerce and a Director of Suez Canal Company, will describe the difficulties now facing the industry, so that listeners may understand the problems upon the solution of which the safety and existence of the whole population depend. He will discuss idle ships, surplus tonnage, foreign subsidies, the size of ships, the recruiting and training of officers and men. Speakers in this series include Sir Richard Holt, Mr. Maurice Denny, Mr. Basil Sanderson, Lord Essendon, and Mr. Leslie Runciman.

The Lucerne Plan

THE Union examined, among other questions, the functioning of the Plan of Lucerne under the severe winter conditions. It reached the conclusion that a further improvement in the situation had been obtained through the stricter application by a number of broadcasting organisations of the technical conditions prescribed for the fulfilment of the plan; but asked for a similarly strict technical application of the plan on the part of all broadcasting organisations. The Technical Commission has been asked to re-examine the difficult situation existing in the overcrowded long-wave band, and to give all possible aid towards a satisfactory solution. A request was also made to members to avail themselves of the technical means prescribed

by the Union for the control of modulation, in order to eliminate the interference difficulties due to over-modulation. Attention was also given to a new form of interaction interference, now generally termed the "Luxembourg effect." As an outcome, members have been asked to take into consideration for the future in their plans for raising the power of stations the existence of this phenomenon, and to envisage in each case the construction of transmitting aerials of a modern type such as permit of a reduction of the radiation of oblique rays.

Greater Stability

During discussions relating to the stability of the wavelengths (or frequencies) of transmitting stations, it was noted that remarkable progress had been made in the European zone, and that many stations now revealed a stability far greater than that required by the Lucerne Convention.

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International Broadcasting Union

THE International Broadcasting Union held its winter meeting at Paris recently, under the presidency of M. Maurice Rambert, Administrateur-Délégué of the Swiss Broadcasting organisation. Delegates were present from twenty-nine European national broadcasting organisations and from seven broadcasting organisations overseas. Representatives of fourteen European Administrations of Posts and Telegraphs, two members of the Direction of the Berne Bureau of International Telecommunications Union, and a representative of the League of Nations were also present as observers.

The International Broadcasting Union was welcomed to Paris by M. Georges Mandel, French Minister of Posts and Telegraphs, through the intermediary of M. Marcel Pellenc, Director of the French State broadcasting service. At the opening session the President of the Union drew attention to the highly-satisfactory growth of interest in broadcasting in Europe (including the Union of Soviet Socialist Republics), where during 1935 the number of licensed listeners had risen from approximately 23,560,000 to 27,650,000—an increase of 4,090,000 receiving sets or of about 16,000,000 potential listeners.

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THE BEGINNER AND A.V.C.

A Simple Explanation of the Function of the A.V.C. Circuit and the Reasons why it is not More Generally Adopted in Home-constructed Receivers. By W. J. DELANEY.

IMRESSED by the fact that the majority of commercial sets to-day employ the A.V.C. feature, many beginners write to us and ask how to incorporate it in their own receivers, and many also desire an explanation of the reason for its omission from the majority of receivers which are described in our pages. It is not on account of either expense or difficulty of construction that we omit to fit it to our receivers, and it is not for similar reasons that we tell the majority of querists that it would not be worth while fitting it to their receivers. When once it is appreciated how the automatic-volume control system functions, it will be seen that a particular type of circuit is needed in order to take full advantage of it, or else some subterfuge has to be incorporated in order to bring the smaller set into line with the more powerful one, and in the latter respect many complications are introduced.

What A.V.C. Does

It has already been pointed out in these pages that the term "automatic volume control" is not strictly accurate, as the system does not directly control volume. What it does do is to limit the amplification or gain of the high-frequency amplifying stages, and thus a more correct term (and one which is coming into more frequent use by technicians) is "automatic gain control." From these remarks it becomes obvious to all that to employ A.V.C. two essentials are required in the receiver, firstly, high-frequency amplifying stages and, secondly, valves of the type known as variable-mu valves. The latter, for the newcomer, may briefly be stated to be S.G. or H.F. pentode valves in which the grid-bias which may be applied can be varied over a wide range, and the variation of bias will affect the amplification of the valve. The amplification factor of the valve will be *highest* when the bias which is applied is *lowest*, and vice versa. In most mains H.F. valves of this type as much as 40 volts negative grid-bias may be employed, whilst in battery valves the bias may be as high as 16 volts with some types of valve and only 9 volts in others. Where the grid-bias is of a low value, the valve is referred to as a "short base" valve, and this obviously enables control to be effected in an automatic circuit with a lower range of signal.

In the ordinary battery receiver employing a variable-mu valve a potentiometer is connected across a grid-bias battery, and the voltage which is dropped across the potentiometer is tapped off and applied to the valve (Fig. 1). In a mains receiver, the bias is obtained by the drop in voltage across a potentiometer in the cathode circuit and acts in exactly the same manner (Fig. 3).

How A.V.C. is Applied

The real reason for the use of A.V.C. is found in the fact that in order to design a receiver to give good results on long-distance stations a very high gain or high efficiency must be employed in the H.F. stages, and thus, when the local is required, the detector or L.F. stages become hopelessly overloaded.

Thus, to obtain an automatic application of the bias it is necessary to replace the potentiometers above referred to by some voltage source which, to modify the gain of the H.F. stage with signal strength

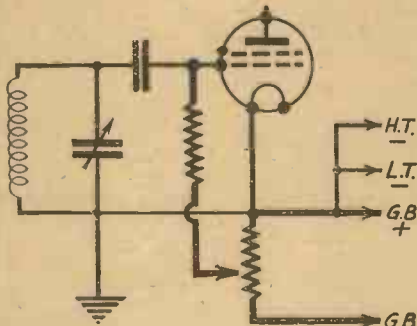


Fig. 1.—One method of employing bias control with a battery variable-mu valve.

must be obtained from the signal. In other words, if we wish to improve the H.F. gain when a weak signal is received, we must reduce the grid-bias on the H.F. stage. Then the signal itself must be used to provide the grid-bias, and this gives us our first limitation, namely, that the signal which is received by the set must be sufficiently great to apply the necessary high value of bias required by the H.F. stage to reduce amplification to such a degree that overloading does not take place.

It will be seen, therefore, that the first consideration in deciding whether A.V.C. may be fitted is the degree of H.F. ampli-

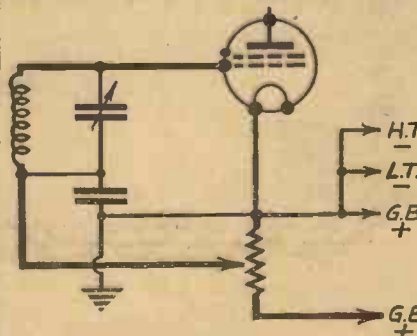


Fig. 2.—An alternative arrangement to Fig. 1, where the bias is applied through the coil instead of through the grid leak.

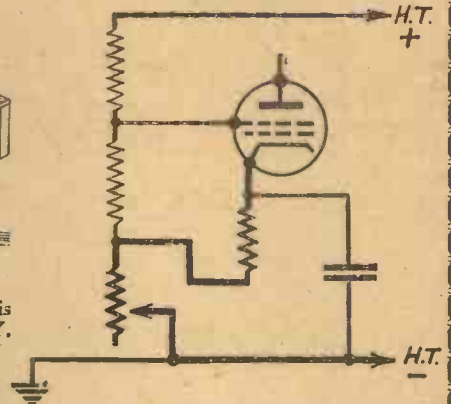


Fig. 3.—The standard variable bias circuit for a mains valve.

fication normally employed, and if only a single H.F. stage is used there is little object in using A.V.C., as the overall stage gain is so small that the receiver may be worked "full out" all the time and it is only necessary to fit a simple L.F. control to avoid too much noise from the local. As soon as a second H.F. stage is added, however, the input from the local may assume such a degree that it is essential to employ an H.F. control to avoid distortion due to overloading, and then we may consider the application of the A.V.C. circuit.

As we wish to employ the signal for the purpose, and a direct current must be employed in order to utilise the voltage drop across a resistance as previously mentioned, we must fit the A.V.C. circuit after the detector stage, that is, when the signal has been rectified. It has, of course, already been explained in these pages that the flow of a current through a resistance provides a fall in voltage, and that the voltage is proportional to the current which is flowing. (Actually it is the product of the current and the resistance.) The first component in the A.V.C. circuit is therefore a resistance, and in view of the fact that there will be variations in the voltage due to the low-frequency variations of the signal, some form of smoothing device must also be included.

A Precaution

From the above remarks it will be seen that the necessary biasing voltage may be obtained only after the H.F. stages, but that it is fed back to the input side of the receiver, and it should be understood that, in the event of the receiver being employed close to a powerful station where the signal is of such a value that it will result in a high-biasing voltage being obtained from the normal circuit, it may exceed that which could normally be used when a single H.F. valve is employed. In such a case distortion would result due to what is known as "cross modulation," and thus some steps should first be made to limit the signal from the aerial, or preferably the circuit should be modified so as to employ two or more H.F. stages.

In certain cases it is possible to increase the voltage which is obtained from the signal, and the arrangement is then referred to as "amplified A.V.C.," but this results in more complications and still demands the use of two or more H.F. stages, or sup.-het I.F. stages. The various simple methods of employing the automatic-biasing circuit will be described next week.

THE LATEST B.B.C. HIGH-POWER STATION

(Continued from page 70)

heating current to the valves are similar to those adopted at Droitwich. The filament of each of the valves in the output stage is supplied from a separate machine, thus permitting very accurate control of filament voltage.

The filaments of the modulated-amplifier valves, which are at a potential of 10,000 volts above earth in the unmodulated carrier condition, are heated by an insulated generator, the frame of which is supported on porcelain insulators and driven by a 3-phase 415-volt motor through a porcelain insulated coupling. The filaments of the modulator valves and other small valves in the transmitter are supplied by one motor-generator. The anode voltage for the low-power valves and grid-bias voltages for all valves are obtained from motor-generators situated in the machine room. With the exception of the main anode H.T. generators, all motors are started by means of automatic starters from the control table. The only switchgear provided is that for starting the synchronous motors driving the main H.T. generators. In view of the type of motor and the heavy nature of the switchgear, it was not considered advisable to use automatic switchgear.

The Building

The general plan of the building is similar to that of other B.B.C. stations. It is 262 feet long by 113 feet broad, and the average height of the elevations is 30 feet.

The roof is flat and surrounded by parapet walls. Like the floors, it is constructed of hollow pre-cast concrete beams, supported on steel beams resting, where heavy loads occur, on steel stanchions which transmit the loads to grillages in the foundations.

The heating system is of the accelerated hot-water low-pressure type. An electrical thermal-storage cylinder is employed, the water being heated in two electrode boilers which together take a maximum load of 450 kW.

On the south side of the building is a concrete reservoir with a capacity of 28,000 gallons, which provides cooling for the valves.

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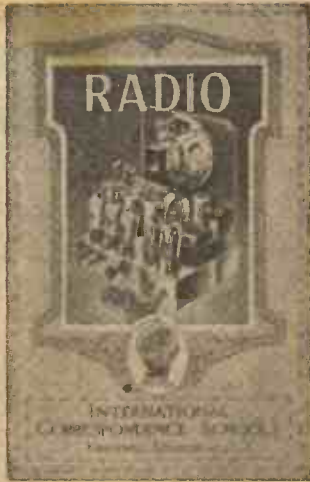
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Taking the Boom out of the Loud-speaker

GIVEN a receiver capable of faithfully reproducing frequencies from 10 to 10,000 cycles, and a good loud-speaker such as the Rola G.12, the R.K. Senior, or the W.B. Stentorian Duplex, the quality of reproduction, particularly the bass and the very high treble, is very considerably influenced by the way in which the speaker is mounted.

The first requirement is that there should be no loose joints or thin wooden panels to spoil reproduction by the introduction of rattles or resonances. Even when the baffle is stiffened with battens, the baffle should be at least 1/2 in. thick, and not less than 3ft. square. With a baffle 6ft. square and 1 in. thick mounted clear of walls and other obstructions, 50 cycle notes can be reproduced with little attenuation and without any "boom." It is generally when a speaker is mounted in a cabinet that "boom" becomes apparent, and this is caused by resonances due to the depth of the sides of the cabinet restricting the column of air enclosed in the cabinet. This air generally vibrates at a fairly low frequency, and causes "box" resonance, and woolly and boomy reproduction.

Cabinet Resonance
Another cause of "boom" is due to "cabinet" resonance caused by the sides and front of the cabinet, especially if they happen to be thin, vibrating at a fairly low frequency. Both "cabinet" resonance and "box" resonance are closely related. To remove boom, therefore, it is necessary to do two things: (1) strengthen the sides of the cabinet and baffle; (2) remove the column of air from within the cabinet or allow it absolutely free circulation. The only cure for "cabinet" resonance is to strengthen the sides in some way, or to line the cabinet with some sound-absorbing substance such as thick felt. There are several compressed paper or wood pulp materials on the market which are eminently suitable for lining a cabinet, because they not only deaden the sound, but they are also stiff enough to strengthen the sides of the cabinet, and effectively remove all but the slightest traces of "cabinet" resonance. The material should be glued on and then battened round the edges.

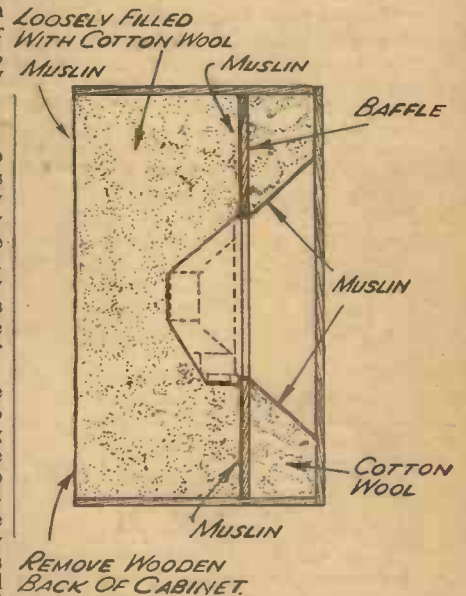
A great deal can be done towards curing "box" resonance by removing the back of the cabinet. Usually more harm than good (to the quality of reproduction at any rate) results from keeping the back of a cabinet in position, and the little extra dust that gets in through removing it is more than compensated for by the improvement in tone. An even greater improvement may be effected by cutting fairly large holes in the top and sides. This allows greater freedom of air in the cabinet, but is rather a disfigurement. The following procedure, however, while being the most effective of all, means going to rather a lot of trouble and is slightly expensive. It consists of filling up the vacant space in the cabinet, thus entirely removing the column of air which causes "box" resonance, and at the same time deadens the sides of the cabinet and stops them vibrating. Box and cabinet resonance are both removed by this method,

An Efficient Method of Eliminating Cabinet Resonance is Described in this Article

and a cabinet so treated gave a remarkable increased performance, there being no perceptible vibrations or resonances even on very loud passages. At the same time, the low frequencies were admirably reproduced, and there was absolutely no sign of "boom."

"Packing" the Cabinet

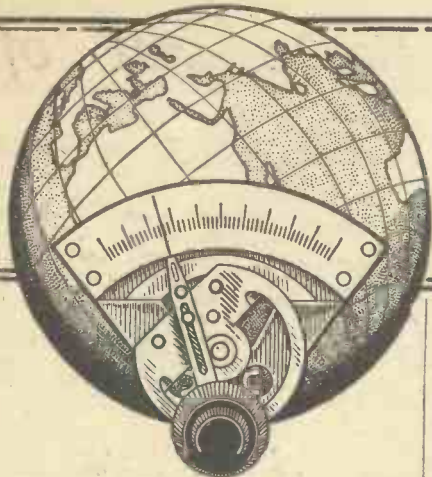
First, loosely cover the back of the speaker with muslin, tacked down at the edges of the baffle on which the speaker is mounted; fill the space between this layer of muslin and the back of the cabinet with cotton wool or "Kapok," and tack muslin across the back. "Kapok" is obtainable from most furnishing stores, but if any difficulty is experienced, flock or cotton wool may be used. In any case, whatever material is used, it must not be packed tightly. It is far better to have it too loose than too tight.



This diagram illustrates the author's remarks in this article.

Having removed the column of air from the back of the cabinet, a further improvement may be obtained by fixing the baffle 3in. or 4in. from the front of the cabinet and filling this space with cotton wool or "Kapok." In this case, however, the filling and its muslin cover are arranged to form a trumpet, the narrow end of the trumpet corresponding in size with the cone of the loud-speaker, and the wide end being arranged to agree with the loud-speaker aperture in the front of the cabinet. It may be advisable to enlarge this aperture, especially if it is circular and of a size corresponding to the cone of the speaker. What is wanted is a good size hole about 12in. to 18in. square. The accompanying sketch shows the arrangement clearly, from which it will be seen that the front of the cabinet is extended to assist in high note reproduction.

SHORT WAVE SECTION



STRAIGHT CIRCUITS FOR TEN-METRE RECEPTION

In this Article Practical Information is Given to Enable the Reader to Adapt Standard Apparatus for Ultra-short-wave Work - - - By A. W. MANN

A REVIVAL of interest in 10-metre reception is apparent generally; nevertheless, there are many short-wave experimenters who, so far as practical interest is concerned, leave this sphere of reception severely alone.

There are various reasons for this state of affairs. Some may associate ultra-short waves with complications and problems which they do not feel qualified to tackle.

The purpose of this article is to place before readers information based on practical experiments, which will enable them to break in on the ultra-short-wave bands at low cost by adapting standard apparatus to suit requirements. If results in terms of transmissions heard are regarded as satisfactory, and ultra-short waves considered to be worth while, the experimenter may consider undertaking the construction of separate super-circuit equipment to suit his own convenience.

Straight circuits usually function satisfactorily below 16 metres, but 12 metres must be regarded as a minimum, after which certain modifications are necessary in order to reach the absolute limit when using standard 16-metres-190-metres layouts.

The Circuit Diagram

Whilst the wiring and testing out of various forms of straight circuits may be interesting, the writer considers that the circuit you are familiar with is usually the best one. For example, Fig. 1 shows the theoretical circuit of a straight three-valver. This is, in fact, a modified version of the Full Range Band Spread Receiver, described in the January 12th, 1935, issue of this journal. The set has in the meantime been fitted with B.T.S. 16-190 metres four-pin type S.W. coils.

Experiments have proved that a receiver which is totally screened in a metal cabinet functions quite satisfactorily below 10 metres without a single alteration to the receiver, apart from an H.T. increase to the plate of the HR220 detector valve. This voltage increase was in the vicinity of 100 volts, which showed room for improvement. The following modifications were carried out: 3-megohm grid-leak replaced by a 2-megohm one and additional aerial connection with a .00005 mfd. pre-set condenser in series with the aerial.

Various Tests

During tests, two valves and three valves were used, but it was found that sufficient volume could be obtained on headphones with the last valve out of circuit.

Comparatively high H.T. voltages on the detector plate were still necessary, there-

fore twisted flex coupling to the aerial was tried in place of the .00005 mfd. pre-set condenser, but did not make any difference. As wiring was as short and direct as possible, further improvement in that direction was impossible. Various values of grid-leak and condenser combinations did not improve matters; neither did the incorporation of an ultra-short-wave choke, and it is apparent that the estimated efficient choking range of the 10-2,000-metre one was very conservative indeed. The original H.F. choke was quite satisfactory.

The original idea was to see if it were at all possible to receive 10-metre signals on this standard receiver without drastic alterations which would cause inconvenience when it was desired to listen on normal S.W. bands.

The Detector Stage

A high detector voltage, however, is apt to make operation difficult. Impedance, which is the resistance to the current flowing in a circuit, is a serious thing, which in the interests of efficiency must be overcome. The design, layout, and use of suitable type valves will reduce this effect to the minimum, so far as special apparatus is concerned. When, however, dual-purpose apparatus is used, a compromise is the only thing possible or to be expected.

The final experiment, therefore, was to try different types of valve as detectors, and the most suitable was a low impedance LP-220, which is, of course, a power valve. Using this as an ultra-short-wave detector under the circumstances outlined, it is possible to obtain exceedingly smooth reaction on 10 metres and below, even when using a standard S.W. aerial. This type of valve is, of course, useless as a detector on the higher wavelengths. Fortunately, our ultra-short-wave tests were carried out during a period of good reception conditions, and amongst others heard consistently was the American amateur station W9BHE on telephony.

A .0001 mfd. tuning capacity will at first sight appear to be much too large, even when used in conjunction with a slow-motion dial. It is, however, possible to tune in 10-metre signals but, at the same time it is a tricky business. The addition of a band-spreading condenser of 15 mmfd.

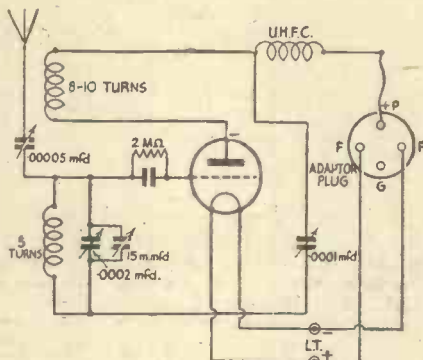


Fig. 2.—Theoretical circuit diagram of a one-valve ultra-short-wave adapter.

Taking into account that wiring throughout, including the detector stage, was as short and direct as possible, and valveholders were of low-loss construction, it was clear that layout, unsuitable detector valve, or high-impedance circuit (that is, when compared with specially-designed ultra-short-wave receivers) was at the root of things.

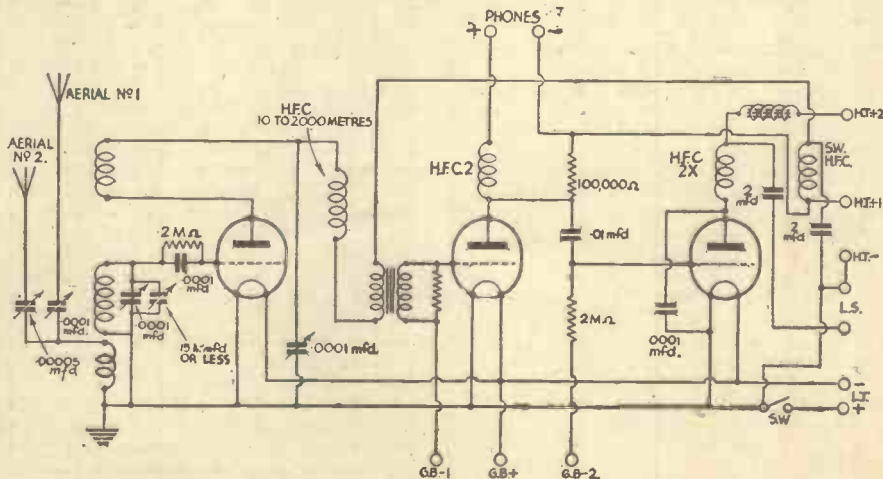


Fig. 1.—Circuit diagram of a three-valve ultra-short-wave receiver referred to in the text.

or even smaller, removes the difficulty, and such an arrangement will provide easier tuning than a slow-motion dial and .00005 mfd. tuning condenser.

The original experimental coil data is as follows:—

GRID—2 turns spaced 1/16in. 30 DCC.

REACTION—3 turns close wound 30 DCC.

Distance between windings 1/16in.

Diameter of valve base former 1½ins.

It must be admitted that circuit differences so far as individual straight short-wave receivers are concerned, will govern whether or not they tune down to 10 metres and remain stable in operation. In instances of this nature, the alternative is to build separate apparatus. This can be taken in hand at low cost, using only standard components, most of which are to be found in an amateur experimenter's workshop.

A One-valve Adapter

Straight circuit short-wave adapters are built for 16 metres-100 metres reception, using the apparatus in conjunction with standard L.F. amplifiers, so why not use ultra-short-wave adapters in a like manner? The writer has tried out the idea, and found that satisfactory reception was possible; conditions prevailing being, of course, a contributory factor relative to the measure of success achieved. Fig. 2 shows the theoretical circuit of a one-valve ultra-short-wave adapter. This is a straight regenerative circuit, which is simply the detector portion of that shown in Fig. 1 with certain modifications.

The experimenter may please himself as to the form of construction adopted in

an experimental unit of this type. The inexperienced experimenter often finds his chief bugbear to be hand-capacity effects when building standard short-wave receiving apparatus other than that of sponsored design.

Constructional Details

It is possible to build ultra-short-wave receiving apparatus on a metal or foil-lined chassis, and mount the tuning condensers directly on to a metal panel, but, so far as experimental work is concerned, is not advisable as a first attempt.

A baseboard and panel arrangement

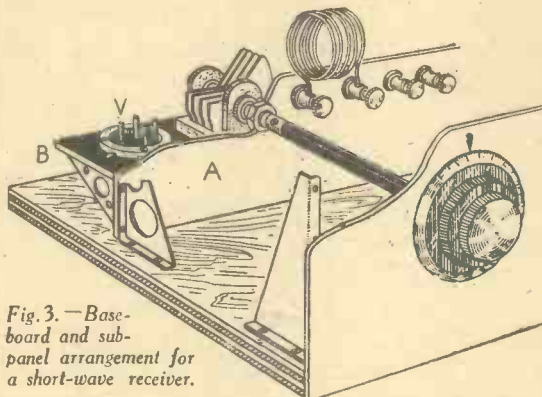


Fig. 3.—Base-board and sub-panel arrangement for a short-wave receiver.

without foil lining, and the use of condenser extension rods, is to be recommended.

Fig. 3 shows a suggested baseboard, panel, and sub-panel arrangement. A is a sub-panel which may be arranged to carry tuning and reaction condensers. If small diameter tuning dials are used,

three may be mounted on the panel and thus a band-spreading condenser may be mounted on the sub-panel A.

With an arrangement of this kind the tuning coils must be mounted on the shelf B, together with grid-leak and condenser, also valve-holder V. The H.F. choke, which should be a special U.S.W. type, is supported by the wiring.

If the experimenter wishes to use a .00005 mfd. tuning condenser and S.M. dial, four telephone-type terminals may be mounted on sub-panel A, the foil ends passing through the holes in the terminals to which the appropriate connections are made. Suitable 16-gauge copper wire, air-spaced, self-supporting coils may be made, using a short length of ¼in. diameter dowelling as a former.

When the band-spread arrangement is used with a .0001 mfd. tank condenser, the following coil data will prove useful:—

GRID—5 turns spaced 1/16in.

REACTION—8 or 10 turns spaced 1/16in.

All 16-gauge copper wire, wound on a ¼in. diameter former. Using an L.P.-220 type, or similar low impedance valve, smooth

oscillation will usually be obtained if careful attention is paid to H.T. voltage, and the setting of the .00005 mfd. pre-set aerial series condenser. Wiring should be short and direct, and aerials of harmonic relation ½ or ¼ wave will provide best results.

THERE is considerable activity all round on the short waves, and much of interest can be found by the listener at almost any hour of the day or night. Without doubt, most countries, both in the old and new continents, are anxious to install short-wave relays for the broadcast of their radio programmes overseas, and, in consequence, many new stations can be heard testing.

Although no details are yet available from official sources, on roughly 49.26 metres (6,090 kc/s), namely, between OER2 (Vienna) and GSL Daventry Empire, a station has been heard of which the call was understood to be: Radio Beograd. This would point to Belgrade (Jugo-Slavia), although, so far, no mention of the installation of a short-wave station has been made. The call and details of the programme were given out by a woman announcer.

In Cuba the short-wave broadcasting stations, which up to the present have been using amateur call signs, are now adopting a four-letter call. CO9GC, Santiago, on 48.78 metres (6,150 kc/s), which now works with a power of 2.4 kilowatts, and relays its main radio entertainments from the medium-wave studio, CMKC, is now registered as COKG. It gives its call—Santiago de Cuba—every fifteen minutes, and as interval signal broadcasts four chimes. All announcements are in Spanish and English. If you tune in just before midnight, at exactly G.M.T. 00.00 you will hear a time signal which seems to be a record of Big Ben.

Santiago de Cuba must not be confused with the other Santiago in the Dominican Republic. It would be an easy mistake to make as there exists in the latter a station

Leaves from a Short-wave Log

with the call sign HI5N, Santiago, broadcasting on the same wavelength as COKG.

Santo Domingo

It is a strange fact that coinciding with the change of name recently carried out by Santo Domingo (Dominican Republic), whereby the capital (Santo Domingo) is now known as Ciudad de Trujillo, broadcasts from "Trujillo City" and from other parts of the Island have been more frequently logged during the past two weeks than for many months back. As, so far, I have not seen a published list of the ever-growing number of transmitters springing up in the Dominican Republic, a short review of the principal ones may prove useful to searchers. To facilitate matters, they are given in order of wavelength. HI1J, at San Pedro de Macoris, on 41.15 metres (7,290 kc/s), works daily from G.M.T. 17.10-18.40, and again from 23.40-01.40, on weekdays; on Sundays from 01.40-02.40 only. It closes down with that popular melody: "All I do is Dream of You." HI3C, at La Romana, operates on 43.48 metres (6,900 kc/s), at roughly the same time (17.00-19.00; 22.00-02.00). HIH, also at San Pedro de Macoris, on 44 metres (6,818 kc/s), is usually on the air between midnight and 02.00, and you may hear the call phonetically rendered as: *Radiodifusora Achay-ee-achay, La Voz del Higuano*. HIT, at Trujillo City, would

appear to be a newcomer; its channel is 45.25 metres (6,630 kc/s); broadcasts daily from G.M.T. 23.00-01.00, and makes it clear in its call that it is *La Voz de la Victor R.C.A. en Ciudad de Trujillo*. On 45.73 metres (6,560 kc/s) we find another station in that city (HI4D), *La Voz de Quisqueya* with an interval signal siren; with the exception of Sundays, when no transmission is made, the daily schedule is: G.M.T. 21.40-00.40 (Quisqueya, by the way, is the native name of the Island of Santo Domingo). Again, in the capital, a further station, HIL, advertises broadcasts on 46.04 metres (6,518 kc/s) from midnight to 02.00 daily, also HI2W, 46.5 metres (6,542 kc/s), and HI4U, *La Voz de la Marina*, which uses the same channel.

Wavelength Alterations

Here are a few alterations in wavelengths, or schedules to be noted:—

XEME, Merida, Yucatan, Mexico, which was working on 37.04 metres (8,100 kc/s), has lowered its wavelength to 36.63 metres (8,190 kc/s). Daily relays are made of the XEFC medium-wave station at G.M.T. 15.00-18.00, and from G.M.T. 23.00-04.00. All announcements are preceded by chimes and a blast on a siren. The call XEME would be heard as: *Ay-kis-ay-emmay-ay*, that of XEFC: *Ay-kis-ay-effay-say*. Merida is pronounced: *May-rec-da*, and Mexico: *May-hecco*.

HP5J, Panama City, previously on 31.28 metres (9,590 kc/s) has moved to 31.22 metres (9,610 kc/s), not a big change perhaps, but enough to clear it from a busy corner. The latest schedule given is: daily G.M.T. 00.00-03.30, and on Sundays from 20.00-21.00.

OUR FREE CATALOGUE SERVICE

CLIX ACCESSORIES

In a neat illustrated folder just issued by Lectrolinx, Ltd., particulars are given of the new Clix plugs and sockets for use with mains sets. The pins in the Clix plug are of special design which allows of a positive fit in varying socket diameters and centres. The wire strands are securely held in a vice-like grip. The popular "M" type 5-amp. 2-pin plug, which incorporates a patent ratchet lock for the cover is used by many of the leading manufacturers of radio sets. Another line included in the folder are 6-amp. plugs and adaptors. Copies of the folder can be obtained on application.

RADIO AS A CAREER

In a well-printed booklet issued by the Technical and Commercial Radio College, Cromwell House, High Holborn, London, W.C.1, particulars are given of a method of specialised correspondence training whereby the student can study in the privacy of his own home. No matter whether you are engaged in the radio industry, or are only interested in radio solely as a hobby, you will find the contents of this booklet of interest. There is a range of courses including a technical course, and a complete technical, service, and commercial course. These courses, which cover a wide field and embrace all phases of radio technique, are designed to give the student a thorough knowledge of radio, and to teach him how to apply his knowledge to practical money-earning advantage. The fees are moderate, and they can be paid in monthly instalments if the student so desires. The principal of the T. and C.R. College is Mr. R. Heath Bradley.

MARCONIPHONE RECEIVERS

An attractive brochure, recently issued by the Marconiphone Company, gives particulars of a fine range of receivers and radiograms. The Mar-

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coniphone, model 292 is a luxury auto-radiogram with silent-speed tuning, variable selectivity, and multi-functional speaker. In fact, every desirable refinement is embodied in this handsome instrument which is priced at 52

guineas. Other radiograms in the series range from 16 guineas to 33 guineas. In the receiver section there is a table model, six-valve all-wave superhet for A.C. mains. This set (No. 345), which is particularly simple to install and operate, is provided with delayed A.V.C. and vernier-controlled tuning. Another table model (No. 219) is a five-valve superhet for A.C. mains, and is provided with a floodlit-tuning scale and visual tuning indicator. These models are priced at 17½ guineas and 12½ guineas respectively. Several battery receivers, console models, and the Marconiphone six-valve 12-volt car radio equipment are also shown in this well-illustrated brochure.

COSSOR SUPERHET (MODEL 376B)

PARTICULARS of this remarkable receiver are given in a folder recently issued by A. C. Cossor, Ltd. Designed for battery operation, many of the latest refinements are incorporated in this seven-stage superhet model, including a compensated anti-fading circuit, pentagrid-frequency changer, variable-mu pentode, I.F. amplifier and moving-coil speaker matched to the Class "B" output stage. The receiver is housed in a handsome inlaid walnut cabinet with plenty of space for an accumulator and high-tension battery. Plugs and sockets for an extension speaker and terminals for pick-up are provided. The complete receiver is priced at £9 19s., and if desired it may be obtained on exceptionally easy Hire Purchase Terms, namely 17s. deposit and 12 monthly payments of 17s., or 40s. deposit and 12 monthly payments of 15s.

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

THE CROYDON RADIO SOCIETY

MR. P. K. TURNER added to the high-quality reproduction programmes of the Croydon Radio Society on Tuesday, when he submitted "Hartley Turner Reproduction" in St. Peter's Hall, Ledbury Road, S. Croydon. His first point of interest was his new gramophone amplifier, and in designing it the essentials had been cheapness, compactness, and robustness. Members carefully followed the circuit, as parts in it which made or marred good reproduction were dealt with. For instance, the output transformer was very important, and this was, of course, the problem of how its leakage affected results. Nor was the coupling unit and its intervalve transformer forgotten. Of special interest among many features was the radio-frequency air-core choke to boost bass a little. Mr. Turner found time for a few remarks on the Piezo pick-up, and said he liked such a design because of its large output and it lent itself to easy control of bass. These points and others were brought out in the demonstration. Question time proved rather hectic, for there were many questions and arguments to ventilate, and the meeting closed with the thought that much had been learnt about high-quality reproduction that evening. Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

THE RADIO PHYSICAL AND TELEVISION SOCIETY

THIS society recently had the pleasure of a lecture by Mr. G. Parr, entitled "Cathode-ray Tubes and their Application to Television and Radio," in which he gave much essential data on the new technique involved in the C.R. tube. The construction and the working of a C.R. tube was fully explained with the aid of lantern slides. Various curves and figures caused by varying the operating conditions of the tube were illustrated, and with the aid of an oscillograph the effects were still further illustrated. The methods of analysing the wave forms produced by radio apparatus, with the aid of a C.R. tube, were demonstrated by the lecturer, who had an oscillograph for the purpose. The wave forms produced by the human voice were amusingly demonstrated, a microphone being connected to the oscillograph via an amplifier, which enabled members to see as well as hear the lecturer's voice.

Mr. Parr finally discussed the subject of Television, and showed by slides some interesting pictures of 30 and 180-line transmissions, while the impending transmissions were fully discussed. It was the opinion of many, he said, that the coming definition of 240 lines was rather excessive for a start, and it would increase our difficulties considerably.

We welcome any readers of PRACTICAL AND AMATEUR WIRELESS to our next meeting, at which Mr. Menage, of R. A. Rothwell Ltd., is giving a lecture with demonstrations, entitled "Piezo Electricity." This meeting will be at 8 p.m. on Friday, April 3rd, at

72a, North End Road (off Talgarth Road), West Kensington. Those requiring more particulars are requested to write to the Hon. Sec., M. E. Arnold, 12, Nassau Road, Barnes, S.W.13.


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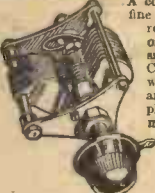
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400 WATT BAXLISS 110/420 v. 50 cycles 26 output taps for 100/400 volts. 50/-

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500 WATT WESTON 230 volts to 50 volts 5 amps. 35/-

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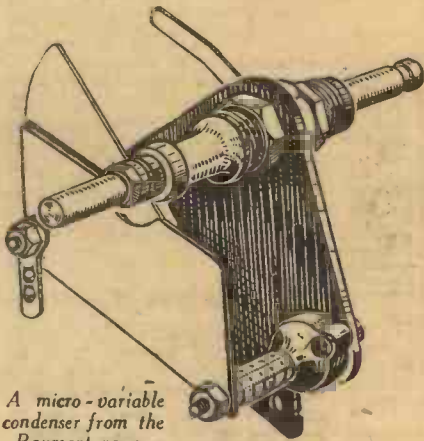
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Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

Micro-variable Condensers

FOR use in bandsread circuits and for neutralising in transmitting circuits and other experimental equipment a very small capacity variable condenser is essential. There are, however, a number of small points in the design of such a condenser which must be considered if a high standard of efficiency is to be obtained. The condenser illustrated below is a 15 mmfd. condenser taken from the



A micro-variable condenser from the Raymart range.

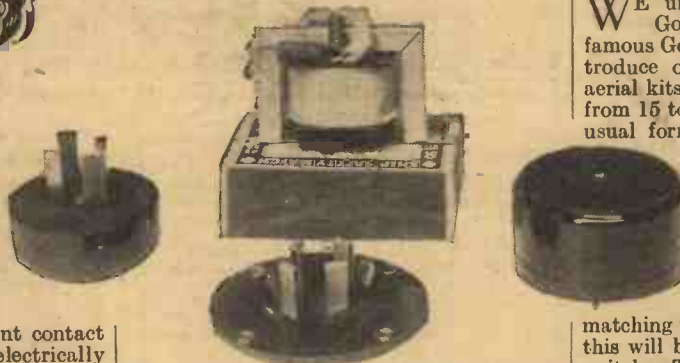
Raymart range, and it is provided with substantial fixing pillars to ensure constancy of capacity, whilst the rotor is provided with ball bearings to provide smooth action and freedom from side-play. To ensure that the electrical efficiency is maintained, and to avoid the risk of noises due to intermittent contact by the bearings, these are electrically short-circuited, and thus the condenser may be employed on the ultra-short waves without the slightest difficulty. The condenser costs 1s., and is also obtainable in a larger capacity (40 mmfd.), price 1s. 6d.

New Bulgin Lines

A GROUP of some interesting Bulgin components is shown above, and these include the new flat-pin wall extension plugs and sockets and a special midget microphone transformer. The former components are designed for use as loud-speaker extension points, etc., and they conform to the Radio Component Manufacturers' Federation standards as regards electrical characteristics. They may be obtained in two-pole, three-pole, or four-pole types, and the component on the right of the group is the type P.80 wall socket, provided with a moulded bakelite case and four very thin slots on the upper surface into which the flat plug shown on the left (type P.81) fits. It is thus impossible to plug in a standard electrical plug, in which round pins are fitted, and therefore no accidents can arise due to misuse. Internal terminals are provided in the socket for connection with the extension or other leads, and these may be taken into the socket either from the rear

or from one side, for which purpose the case is slotted. The plug is provided with internal terminals and means for cord gripping, and the leads are taken in at the side through the slot which may be seen, thus avoiding strain on the cords and removing the risk of the user pulling out the plug by means of the flex. A chassis-type socket is also obtainable for use on the receiver and this is provided with special resilient contacts, and the bakelite disc is built up to avoid bare contact tips and thus removes risk of shock. The price of this component is 1s., whilst the plug costs 1s. 3d. The wall socket, type P.80, costs 1s. 6d. Similar models are available with two or three pins.

The microphone transformer, which is an extremely small component, as may be seen by its comparison with an ordinary matchbox upon which it is standing, has a centre-tapped primary winding and an overall ratio of 1 to 35. The tapped primary is designed for use with two microphone buttons in push-pull, and a current up to 30 mA may be passed through the primary in this type of circuit, or 50 mA if only



A midget microphone transformer and some wall plugs for extension speaker leads, etc., manufactured by Messrs. Bulgin.

one half of the primary is employed. The price of this component is 5s.

Hycap Batteries

WE mentioned last week that some new model accumulators had been introduced by the Exide company for use in receivers requiring a higher current rating than is normally safe with the "mass" type batteries usually employed. The illustration on this page shows one of these new batteries, from which it will be seen that the thickness of the plates has been decreased and, in addition, many more plates are fitted. The batteries are slightly dearer than the mass-type cell, and may be obtained in the following types and prices:—



The new Exide Hycap battery showing the plate assembly.

- OCG3-C. 2-volts, 15 ampere hours (20 hour rate). Dimensions: 3½ in. W. x 3 in. L. x 6½ in. H. Price: 8s. 6d.
 GFG4-C. 2-volts, 24 ampere hours (20 hour rate). Dimensions: 3½ in. W. x 3½ in. L. x 7½ in. H. Price: 10s. 6d.
 GKG5-C. 2-volts, 36 ampere hours (20 hour rate). Dimensions: 3½ in. W. x 3½ in. L. x 7½ in. H. Price: 12s. 6d.
 CZG6-C. 2-volts, 60 ampere hours (20 hour rate). Dimensions: 5 in. W. x 4½ in. L. x 8 in. H. Price: 15s. 6d.

Lissen Luxfilter

MANY listeners experience difficulty in cutting out the Droitwich station when listening to stations on the long-wave band, and in most circuits the inclusion of a "wave-trap" device in the aerial lead is all that is necessary to restrict this station to a narrow band and thus give freedom from interference. There are already two or three such filters on the market, and the latest addition to the range is the Lissen Luxfilter. Although designed primarily for the Lissen receivers, it will function equally satisfactorily on practically any receiver, and it will be found that in most cases it may be left permanently connected, although in some receivers a slight reduction in signal strength will be experienced on the Droitwich station. However, it is a simple-matter to cut out the filter by removing the plug at the top or, if desired, a switch could be fitted for the purpose. The price is 5s.

Goltone All-wave Aerial Kit

WE understand that Messrs. Ward & Goldstone, manufacturers of the famous Goltone products, are shortly to introduce one of the now-popular all-wave aerial kits designed for use on wavelengths from 15 to 2,000 metres. This will take the usual form of a double aerial with twin feeder leads and highly-efficient insulators. The latter will be of the "Pyrex" material, and the double aerials will be 30 feet in length, and the feeder cable 50 feet. To enable the equipment to be used with any type of receiver, a special impedance matching transformer is to be supplied, and this will be fitted with a special 3-position switch. The equipment will be completed by stand-off insulators, staples and similar sundries for its complete installation. Further details and prices will be given later.

LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.



All letters must be accompanied by the name and address of the sender (not necessarily for publication).

American Stations

SIR,—In reference to the letter from D. C. Locke (Thorney) in the March 7th issue, I have been receiving W2BSD for some weeks now.

This station is a 1 kw. station, 14,470 kc. (20.73 m.). Call sign is given in five languages by an electrical recording, followed by: "All letters sent to this address will be answered."

This station is on the air every night from 7 p.m. G.M.T., except Saturdays and Sundays, and most nights is an R5-7 signal on the speaker.

My set is a simple 2-valve home-made battery set (o-v-1), with no special short-wave components. Condensers are "cut-downs," and home-made coils, etc., are used.

Your correspondent made one mistake, of which you are no doubt aware. His VQ for Johannesburg should have been "ZEE"U.

I fell into the "Zee" trap myself over W1AJZ and logged him for weeks as WIHAC, until I heard him spell his call-sign letters out one night.

I enclose my log of 20-metre transatlantic amateurs (all telephony) received during the past month:

U.S.A.—W1HCM, W1AJZ, W1UK, W1HYG, W1HHQ, W1CPB, W1IKB, W1HVF, W2BSD, W2AN, W2HAU, W2ELO, W2GDU, W2FLO, W2CBO, W3EOZ, W3DCP, W3BIN, W3DHY, W3BOF, W3CM, W4COT (Miami).

Canada.—VE2CA (Quebec), VE1AW, VE3OX (Niagara Falls), VE1DC.

Newfoundland.—VO1L.

Cuba.—CO6OM.

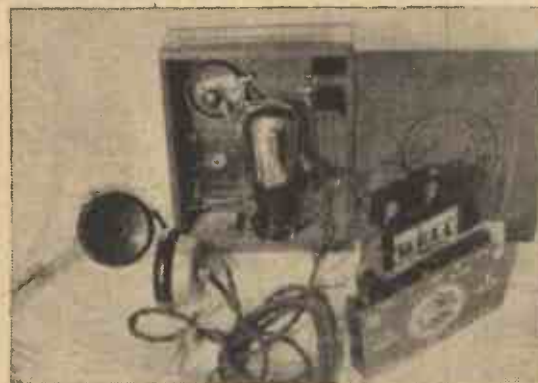
All the above were R5 on 'phones. Aerial 75ft. inverted L, 30ft. high.—H. PEARSON (Stechford, Birmingham, 9).

A Good Log from Staffordshire

SIR,—I have seen in your excellent paper during the last few weeks some excellent logs of amateur stations. Well, here is mine, which I hope will be of interest to other readers.

On 28 mc. since last December I have received over 200 different amateurs and broadcast stations. All received on a 2-valve super-regenerative receiver, using

W2XEM, Newark police; W8XAI, relay of WHAM, Rochester; OH7NC, OH7ND, W2HPS, WIZE, W2AOG, W3AIR, W6IRX, VE2EE, VE3ER, IAF, IAG, CN8MQ, HJO (harmonic), WIDZE and W8MWL. About 90 per cent. of the reception has been carried out on Saturday and Sunday afternoons. The aerial until recently was an eight-foot length of 1/2 in. copper tube, fixed vertically about a yard from house, and the bottom end at about 10ft. from the ground. The aerial in use



A one-valve portable set made by a reader, Mr. N. D. Houghton.

now is a 70ft. top aerial with 30ft. lead-in, 20ft. high (lead-in connected to centre). The receiver is a combined det.-super-regenerative, with one L.F. stage, battery driven.

I believe that most of the signals from Germany, Spain, Czechoslovakia, Poland, and France have been harmonics, but the others have been definitely direct transmissions.—DONALD ROCK (Old Hill, Staffs.).

Two Masterpieces

SIR,—I feel that I must write to thank you for the assistance your two books, "The Wireless Constructor's Encyclopaedia" and "Fifty Tested Wireless Circuits" have given me.

I was first bitten by the wireless "bug" when crystal sets were the order of the day, and I have remained an enthusiast ever

pædia proves its worth. When I meet with some little point that I cannot fully grasp, instead of asking my tutor for assistance, as I am fully entitled to do, I grab your book, turn up the subject required, and enlightenment immediately follows.

Thanking you once again for two really fine books.—DONALD T. KEAN (Bream, Glos.).

Our One-valve Portable

SIR,—I have recently constructed the one-valve portable as described in the December 7th issue of PRACTICAL AND AMATEUR WIRELESS. The results obtained have been excellent; very strong signals have been received from the National and Regional, and also some foreign stations after dark.

I have been using 9 volts H.T., and the valve used takes one-fifth of an mA! The pentode I purchased cost 5s., and was advertised in your miscellaneous advt. columns.

As hand-capacity caused queer effects, I had to fit extension rods, consisting of wooden knitting needles, to both tuning and reaction dials. This is quite effective, and also makes the tuning, which is very critical, much easier.—N. D. HOUGHTON (London, N.W.).

Back Numbers Wanted

SIR,—Having failed to obtain a copy of *Amateur Wireless*, dated October 27th, 1934, from the publishers, I would be very grateful if any reader would loan me one.—J. DUNN (Cardenden, Fife).

SIR,—I should be pleased if any reader could loan me the back numbers of PRACTICAL WIRELESS dated 25-2-'33 and 24-11-'34. I will return same in one week in same condition as I receive them, and will pay postage both ways.—G. H. GREEN, (67, Petley Road, London, W.6).

CUT THIS OUT EACH WEEK.

Do you know

—THAT a leading-in wire should not be permitted to pass close to the batteries in a battery-operated receiver in view of the risk of losses on a weak signal.

—THAT the impedance of an iron-cored inductance varies with the frequency of the A.C. which is applied to it.

—THAT an S.G. valve may often be plugged into a four-pin detector stage valveholder without modification of the circuit for test purposes.

—THAT in the above arrangement the screening grid would, of course, act as the anode.

—THAT the anode of the oscillator section of a pentagrid valve is not of the solid plate type.

—THAT at least one super-power valve now on the market employs an anode of the mesh type.

—THAT the condensers used in decoupling circuits should always be of the non-inductive type.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newman, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

List of more consistent stations:—

CN8MQ	WIDZE	W2PT	W6GCX	W8DUC	VE3ER
IAG	WIDF	W2DC	W8MWL	W9BCR	VE3AEL
IAF	W1AF	W2EMP	W8ANN	W9EF	W9CJI
OH7NC	W1CBZ	W2BLX	W8ANQ	W9LD	W9XCH
OH7ND	W1CMX	W2BN	W8FYC	W9FDO	W3BSY
OH7NF	W1APL	W3DBX	W8KH	W9BHT	W8JFC
OK1BC	W1CPV	W3KT	W8IFO	W9BPU	VE1BC
G2NV	W2HFS	W3EPR	W8MAH	W9FD	W8XA1
SP1LM	W2BLL	W3BPH	W8AGU	W9ASH	W8XWJ
HJO	W2AOG	W4MR	W3AIR	W9CYT	W9XAZ
W1ZE	W2AWF	W4H	W8CRA	W9ABN	W1ZD
W1GBE	W2BCR	W6IRX	W8KTV	VE2EE	
D4GYP	RTD (harmonic)	W1WV	WDC	WAT	Harmonics of commercial
D4RVC	NSS (commercial)	W9FLH	W8LUQ	WQP	
D4QET	W2GOQ	W8LUQ	HJO	WDU	
ON4LX	W1AW				

a loud-speaker. In no case have the headphones been used on this band at all. The log includes stations in U.S.A., Canada, Italy, France, Germany, Czechoslovakia, Finland, Morocco, Colombia, Spain, and England. The most consistent have been

since. Now, being unemployed, I am studying hard at the subject, under the guidance of a well-known correspondence school, in the hope of getting a job connected with radio.

It is when studying that your encyclo-

Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS.

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.

	Date of Issue.	No. of Blueprint
All-Wave Unipen (pentode) ..	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen) ..	11.8.34	PW36D
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (trans.)) ..	—	PW10
Sixty-Shilling Three (D, 2 LF (R.C. & trans.)) ..	2.12.33	PW34A
Leader Three (SG, D, Pow.) ..	PW35	
Summit Three (HF Pen, D, Pen) ..	18.8.34	PW37
All-Pentode Three (HF Pen, D (pen), Pen) ..	22.9.34	PW39
Hall-Mark Three (SG, D, Pow.) ..	—	PW41
Hall-Mark Cadet (D, L.F. Pen (R.C.)) ..	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (pen), Pen) (All-wave Three) ..	13.4.35	PW49
Genet Midget (D, 2 LF (trans.)) ..	June '35	PM1
Camco Midget Three (D, 2 LF (trans.)) ..	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) ..	17.8.35	PW53
Battery All-wave Three (D, 2 LF (R.C.)) ..	31.8.35	PW55
The Monitor (HF Pen, D, Pen) ..	8.2.36	PW61
The Tutor Three (HF Pen, D, Pen) ..	21.3.36	PW62
The Centaur Three (SG, D, P) ..	7.12.35	PW64

Four-valve : Blueprints, 1s. each.

Fury Four (2 SG, D, Pen) ..	—	PW11
Beta Universal Four (SG, D, LF, Cl. B) ..	15.4.33	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B) ..	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen) ..	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull) ..	—	PW46
F. J. Camm's Superformer (SG, Sg, D, Pen) ..	12.10.35	PW57

Mains Operated

Two-valve : Blueprints, 1s. each.

A.C. Twin (D (pen), Pen) ..	—	PW18
A.C./D.C. Two (SG, Power) ..	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow.) ..	—	PW19

Three-valve : Blueprints, 1s. each.

Double-Diode-Triode Three (HF Pen, D.D.T., Pen) ..	10.6.33	PW23
D.C. Ace (SG, D, Pen) ..	15.7.33	PW25
A.C. Three (SG, D, Pen) ..	16.9.33	PW29
A.C. Leader (HF Pen, D, Power) ..	7.4.34	PW35C
D.C. Promier (HF Pen, D, Pen) ..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen) ..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen) ..	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) ..	11.5.35	PW50
"Allwave" A.C. Three (D, 2LF (R.C.)) ..	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) ..	31.8.35	PW56

Four-valve : Blueprints, 1s. each.

A.C. Fury Four (SG, SG, D, Pen) ..	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen) ..	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull) ..	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull) ..	9.2.35	PW47

SUPERHETS.

Battery Sets : Blueprints, 1s. each.

£5 Superhet (Three valve) ..	—	PW40
F. J. Camm's 2-valve superhet (two valve) ..	13.7.35	PW52
F. J. Camm's £4 Superhet 4 ..	10.11.35	PW58
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (three valve) ..	—	PW43
D.C. £5 Superhet (three valve) ..	1.12.34	PW42
Universal £5 Superhet (three valve) ..	—	PW44
F. J. Camm's A.C. £4 Superhet 4 ..	7.12.35	PW59
F. J. Camm's Universal £4 Superhet 4 ..	11.1.36	PW60

SHORT-WAVE SETS.

Two-valve : Blueprints, 1s. each.

Midget Short-wave Two (D, Pen) ..	15.9.34	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Power) ..	28.9.33	PW30A
The Perfect 3 (D, 2 LF, RC and Trans.) ..	8.2.33	PW63

PORTABLES.

Four-valve : Blueprints, 1s. each.
Featherweight Portable Four (SG, D, LF, Cl. B) .. — PW12

MISCELLANEOUS.

S.W. Converter-Adapter (1 valve) 23.2.35 PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.
Four-station Crystal Set .. — AW427
1934 Crystal Set .. — AW444
150-mile Crystal Set .. — AW450

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.
B.B.C. Special One-valver .. — AW387
Twenty-station Loud-speaker One-valver (Class B) .. — AW449

Two-valve : Blueprints, 1s. each.
Melody Ranger Two (D, Trans.) .. — AW388
Full-volume Two (SG, Det, Pen) .. — AW392
Iron-core Two (D, Trans.) .. — AW395
Iron-core Two (D, Q.P.P.) .. 12.8.33 AW396
B.B.C. National Two with Lucerne Coll (D, Trans.) .. — AW377A
Big-power Melody Two with Lucerne Coll (SG, Trans) .. — AW338A
Lucerne Minor (D, Pen) .. — AW420

Three-valve : Blueprints, 1s. each.

Class-B Three (D, Trans, Class B) 22.4.33 AW386
New Britain's Favourite Three (D, Trans, Class B) 15.7.33 AW394
Home-Built Coll Three (SG, D, Trans) — AW404
Fan and Family Three (D, Trans, Class B) 25.11.33 AW410
£5 5s. S.G.3 (SG, D, Trans) 2.12.33 AW412
1934 Ether Searcher : Baseboard Model (SG, D, Pen) 20.1.34 AW417
1934 Ether Searcher : Chassis Model (SG, D, Pen) — AW410
Lucerne Ranger (SG, D, Trans) .. — AW422
Cossor Melody Maker with Lucerne Coils .. — AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans) .. — AW337A
Mullard Master Three with Lucerne Coils .. — AW424
£5 5s. Three : De Luxe Version (SG, D, Trans) 19.5.34 AW435
Lucerne Straight Three (D, RC, Trans) .. — AW437
All Britain Three (HF Pen, D, Pen) "Wireless League" Three (HF Pen, D, Pen) 3.11.34 AW451
Transportable Three (SG, D, Pen) £6 6s. Radiogram (D, RC, Trans) — WM271
Simple tune Three (SG, D, Pen) .. June '33 WM318
Economy-pentode Three (SG, D, Pen) .. Oct. '33 WM327
"W.M." 1934 Standard Three (SG, D, Pen) .. — WM337
£3 3s. Three (SG, D, Trans) .. Mar. '34 WM351
Iron-core Band-pass Three (SG, D, QP21) .. June '34 WM354
1935 £5 6s. Battery Three (SG, D, Pen) .. — WM362
Graduating to a Low-frequency Stage (D, 2LF) .. — WM371
P.T.P. Three (Pen, D, Pen) .. June '35 WM378
Certainty Three (SG, D, Pen) .. Sept. '35 WM389
Minute Three (SG, D, Trans) .. Oct. '35 WM393
All-wave Winning Three (SG, D, Pen) .. Dec. '35 WM396

Four-valve : Blueprints, 1s. 6d. each.

65/- Four (SG, D, RC, Trans) .. — AW370
"A.W." Ideal Four (2SG, D, Pen) 16.9.33 AW402
2 H.F. Four (2SG, D, Pen) .. — AW421
Crusaders' A.V.C. 4 (2HF, D, QP21) 18.8.34 AW445
(Pentode and Class-B Outputs for above : blueprints 6d. each) 25.8.34 AW445A
Self-contained Four (SG, D, LF, Class-B) .. Aug. '33 WM331
Lucerne Straight Four (SG, D, LF, Trans) .. — WM350
£5 5s. Battery Four (HF, D, 2LF) .. Feb. '35 WM381
The H.K. Four .. Mar. '35 WM384

Five-valve : Blueprints, 1s. 6d. each.

Super-quality Five (2HF, D, RC, Trans) .. May '35 WM320
New Class-B Five (2SG, D, LF, Class B) .. Nov. '33 WM340
Class-B Quadradyne (2SG, D, LF, Class B) .. Dec. '33 WM344
1935 Super Five (Battery Superhet) .. — WM379

These blueprints are full size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—
"Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7d., and "Wireless Magazine" at 1/3d., post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send (preferably) a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Mains Operated.

Two-valve : Blueprints, 1s. each.

Consoelectric Two (D, Pen) A.C. ..	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C. ..	—	WM286
Unicorn A.C./D.C. Two (D, Pen) ..	Sept. '35	WM394
Three-valve : Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C. ..	—	AW383
S.G. Three (SG, D, Pen) A.C. ..	—	AW390
A.C. Triodyne (SG, D, Pen) A.C. ..	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C. ..	23.6.34	AW439
Mantovani A.C. Three (HF, Pen, D, Pen) A.C. ..	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen) ..	Jan. '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen) ..	July '33	WM329
Harris Jubilee Radiogram ..	May '35	WM386

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.

Modern Super Senior ..	—	WM375
Varsity Four ..	Oct. '35	WM395
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..	10.3.34	AW425
Heptode Super Three, A.C. ..	May '34	WM359
"W.M." Radiogram Super A.C. ..	—	WM366
1935 A.C. Stenode ..	Apr. '35	WM385

PORTABLES.

Four-valve : Blueprints, 1s. 6d. each.

Midget Class-B Portable (SG, D, LF, Class B) ..	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B) ..	1.7.33	AW393
Family Portable (HF, D, RC, Trans) ..	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21) ..	June '34	WM363
Tyers Portable (SG, D, 2 Trans) ..	Aug. '34	WM367

SHORT-WAVERS—Battery Operated.

One-valve : Blueprints, 1s. each.

S.W. One-valve converter (price 6d.) ..	—	AW320
S.W. One-valve for America ..	—	AW429
Roma Short-waver ..	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SGdet, Pen) ..	Feb. '36	WM402
Home-made Coil Two (D, Pen) ..	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans) ..	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen) ..	30.6.34	AW438
Experimenter's Short-waver ..	Jan. 19. '35	AW463
The Carrier Short-waver ..	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World Beater (HF Pen, D, RC, Trans) ..	—	AW436
Empire Short-waver (SG, D, RC, Trans) ..	—	WM313
Standard Four-valve Short-waver ..	Mar. '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-wave Super ..	Nov. '35	WM397

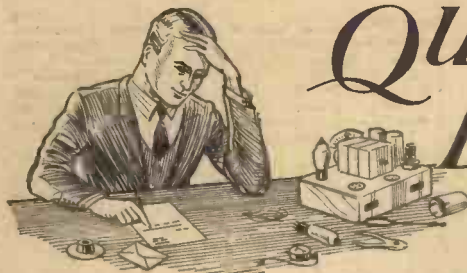
Mains Operated.

Two-valve : Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C. ..	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C. ..	Aug. '34	WM368
"W.M." Long-wave Converter ..	—	WM380
Three-valve : Blueprint, 1s. each.		
Emigrator (SG, D, Pen), A.C. ..	—	WM352
Four-valve : Blueprints, 1s. 6d. each.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ..	Aug. '35	WM391

MISCELLANEOUS.

Enthusiast's Power Amplifier (1/6) ..	June '35	WM387
Listener's 5-watt A.C. Amplifier (1/6) ..	Sept. '35	WM392
Radio Unit (2v.) for WM392 (1s.) ..	Nov. '35	WM393
Harris Electrogram (battery amplifier) ..	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram ..	Mar. '36	WM403
New style Short-wave Adapter (1s.) ..	June '35	WM388
Trickle Charger (6d.) ..	Jan. 5, '36	AW462
Short-wave Adapter ..	Dec. 1, '34	AW456
Superhet. Converter ..	Dec. 1, '34	AW457



QUERIES and ENQUIRIES

The Reaction Circuit

"I have been looking through various circuit details, both in your paper and in other trade books, and find that there seems to be no standard for the reaction circuit. Sometimes the reaction condenser is earthed and sometimes it is between anode and reaction coil. The value of the condenser seems to vary over wide limits, and sometimes a reaction choke is included and sometimes not. Is there no standard which can be adopted so that circuits may be easily changed? What do you recommend as the ideal arrangement?"—G. E. (Watford).

UNFORTUNATELY the makers of coils leave no option but to change the circuit according to the coils which are used. In some coils the reaction winding is brought out to two separate terminals, and thus it is possible to connect the reaction condenser either on the anode side or the earth side of the reaction winding. In the latter case the moving plates of the reaction condenser will be directly earthed, whilst in the former case they will be earthed through the reaction winding, which, in view of its low resistance, will not make a great deal of difference. The choke is always to be preferred in the anode circuit, although if a good transformer is employed it is possible that the primary will have a sufficient choking effect. A good high resistance (such as is used in a resistance-capacity coupled stage), will also act as an efficient choke. The best arrangement is undoubtedly to be found in the employment of a separate reactor valve.

The Mains Rectifier

"Can you help me in deciding upon the rectifying circuit in a mains unit I am building? I can use either half-wave or full-wave, but I am not certain regarding the advantages or disadvantages of each system. I have bought no components yet, other than the smoothing condensers, so should be glad to receive your remarks."—B. A. S. (Petersfield).

THERE are many points of difference in the two types of rectifier, and apart from the design of the input circuit (that is, the secondary winding of the transformer) the general differences may be broadly stated to be that the full-wave rectifier delivers a smoother output than the half-wave and a higher current is obtainable. It is necessary, however, to differentiate between the metal-oxide rectifier and the valve, and in general it may be stated that the full-wave arrangement is always to be preferred especially for the larger types of receiver.

Superhet Problem

"I attach a circuit diagram of a set which I have built up from surplus goods advertised in your book. I have found that I can only get good results over short patches of the condenser. That is, if I gang accurately at 200 metres, I get a few stations up to about 300 or 350 and then very little can be heard unless I trim up again. This occurs on both wavebands. I have had all com-

ponents tested at my dealer's, and he tells me that they are in order. Have I overlooked some snag which may be causing the trouble? In case it would be of assistance to you I attach a list of all the parts, and the set is being operated from a wet H.T. battery of 150 volts."—P. C. R. (Ealing).

THE circuit is quite in order, but a study of the parts which you are using probably reveals the trouble. The coils and I.F. transformers are designed for 126 kc/s, but the gang condenser, according to the reference number, is of the type designed for use in a superhet in which the intermediate-frequency is 110 kc/s. Thus the oscillator coil will not be kept at the correct frequency separation throughout the tuning range, and the only method of getting optimum results is to replace the gang condenser by one designed for 126 kc/s or, alternatively, to use a straight condenser and use the padding condensers recommended by the makers of the coils.

RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant Interviews to querists.

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

Matching Speakers

"I have a commercial set in which extension speaker sockets are provided. I had an old speaker left from my previous set, but when I connect this to the extension-speaker sockets it cuts down volume quite a lot. Is there any reason for this, or does it indicate that the set will not deliver sufficient volume for the two speakers?"—V. E. (Harrow).

THE set will deliver sufficient volume for quite a number of speakers, but it is possible that your additional speaker has characteristics of such a value that the load on the output valve is seriously modified. The makers of the receiver have probably indicated the correct type of extension speaker to use in order to preserve the output load, but, if not, you should employ an extension speaker provided with a special tapped transformer winding in order that various loads may be imposed and thus the correct balance obtained. There is, of course, the possibility that some fault exists in the connections to the extension-speaker sockets.

The coupon on cover iii must be attached to every query.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

W. D. (Paisley). We cannot supply diagrams of commercial receivers, and suggest that you communicate direct with the makers concerning this matter.

F. W. (Mansfield, Notts). We are unable to suggest any method of modifying your commercial receiver and suggest that you communicate direct with the makers as the set may be faulty.

J. G. S. S. (Earl's Court). The set may have been designed for use on D.C. mains, in which case there may have been a definite reason for omitting the earth connection—possibly to avoid shorting the mains. You may be using the set on mains in which the negative is earthed and thus no ill effects are obtained, but on another supply the mains supply may be shorted.

E. A. D. (Amersham). We regret that we do not know of any books on the subject you mentioned.

C. F. C. (Rednal). It is not possible to give any indication of the stations which may be heard, as conditions vary in different parts of the country, and local conditions, such as directional of aerial, etc., will affect results. When the switch is pulled out the set is tuned for medium waves, and when pushed in long-wave reception is obtained.

F. T. (Dorchester). The trickle charger would not be suitable for the accumulator in question unless you only take from it a very small current, when the use of the charger would enable the cell to be kept more or less in the same condition. However, if your set takes more than the trickle charger replaces, the cell would require to be fully charged periodically, and a watch should be kept on it by means of a meter and hydrometer.

J. M. (Titchurst). A transmitter may be operated from a battery supply, but we cannot give circuits or other details of transmitting apparatus. A licence is necessary before any experiments in transmission may be carried out.

W. J. V. (Surbiton). The peculiarity was due to the fact that your meter was of low resistance and thus short-circuited the coupling component. For test readings in this part of a circuit a good high-resistance meter should be employed, and a standard of 1,000 ohms per volt should be considered as satisfactory.

W. B. (Llaner). Your valves are of very old design and it would be worth while to obtain new ones. Two modern valves would be capable of giving as good results as will now be obtained with the three mentioned, and the L.T. consumption would also be reduced.

H. R. H. (Westminster). The coils agree in principle, although two different articles should not be compared in this manner. The only difference is in the numbering of the ends of the reaction winding, and this will not affect results as the application of reaction depends upon the size of the winding and its direction, and not on the numbers or references applied to the ends of the coil.

S. M. (Anerley). Whilst it may be possible to use your meter by doubling all the readings and values which have been given, you may find that the resistance of the meter is of such a value that none of the constructional data will apply. In view of this, we suggest you dispose of the instrument and obtain the correct type of meter.

V. G. (Nr. Aylesbury). "The Constructor's Encyclopedia" should be of the greatest use to you. We have no details of an amplifier giving the output mentioned, although the paraphase amplifier recently described should be found suitable. We have given details on various occasions for using a simple meter for the measurement of resistance. Such an instrument is simply an ammeter (or milliammeter), and measures the current flowing, and by knowing the voltage the resistance is thereby calculated.

T. F. C. (Northam). We have already mentioned that in place of the .006 mfd. pre-set condenser, a .002 mfd. should be employed with a .004 mfd. fixed condenser in parallel. The makers have, unfortunately, discontinued the larger value pre-set.

L. D. (Aberfan). The blueprints do not include a list of components, and this information, together with the constructional details, is given in the article in the appropriate issue of the paper.

E. C. (Old Swan). The set was not described by us and we cannot give you any advice concerning it. We suggest you communicate direct with the periodical in which the set was described.

G. H. P. (N. 13). We have described several short-wave adapters, but the most suitable blueprint would be P.W.48A, which is a unit which may be used either as converter or adapter, and also may be used with mains or battery-operated receivers without difficulty.

Sirrah (Walton). The current from your eliminator would not be suitable for charging an accumulator.

W. J. R. (Pwllheli). We regret that we cannot give the details as you give no dimensions of the transformer stampings. Perhaps the makers of the speaker would supply a replacement at low price, or, alternatively, would give you the impedance of the speech coil so that you could obtain a suitable transformer for use with it.

J. O'B. (Nr. Blackburn). We suggest the Four-station Crystal Set, the 1934 Crystal Set, or the 150-mile Crystal Set. Blueprints of each of these may be obtained from this office, price 6d. each.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

PREMIER SUPPLY STORES

All previous bargains advertised are still available. Send 3d. for large illustrated catalogue including Bargain Supplement.

WORLD Famous Continental Valves, mains type, 4/6 each. H.L., L.; screen grid; variable mu screen grid; 1, 3 and 4 watt A.C. output directly heated pentodes; 250-volt 60 m.a. full wave rectifiers. V.M.H.P., D.D.T., diode tetrodes; A.C., D.C. types, 20 volts, 0.18 amp., filaments; screen grid; variable mu screen grid; H., H.L., power and pentodes.

THE Following Types, 5/6 each; 350v. 120 m.a., full wave rectifiers, 500v. 120 m.a., full wave rectifiers, 21 watt indirectly heated pentodes.

2-VOLT H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screen grid, variable mu screen grid, 5- or 4-pin pentodes, V.M.H.P., H.F.B., Class B, 5/-.

THE Following American Types, 4/6: 250, 210, 245, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 281; all other American types, 6/6 each.

PREMIER Kit of Parts for 1 Valve 14/150 metres receiver or adaptor, complete with coils, chassis, and circuit, 12/6.

SPECIAL Offer. Bargain Parcels. Every parcel is amazing value, being genuinely worth several times its cost; available in 5/-, 10/-, 20/- Parcels.

LISSEN Ganged Bandpass Coils, set of 3, with integral switching, 6/11, or complete with 4v. chassis. Valveholders, 3-Gang Condenser and Drive, 14/6. Circuit supplied.

PREMIER SUPPLY STORES

20-22, High St., Clapham, S.W.4 ('Phone: Macaulay 2381), and 165, Fleet St., E.C.4 (next door to Anderson's Hotel). 'Phone: Central 2833.

All goods advertised in last week's issue still available.

WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

HOME CONSTRUCTORS of Coils, Chokes and Transformers should send for lists.—Lumen Electric Co., Litherland, Liverpool 21.

RADIO AND ENGINEERING SUPPLIES.

ATTENTION to all Orders within 48 hours.

SATISFACTION Guaranteed or Money Refunded.

SHORTWAVE CONDENSERS, Coils, Chokes, Tubular non-inductive condensers, still available as advertised in March 21st issue.

ELMINATORS, Superior, Guaranteed 12 months, 200-260 volts, 40-100 cycles. Output 150 volts at 30 milliamperes, with Tappings, 21/-. With Trickle Charger, 30/- Carriage 1/- extra.

WESTINGHOUSE Rectifiers, H.T.8, 8/6; H.T.9, 9/6.

HIVAC Valves, Complete Range. Send for Lists.

T.C.C. Dry electrolytics, 8/4 mfd., 450 v., 2/5.

All other lines advertised in March 21st issue still available.

TRADE Enquiries. Send stamp and Trade Heading for latest Lists.

RADIO AND ENGINEERING SUPPLIES, 83, Edgware Road, London. 'Phone: Pad, 6652.

G.P.O. Surplus Condensers, 2mid. 800v. wkg., 2/3. 4mfd. ditto, 3/9. 2mfd. 1,000v. wkg., 3/3. 4mfd. ditto, 4/9. Postage 4d. or C.O.D. De-Ware, 364, Fulham Road, S.W.10.

BANKRUPT Bargains. List free. £5 allowed on your old set against a new Mullard 6v. AC/DC superhet at 12 gns. Alba model, 21 3v. S.G. pentode, MC and batteries, 67/6d. each. Ormond Class B 3v. complete MC and batteries, 65/0d. Truphonic battery 5v. superhet, complete batteries MC, new, £6-10-0. Many others. Amplion A.C. 21 gns. radiograms. Superhets, £14. Large stock components. Quotations per return. Butlin, 6, Stanford Avenue, Brighton.

HEADPHONES. G.E.C., B.T.H., Sterilug, Nesper, Marconiphone, Brunet, Western Electric. 2,000 ohms, 2/6; 4,000 ohms, 5/-. SPECIAL. Brown type "A." 1,000, 2,000, 4,000 ohms, 20/- pair. Every pair complete. Guaranteed. Postage 6d. Crystal detectors. Complete parts, 1/-. Kodesh, 56, Barnsbury Street, London, N.1.

RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1.

TEL.: HOLBORN 4631.

GENUINE SALE FOR 14 DAYS ONLY.

OPPORTUNITIES THAT OCCUR ONCE A YEAR ONLY:

15/11 LISSEN SKYSCRAPER 3 CHASSIS. Less Valves, shop soiled. Built and Aerial tested.

25/11 LISSEN SKYSCRAPER 3 CHASSIS. Complete with Valves, shop soiled. Built and Aerial tested.

84/- LISSEN 4 VALVE BAND PASS A.C. MAINS SET. Screen Grid, Detector, Pentode, Valve Rectification, Iron Cored Coils, Band Pass tuned, fitted energised Moving Coil. A super bargain. List £9 15s. Brand new.

70/- LISSEN BAND PASS 3 BATTERY SETS. Complete in handsome Walnut Cabinets, Iron Cored Coils, Band Pass tuned, P.M. Moving Coil Speaker and Valves. Brand new. List £8 10s.

57/6 LISSEN BAND PASS 3 BATTERY CHASSIS. With Valves, details as above.

42/6 LISSEN BAND PASS 3 BATTERY CHASSIS. Less Valves.

45/- LISSEN 100 STATIONS SET. Complete in Cabinet with Valves and Speaker, Aerial tested, few only.

75/- 4 VALVE A.C. MAINS CHASSIS, 200 to 250 volts, by well-known proprietary manufacturer, Mullard Valves, Band Pass tuned, suitable for use with energised Moving Coil Speaker, brand new.

97/- AERODYNE DRAKE 4 VALVE A.C. SET. 200 to 250 volts, by well-known proprietary manufacturer, Mullard Valves, Moving Coil Speaker, Band Pass tuned, in handsome Walnut Cabinet, brand new, boxed. Hire purchase terms can be arranged on application.

5/6 TRIAD VALVES. 01-A, 24A, 27, 30, 31, 32, 33, 35, 37, 38, 39, 41, 42, 43, 45, 46, 47, 53, 55, 56, 57, 58, 59, 71A, 75, 78, 80, 8A6, 1C6, 6F7, 2A3, 5Z3, 12A7, 6A7, 6C6, 6D6, 12Z3, 25Z5.

ALL THESE VALVES CARRY A 90-DAY GUARANTEE AND FREE REPLACEMENTS, PROVIDED THAT THE FILAMENT OR HEATER IS INTACT AND THE GLASS IS NOT BROKEN WHEN RETURNED TO US. 5/6.

2/6 LISSEN 2 VOLT BATTERY VALVES. L2 Metallised, brand new, boxed.

3/6 LISSEN 2 VOLT CLASS B VALVES. Type BB 230 A. Brand new, boxed.

2/11 POLAR 2 GANG CONDENSER. 0.0005 Section, unscreened.

8/6 COMPLETE LISSEN SUPERHET ASSEMBLY. Comprising 3 Gang Superhet Condenser. 126 k/cs Oscillator Section. Set of Ganged Superhet Coils with Switch and two 126 k/cs I.F. Transformers. A Wonderful Bargain.

2/11 LISSEN INTERMEDIATE FREQUENCY TRANSFORMERS. 126 k/cs. Brand new, boxed. List price, 8/6.

2/11 LISSEN IRON CORED OSCILLATOR COILS. 126 k/cs. Fully Screened. Brand new, boxed. List price, 12/6.

BRYCE MAINS TRANSFORMERS.

8/11 250-0-250, 80 M.A. 2-0-2 Volts, 2.5 amps., 2-0-2 Volts, 4 amps. Shrouded.

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11/6 350-0-350 volts, 150 m.a., 2-0-2 volts, 2.5 amps., 2-0-2 volts, 4 amps., 2-0-2 volts, 2 amps. Shrouded.

17/6 500-0-500 volts, 150 m.a., 2-0-2 volts, 2.5 amps., 2-0-2 volts, 6 amps., 2-0-2 volts, 2 amps., 2-0-2 volts, 2 amps. Shrouded.

8/11 H.T.8 TRANSFORMERS. 250 volts, 60 m.a., 2-0-2 volts, 4 amps.

17/6 DITTO. With H.T.8 Metal Rectifier.

ALL THE ABOVE TRANSFORMERS ARE OF FIRST CLASS MANUFACTURE, BRAND NEW AND CARRY MAKERS' GUARANTEE.

5/- UTILITY 3 GANG MIDGET SUPERHET CONDENSERS. With 110 k/cs Oscillator Section, fully screened.

2/11 BRITISH RADIOPHONE 3 GANG SUPERHET CONDENSERS. With 110 k/cs Oscillator Section, unscreened. Wonderful bargain.

2/6 8 mfd. and 4 mfd. DRY ELECTROLYTIC CONDENSERS. By well-known manufacturer. 450 volt working, 500 volt Peak. Brand new.

1/6 LISSEN CENTRE TAP OUTPUT CHOKES. Brand new, boxed. List price, 7/6.

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2/6 PEAK 4 mfd. PAPER CONDENSERS. 750 volt test.

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1/- 4 mfd. POST OFFICE TYPE MAINSBRIDGE CONDENSERS. 250 volt working.

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(Continued at top of column three)

(Continued from foot of column two)

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1/11 G.E.C. MANUFACTURERS TYPE L.F. TRANSFORMERS.

9d. LISSEN R.C. UNIT, Brand new, boxed, list price, 3/6.

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TEL.: HOLBORN 4631.

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Surplus, Clearance or Secondhand, etc.

SOUTHERN RADIO'S Wireless Bargains; all goods guaranteed and sent post paid.

S 11/-: Celestion, mains energised, 2,500 ohms (model E.6), 8/6; Telsen latest type permanent magnet, with ten ratio transformer for use with any receiver, including Class B and Q.P.P., 14/6 each; Telsen loud speaker units, 2/9 each; all new and boxed.

COSSOR MELODY MAKER 3-VALVE Battery Kits. Complete with Cossor Valves, Speaker and Cabinet. Model 341. Brand New. In sealed cartons, £3/7/6.

DEEMARK Short-Wave Adaptor Kit, complete with all accessories for adapting set to 14-150 metres, 20/-; superhet short-wave converter kit, 20/-.

G.E.C. A.C. D.C. Mains 3-valve Sets, complete with 3 Osram valves in exquisite Bakelite cabinet, with Osram M.C. speaker, ready to plug in to any mains universal voltage, new, in sealed cartons, fully guaranteed; £3/19/6 (list £7/15/-).

MULLARD M.B.3 THREE-VALVE BATTERY SETS. Complete with 3 Mullard Pentode Valves, Permanent Magnet Speaker, Batteries and Accumulator. Contained in handsome walnut cabinet, £5/7/6 (List 8 guineas). In original sealed cartons.

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5/- PARCEL.—Contains modern components, valued at 20/-, including Resistances, Condensers, Coils, Wire, etc. Circuits of modern Receivers included with each parcel.

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SHORT WAVE on a crystal set. Full building instructions and crystal 1/2 post paid.—Radionall, Tanworth-in-Arden, Warwickshire.

BIRMINGHAM RADIOMART SHORT-WAVE SPECIALISTS

Proprietor, G5NI. Manager, G2AK. Staffed by experienced transmitting amateurs. Obviously we can serve you better.

CAUTION: Beware of coilforms, etc., moulded in cheap bakelite. Our coils and formers are guaranteed efficient.

4-PIN interchangeable short-wave coils; set 3. Cover 15-100 metres, latest ribbed former, 7/9.
11IN. ribbed short-wave coil forms: valveholder 2 type, lolosa, 4-pin, 1/6. 6-pin. 1/0. Threaded for winding, 2d, extra.

UTILITY 8/6 microdisc dials, fitted famous micro-high reduction, only perfect short-wave dial, 3/11.

SHORT-WAVE H.F. chokes, 9d. *Wireless World* states: "Very efficient—100 to below 10 metres."

UTILITY microvariables 15, 40 mmfd., 1/-; 100 mmfd., 1/3; 465 kc/s litz wound I.F.'s, 5/6.

ADIOPHONE super ceramic insulated short-wave condensers, .00016, 3/6; series cap, 3/9.

CONTINENTAL A.C. valves, 4/6, VMPT, HPT, VMSG, A.C.S.G., A.C.H., PT4. Most American types, A.C. Pen., 5/6.

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BARGAIN parcel value 30/-, containing binocular HFC, 4 750 v. test condensers, G resistances, 4 valveholders, .0003, .0005 variable, electrolytic condenser, etc., 5/-. Traders' parcel, £4/10/0 value, 10/-.

SPECIAL. Set Lissen 3-gang superhet coils, two Lissen I.F.'s, 3-gang superhet condenser; value 63/- for 10/-.

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ISSEN 2-gang coils, 12-2,000 metres, switched and screened, nothing else required to convert 8G3 to all-wave, 12/6.

ISSEN 3-gang bandpass superhet coils, 4/6; 3-gang bandpass Tuned grid, 6/11. All with circuits.

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UTILITY 2-gang .0005 Uniknob with large disc drive, 3/11. Ditto, single, with disc, 2/3.

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SCREENED iron-core selective dual-range coils, with reaction; circuit diagrams, 2/11.

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ISSEN 6-way battery leads, with plugs, 6d. Belling-Lee safety mains plug and socket, 6d.

TRANSFORMERS B.T.H. speaker; suit all moving coils, 2/11. Manufacturers push-pull, 1/11.

USES. Telsen 1/2-amp., 1-amp., 3-amp., 2d. Telsen 100 ma., 2d.

TELSEN latest differentials, .003, 1/3; .00015, 1/- Radiogram transformers, 2/9.

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AND many others. Send for lists. Cash with order carriage paid. C.O.D. carriage forward.

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8-VALVE ALL-WAVE SUPERHET A.C. or Universal. High fidelity output, five watts delivered by push-pull valves. Response within two D.B.'s from 25 to 9,000 cycles. £13. 15. 6 carriage paid.

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Short Wave, Ormond, slow motion 00015-0002-00025 mfd. 1/9. Band-spread condensers, 00005, 1/6. 00015 to 0003 reaction, 6d. 2 Band S.W. coil, litz wire wound, 13-55 m., 1/10. Switch for 5d. S.W. plug-in coils, 4-pin sizes, 13-20, 22-47, 41-94, 76-140 m., 1/10 each. 6-pin coils, 2/3 each. 150-326, 250-500 400-800, 1,100-2,000, 4-pin, 2/3, six-pin 2/6. Volume, controls, 10,000, 25,000, 1 Meg., 1/-, 50,000 with switch, 1/11. Dual range coils (with diagrams), 1/5. L.F. Transformers, 1/4. Ormond disc drives, 1/5.

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| (5) Interchange of ideas with fellow-members. | |

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Vol. 8. - No. 186.
April 11th, 1936.

AND PRACTICAL TELEVISION

Secrets of
**Successful
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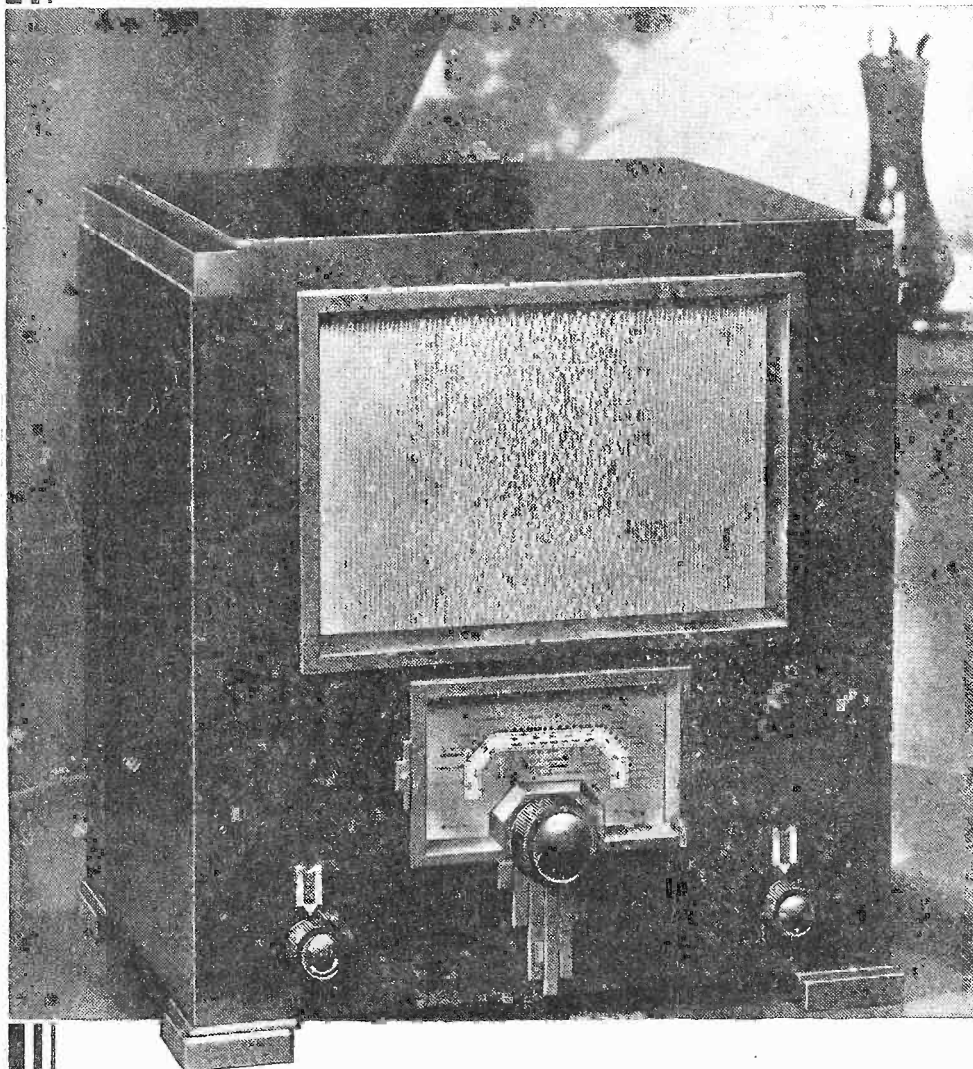
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PRAO. 11/4/36

CHEMISTRY IN RADIO See page 101:



Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sc.,
B.Sc., A.M.I.E.E., Frank Preston.

VOL. VIII. No. 186. April 11th, 1936.

ROUND *the* WORLD of WIRELESS

Hungary's Relays

WHEREAS the broadcasts from Budapest (594.5 m., 546 kc/s) are frequently marred by morse interference, it is often possible to secure a clear reception of the same programme through Miskolc on 208.6 metres (1,438 kc/s). The transmitter is only rated at 1.25 kilowatts, but in that portion of the band provides a powerful signal. Occasionally on 267.4 metres (1,112 kc/s), Nyiregyhaza, relaying the capital, may give a good signal, but only in the later hours of the evening when Alexandria, sharing the same channel, has closed down.

Proposed 100-kilowatt for Lithuania

THE Lithuanian Government has voted the sum necessary for the construction of a 100-kilowatt transmitter to replace the present 7-kilowatt station at Kaunas, operating on 1,935 metres (155 kc/s). Work on the construction of the buildings will start this year. It is also proposed to instal short-wave plant for the relay of the programmes to overseas listeners.

A Bid for Supremacy

FROM Paris comes the news that the proposed Poste Nationale (150 kilowatts) is to be situated at the village of Allovis, between Bourges and Vierzon. It is reported that twin 150-kilowatt transmitters are to be installed, and will be constructed in such a manner that 300-kilowatt power may be obtained. The station will work on the channel now used by Radio-Paris, namely, 1,649.7 metres (182 kc/s), and should be ready by the end of 1937.

New Paris Broadcasting House

THE French Ministry of Posts and Telegraphs has allocated the sum of ten million francs for the construction of central broadcasting headquarters in the capital. The actual amount to be spent on its equipment and decoration will by far exceed the credit, but it is said that the balance will be borne by the organisers of the 1937 Paris International Exhibition.

Denmark's Proposed Short-Wave Broadcaster

TO provide a service for their shipping in all parts of the world, the Danes propose to build a powerful short-wave

broadcasting station which would not only supply daily news bulletins, but also a relay of the Copenhagen programmes.

Reduced to its Simplest Expression

IN future, the Kalundborg and Copenhagen stations will shorten the call of *Kjøbenhavn, Kalundborg og Danmarks Kortbølgesender* to two words, namely: *Danmarks Radio*. The interval signal is to be retained.

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Imminent Opening of Radio Marconi

WORK on the high-power station at Bologna (Italy) has progressed so satisfactorily that it is expected the official ceremony of its inauguration may take place on April 21st next.

Remarkable Short-wave Broadcast

BY means of a new magnetron transmitter, the Philips works at Eindhoven (Holland) have succeeded in transmitting signals on an ultra-short-wave channel of 1.20 metres to a distance of roughly forty miles. The aerials of the transmitting and receiving stations were respectively 264 and 303ft. high.

Weather Reports and Forecasts

IN view of the rapid development of aviation services, and greatly increased activity, the Air Ministry has extended its

daily schedule of weather reports and forecasts. They are now broadcast from Borough Hill (Northants) on 1,186 metres (253 kc/s) at the following times: G.M.T. 06.45 (Summer only; not Sundays); 07.15, 07.30, 08.00 (Summer only); 08.15, 08.45, 09.00, 09.15, 10.15, 10.30, 11.15, 11.45, 12.15, 13.15, 13.30, 14.15, 14.45, 15.15, 15.45, 16.15, 16.30, 17.15, 18.15, 18.30, 19.15, 19.45. As these reports cover the greater part of the British Isles, they are proving of considerable interest to the ordinary listener.

U.S.A. High Fidelity Station

W²XR is the call sign of a transmitter working at Long Island City (New Jersey) on 193 metres (1,550 kc/s). High-fidelity broadcasts are made daily from G.M.T. 22.00-01.00. In view of a recent poll taken from the radio audience, the schedule will shortly be extended until 03.00.

Broadcasts from Newfoundland

ALTHOUGH only rated at 500 watts transmissions from VONF, St. John's, Newfoundland, on 251 metres (1,195 kc/s), and operated by the Dominion Broadcasting Company, Limited, have been heard in the United Kingdom.

Radio in the Pacific

A WIRELESS station is to be installed on the Phoenix Islands, situated on the Suva-Honolulu steamship route, and lying some 600 miles to the North of the Fiji Isles. Although practically deserted, the islands will be the base of a scientific expedition, composed of astronomers, to view the total solar eclipse which is taking place in 1937.

In Close Touch with Europe

THE average radio fan in the United States hears much of the European radio programmes in the course of a year. During 1935, the National Broadcasting Company relayed 229 broadcasts, and the Columbia System provided as many as 149 foreign transmissions to its listeners.

An Income to Play With

THE gross revenue of the National Broadcasting Company of America for the year 1935 amounted to \$31,148,931, or roughly £6,230,000. Figures for the Columbia Broadcasting System for the same period have not yet been officially published.

ROUND the WORLD of WIRELESS (Contd.)

Parsifal Concert

AS in former years, a special concert will be given on Good Friday, April 10th, in the Queen's Hall, at 7.30 p.m. Sir Henry Wood will conduct and the programme will consist of excerpts from "Parsifal." The "Prelude," and the Grail scene and Finale from Act 1 will make up the first part of the programme (7.30 to 8.30 p.m.), while Part 2 (from 8.45 to 10.20 p.m.) will consist of the following scenes: Act 2—Klingsor's

INTERESTING and TOPICAL PARAGRAPHS

Easter Concert Parties

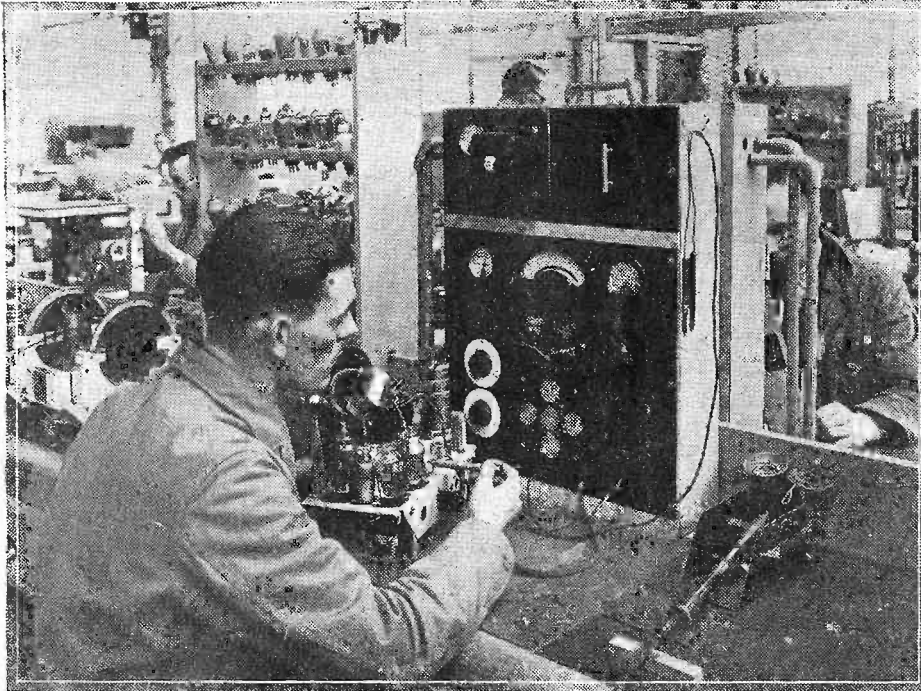
TWO well-known Northern concert parties, which have been on tour during the winter, return to their summer headquarters for Easter week, and they will broadcast to Northern listeners on April

The party includes comedians, entertainers, singers, a ventriloquist, soubrettes and dancers, and the famous beauty chorus, Madame Helena Lehmiski's Young Ladies. Mr. Terry himself is the compère.

"Week-end out of Doors"

NOW that April's here the Talks Department of the B.B.C. begins to put into effect the plans which have been simmering for months for the proper entertainment and recreation of its listeners in spring and summer. The first of these, to be given in the Scottish programme on April 10th, is "Week-end out of Doors," which is a weekly bulletin of advance information on walking, climbing, sailing, and angling, together with local weather forecasts affecting these activities. The bulletin will be edited by Ian Wilson, a Glasgow journalist, and its scope will cover Scotland at least from Spey-side to Galloway. The Scottish Youth Hostels Association are co-operating in supplying information for walkers and climbers, and the bulletins should prove very useful to those who are planning holidays of a week-end or longer.

NEW EKCO SERVICE CENTRE



A corner in the new Ekco Service Centre, showing the test bench equipment for testing and repairing sets returned for servicing.

Magic Garden, the Flower Maidens, and the scene between Kundry, Parsifal, and Klingsor; Act 3—the Good Friday Music, the Prayer of Amfortas, the Procession of Knights, the Healing of Amfortas, and the closing scene. The B.B.C. Symphony Orchestra and the Philharmonic Choir, augmented by a contingent of boys from the London College of Choristers, will take part; and the soloists will be as follows: Muriel Brunskill, Walter Widdop, Herbert Heyner, Norman Walker, Victor Harding, Elena Danieli, Kate Winter, Janet Powell, Helena Bromley, Molly de Gunst, and Myra Owen.

The Two Easters

CHENRY WARREN, who broadcasts fortnightly talks on the Midland countryside, has devised for April 12th a mosaic programme of poetry and music on the theme of the Two Easters—the Easter of the Christian Church and the Easter of Nature. This is not his first experience with this kind of programme, for he previously devised a mosaic on "Men and the Machine."

"Western Week-end"

THE first of a series of programmes from different places of entertainment in the Region will be given on April 11th under the title "Western Week-end." This series is a development from the early series "You Pays Your Money." A broadcast will be taken from the Headland Hotel, Newquay, from an Organ Recital by Reginald Porter-Brown at Torquay, and from a popular orchestra,

14th. They are the Arcadian Follies from the South Pier, Blackpool, and the "Bouquets," who are to broadcast from the Floral Pavilion, New Brighton.

Gypsy Music from Harrogate

YASCHA KREIN and his Gypsy Orchestra, who are to broadcast from the Valley Gardens, Harrogate, on April 10th, will contribute another programme on April 12th. A native of Russia, Yascha Krein studied music at the Imperial Conservatoire in Petrograd. Coming to England, he joined the old Queen's Hall Orchestra under Sir Henry Wood. He resigned in order to become leader of a Viennese Orchestra in Scotland. His present combination was formed three years ago.

A "Sports Causerie"

A "SPORTS Causerie" will be broadcast from Cardiff on April 14th, in which C. B. Thomas, Muriel Orsman, B. Watts Jones, and W. Rowe Harding will review the winter's activities in Wales in boxing, hockey, soccer and rugby.

Pleasure on Parade

FRANK A. TERRY'S touring concert party, "Pleasure on Parade," will be in Doncaster on April 9th, and it is at the Grand Theatre there that the Northern microphone will track them down in the evening. Presented under the heading "Northern Concert Party on Tour," excerpts from their show will be broadcast.

Concert from Torquay

ORIS COWEN (contralto) will be the artist in a concert by the Torquay Municipal Orchestra, conducted by Ernest W. Goss, to be broadcast from the Pavilion, Torquay, on April 14th.

Eugene and his Magyar Quartet

THIS combination appeared at the Royal Command Performance in 1932. It has been broadcast on three occasions from exhibitions in the Midlands where it has been appearing, but April 13th will be its first Midland studio broadcast. Eugene has toured in many parts of the world. At the age of fifteen he was playing in a café in Buenos Aires. The combination is having a season at Prince's Café, Birmingham. The vocalist is James Benbridge, who was formerly with the Gresham Singers.

SOLVE THIS!

PROBLEM No. 186.

Johnson built a superhet using reliable components with matched coils and gang condenser. Reception was moderately good, but if the gang condenser trimmers were adjusted so that stations tuned in at the correct wavelength setting at approximately 250 metres, they were about 15 metres out at 500 metres, and *vice versa*. What was the trouble? Three books will be awarded for the first three correct solutions opened. Address your letters to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Envelopes must be marked Problem No. 186 in the left-hand corner, and must be posted to reach this office not later than the first post Tuesday, April 14th, 1936.

Solution to Problem No. 185.

Hollis had overlooked the fact that a large voltage drop occurred across the field winding of the energised speaker, thus reducing the valve anode voltages to too low a value.

The following three readers successfully solved Problem No. 184, and books are accordingly being forwarded to them: N. K. Batchelor, 106, Evenlode Crescent, Coventry, Warks.; R. C. Tyler, 48, Burlington Gdns., Chadwell Heath, Essex; J. Robertson, Aukengill, Wick, Cathness.

Obtaining Quality Reproduction

In This Article some of the Methods Adopted by Set Manufacturers for Obtaining Quality Reproduction are Discussed

ON many occasions, articles in these columns have stressed the suggestion that the development of high-quality reproduction provided a field for experiment which is particularly suited to the radio amateur. It was also stated that in general, the amateur had a better chance of making a good high-fidelity set than the ordinary listener had of buying one, since the almost universal cry from the man in the street was for sets sufficiently sensitive and selective to give him large numbers of stations, almost irrespective of the quality of reproduction. Finally, it was suggested that the time would come when the commercial set manufacturer would find it necessary to pay more attention to fidelity of reproduction, and to put on the market at least a proportion of models having some claim to realism of tonality.

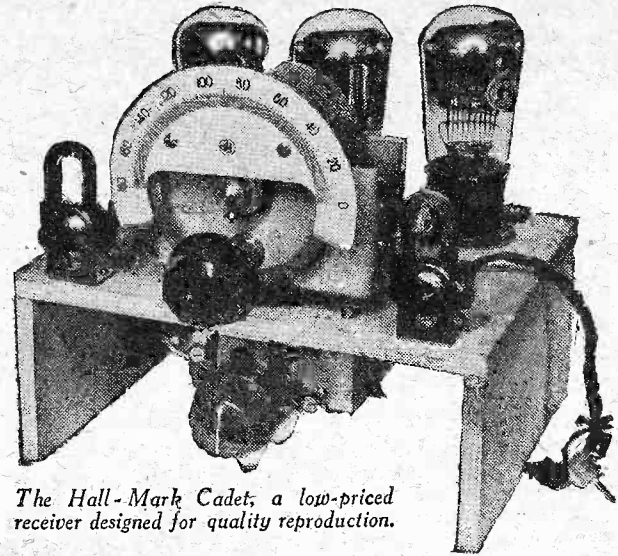
While we lay no claim to the gift of prophecy, and are quite content to suggest that our previous articles were based upon pure reasoning, we cannot refrain from pointing out that the state of affairs which we then forecast has now come about. A very large proportion of the principal manufacturers are now advertising receiver models which are described as "fidelity" sets, and, from our own observation, these quality models do represent a very substantial advance in reproduction. Not only so, but the general standard of quality in all reputable makes has very definitely advanced.

It may be said at the outset that this article will exclude all those luxurious fidelity sets which are sold at prices between 30 and 150 guineas, because they are quite beyond the reach of the average listener and, moreover, are usually attempts to combine high performance by way of the number of stations receivable with naturalistic reproduction; and include gramophone equipment with auto record changing

and most elaborate and expensive cabinet work. We will confine our remarks to ordinary table models costing, at the most, 20 guineas, and it must be remembered that even at that price, which includes cabinet work, cost of assembly and advertising charges, the design must be such that the intelligent constructor should be able to produce as good at lower cost.

The Superhet

There has been a general impression that really high quality reproduction cannot be obtained in a superhet, and it therefore may come as something of a shock to find that quite a number, in fact the majority, of sets advertised as of the high-



The Hall-Mark Cadet, a low-priced receiver designed for quality reproduction.

extreme top and bottom frequencies, or if it produces a crop of resonances at all sorts of places in the musical scale. There was a time, and that not so very long ago, when the speakers commonly fitted in commercial sets were tiny little units of poor performance, which could be made at the cost of only a very few shillings apiece. To-day, any set put forward as a quality receiver, will be found to contain a speaker of generous design and having a really good performance characteristic. For the sake of cheapness, energised models are chiefly used in mains sets, but with the latest improvements in special magnet alloys, the permanent magnet models are of almost identical performance.

The Choice of Speaker

The lesson which the constructor must learn from the set maker in this connection, therefore, is to start designing his quality set from the output end. Obtain the best speaker you can afford, and design your set around it. A speaker of this year's design, costing in chassis form from 1½ to 2 guineas, may be taken as fully equivalent in performance to the speakers employed in the average commercial fidelity table model, so that the constructor is at no disadvantage on the score of the speaker.

Working back from the speaker towards the aerial, we next come to the output stage. Two factors have to be considered here, the actual power output in milliwatts; and the class of valve, namely triode or pentode and, in the case of battery sets, whether Class "A," Class "B," or Q.P.P. working.

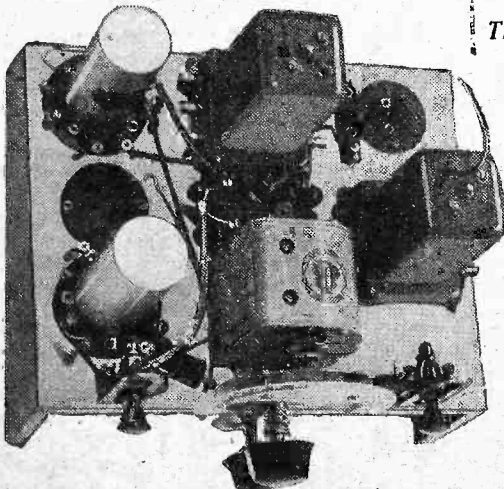
With regard to total output, a last stage capable of a big undistorted output is advisable so that even on the loudest passages there will be no distortion. Bearing in mind that 50 milliwatts represents the minimum for reasonable volume for quiet passages, a 2½-watt output valve gives a factor of safety which is adequate where only moderate volume is required, but a 5-watt output stage is generally considered the minimum for serious high-fidelity work. There are, however, very few commercial sets at prices up to 20 guineas giving more than 3 to 3½ watts undistorted output, and practical tests show that while such sets do give really good reproduction so long as volume is kept within reasonable limits, there is a tendency to overload if the volume control is advanced too far. We, therefore, repeat our own conviction that the constructor desiring quality must exercise his discretion in handling the volume control if he confines himself to a 2½ to 3 watt output stage,



The popular Stentorian speaker, designed for use with any receiver to obtain correct matching.

fidelity type, come under the superhet class. It will, therefore, be necessary to describe both straight and superhet sets in the quality range.

Analysis of a large number of commercial sets brings out one point which is common to practically all makes, and that is that set makers as a whole have realised what we have pointed out on so many occasions, namely that the loud-speaker is still by far the weakest chain in the link. It is simply useless, and a waste of time and money, to provide circuits of wide frequency response, to design receivers with nicely adjusted values and automatic devices for avoiding overloading, and to fit last stage valves giving a large output of undistorted power, if the speaker cannot reproduce the



Another quality receiver, Mr. E. J. Camm's two-valve superhet.

and that he will be well advised to go one better than the commercial makers and fit at least a 5-watt valve.

While there is little question that a triode output stage has the best possibilities with respect to tonal fidelity, and is also less easily overloaded, quite a large number of commercial fidelity sets use pentodes. The rather greater sensitivity of this type permits some saving in cost, and manufacturers have succumbed to the temptation. The pentode has a further allure in this connection, since the higher top-note response of this type of valve compensates in part for the attenuation of upper frequencies brought about by the sharpness of the tuning.

Comparisons

This brings us to the fundamental difference between the average commercial fidelity set and the average amateur fidelity set. The former is an attempt to combine a better standard of quality with a degree of selectivity which will still give a very large selection of stations, while the quality enthusiast who builds his own set is usually perfectly willing to sacrifice stations for still better reproduction. As a result, the commercial quality set is usually crammed with tone compensating devices calculated to provide a final output containing a reasonably balanced quality but not necessarily a faithful replica of the original performance. The net result is certainly pleasing, and satisfies a very large proportion of listeners, but it lacks the individuality and naturalness which can undoubtedly be obtained in a simpler and far less expensive way if only the desire for wide-world listening can be put aside. Again we say, stick to the triode—a good hefty fellow—or, better still, two in push-

pull, and avoid as far as possible all tone correction circuits.

In practically every commercial fidelity set the speech detector is a diode, and here we are in thorough agreement with the set maker. Usually there is no other L.F. amplification between the diode and the output stage, but in some instances a double-diode-triode combination is employed. It is probable that the degree of amplification obtained in the L.F. stage is obtained a little more cheaply than is possible in the pre-detector stages, but even so, for the amateur builder, an additional L.F. stage is not a very good proposition, as it is easily the most prone to introduce hum, and calls for great care in both design and layout. Get all your voltage amplification in the high-frequency stages is a good motto for the home constructor.

The H.F. Stage

There is little to be said about the high-frequency side of those commercial receivers using a straight circuit. In most cases the aerial input is of the band-pass filter type and the inter-valve couplings high-frequency transformers of conventional type. The superhets, on the other hand, have interesting features. The aerial input circuit is again of the band-pass type, but the intermediate-frequency transformers—which are, in effect, additional band-pass filters—are so designed that the width of the band accepted is variable. This variable selectivity, as it is termed, is achieved by adjusting the coupling between the two windings, either by variation of the value of one of the coupling components or by adjusting the position of one of the coils with respect to the other. By these means the set can be used as a conventional highly selective superhet for "all stations"

listening, or, with the band width increased to maximum, as a less selective set for quality reproduction.

The snag in this arrangement is, of course, that as soon as the selectivity is reduced for quality reception, in come the interfering stations—a difficulty also experienced by constructors who interest themselves with fidelity reproduction. As a result, the commercial quality sets are for the most part so designed that even at minimum selectivity there is a considerable degree of high-note attenuation, which accounts, no doubt, for the readiness with which tone compensating devices and similar aids to synthetic "quality" have been adopted.

While, therefore, set makers must be given due credit for their efforts to improve the general standard of reproduction, and while it must be admitted they have been successful up to a point, it must not be imagined that the fidelity problem has been brought very much closer to solution. The whole problem simply bristles with difficulties, most of which are, so far, not within either the manufacturer's or the listener's control, being due to the existence of far too many stations. At the best, a quality set must be a compromise between conflicting conditions. The commercial solution is synthesis—the building up of pleasant quality without too much heed to fidelity of reproduction of the original. This is perhaps unavoidable, since the commercial set must be capable of satisfactory operation under all conditions, anywhere. But the home constructor who has only to cater for his own personal and local conditions, can often achieve far better results, more cheaply, and without too many correcting and compensating circuits. H.C.

Canoe Cruise on the Avon

THE British Canoe Association hold their annual cruise on the Avon, the stretch for Easter Monday being from Warwick Castle to Tewkesbury. About forty canoes (mostly collapsible) will be taking part, carrying in all about seventy members. On April 13, Hans Renold, leader of the meet, will describe from the Midland Regional the day's cruise in an eyewitness account just after the Second News.

Service from St. Martin's

ON Easter Sunday, evening service will be heard from St. Martin-in-the-Fields, when the sermon will be given by the Rev. H. R. L. Sheppard, Canon of St. Paul's. Later in the day a short biblical drama by Mona Swann, author of "Mary the Mother" and "The Prince of Peace," will be produced by Robin Whitworth. This play, in which music and speech are particularly happily blended, was first broadcast on Easter Day last year. The players will include Ion Swinley, Christopher Casson, John Garside, and Lilian Harrison.

Shakespeare Festival

ON April 14th First Night Impressions of the Shakespeare Festival at Stratford-on-Avon, which is to begin on Easter Monday, will be given by M. F. Fraser, News Editor of a Birmingham newspaper, who has attended most of the Festivals in the past twelve or fifteen years. This year the Company's season will be a fortnight longer than last year. B. Iden Payne directs the Company. The play for the Birthday (April 23rd) will be "Much Ado about Nothing." The unfamiliar Shakespeare play to be included this season is

EASTER PROGRAMMES

"Troilus and Cressida." The accommodation in the gallery of the Memorial Theatre at Stratford-on-Avon has now been extended.

"Quayside Nights"

THE fifth edition of "Quayside Nights" will be broadcast from Brixham on April 14th. Walter Barnes, a fisherman, will recite what is known as "The Fisherman's Alphabet," originally written for the Fishing Exhibition; Jabez Lake, known as the Fisherman Poet of Brixham, will read one of his own poems and will also sing fisherman songs; Charlie Howe will give an account of the Brixham Trawler Regatta; and some young folk from the Seaman's Orphanage will sing sea-shanties and swing Indian clubs at the same time. Brixham was the home of the composer of "Abide With Me," and this famous hymn-tune will be played on the bells of Brixham Church.

Leicester Dog Show

ANOTABLE Easter Tuesday event in the East Midlands is the annual show, of the Leicester Canine Society. The judging is completed early in the day, and in order to give a microphone impression of the Show at suitable times for listeners, recordings will be made. There will be descriptions of preparing dogs for the Show, preparing the Show for the dogs, and the methods of judging, and, in order to get good

background noises, there will be a microphone on the terrier benches. The recordings taken at the Granby Halls, Leicester, where the Show is held, will be heard in the Children's Hour on April 14th, and again in the evening programme.

Cabaret from Northern Ireland

LISTENERS who like broadcasts from L roadhouses will be interested to hear that another fifteen minutes' broadcast has been arranged from the Heart o' Down Roadhouse, Ballynahinch, on April 13th. The Heart o' Down Roadhouse is now almost as popular among listeners as it is among its patrons.

"An Ambiguous Escape"

IF you were motoring over moors on a dark winter's night and came across an escaped convict, whose story convinced you of his innocence and made you believe in his wrongful imprisonment, what would you do? That is the problem which faces a retired judge in F. M. Cornford's radio play, "An Ambiguous Escape" to be broadcast on April 14th in the Northern Ireland programme. How Sir Robert, the retired judge, a man he encounters on the moors, a station-master and a prison warden find themselves gathered together in the restaurant of Longmoor Railway Station, holding an unofficial inquiry which becomes a discussion on logic and the identity of indiscernibles, is told in this amusing and exciting play. But there is a remarkable and unexpected twist at the end, and beneath all its humour there is an undercurrent of philosophy. S. A. Bulloch, who produced the play in the National programme some time ago, is to produce it again on April 14th.

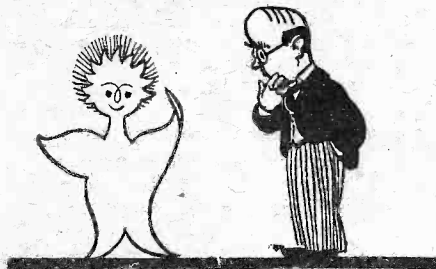
On Your Wavelength

Family Names

IT seems that I must make clear to some of my readers the relation which exists between me and a well-known figure which appears almost every day in the daily newspaper and which also may be seen sometimes on some of London's omnibuses. I am prompted to make this statement due to the fact that some of the letters which are now reaching me are being addressed to Mr. Therm, or the writers open their letters with the greeting, "Dear Mr. Therm." Now I am no relation and have no kinship with the delightful little man who bears the name of Therm, although he may be as hot as I in some respects. His father was one Thermos, a Greek, but I cannot lay claim to such noble parentage. However, I should be glad if you would note that I am Thermion, and whilst I appreciate the friendliness which is shown by the familiarity of the greeting, I do not wish to be confused with Mr. Therm. Other papers please copy!

A New Use

I HAVE just heard of a new use for the radio, and in view of the hundreds of henpecked husbands who have to sit and listen to the wagging of wives' tongues, I must pass on this hint, although it is probable that it will already have been discovered by many. Incidentally I was informed of it by a friend who suffers from the above malady, and he says that he used to find the evenings terribly boring whilst he heard how Mrs. So-and-So had just bought a new hat and other items of local scandal, but he has now built a 6-watt radiogram and he finds that he can now sit down in comfort, with his pipe and



I am no relation to Mr. Therm.

a paper, and can rest in peace without hearing his wife's tongue. I did not go into the matter deeply in order to find out how he can find peace with 6 watts blaring out at him, but I presume that it is a case of the lesser of two evils and that this cacophony is preferable to the old wives' tales. At any rate, I sympathise with him from all angles.

Go-ahead Football

I SEE that the Arsenal Football Club are having a new grandstand built at a cost of £100,000, and that the stand is to contain a special room wired for television reception and transmission. This is good news and will, I am sure, be of interest to all my readers, who must envisage the time when all of our sports are televised so that

By Thermion

we can view them in the comfort of our own homes. I was very glad to see in this connection that the manager of the Arsenal team does not anticipate any loss in the gate due to television, and that he hopes that the first team home matches will be televised when the new station is completed. What wonderful possibilities are to be opened up to us when the television receiver becomes part of our normal wireless equipment. There are, of course, still many obstacles to be overcome, but the fact that the Arsenal team are making preparations for this branch of the science shows that there must be an increasing public interest in it, and we trust that their efforts will be rewarded by apparatus which will enable the whole of the game to be seen, and not simply a goal-mouth view.

What Next?

A FRIEND who is on one of the dailies told me of some of the peculiar communications they receive from time to time and of some of the events which live up their usual routine. But I think one of the prize ones was about a lady who rang up the editor to complain that the B.B.C. announcer who was reading out the news bulletin was chewing a sweet. She was asked how she knew this and she said that it was obvious as her radio was perfect and she could detect the slightest thing, and that she was disgusted to think that an announcer should speak with his mouth full. After carrying on at some length the editor told her that he could do nothing, and that she ought to ring up the B.B.C. "But I can't do that," she exclaimed. The Editor asked her why not, as they were the correct people to whom complaints should be made. Her reply laid the Editor out for the rest of the night, for she calmly said: "I can't get on to them because I haven't paid my licence this year." Now can you beat that?

Trouble Tracking

I KNOW that many readers are interested in problems which arise in various receivers and in the methods of locating trouble, and therefore the following details will no doubt be appreciated, although I should like to state, before going any farther, that I cannot explain the matter satisfactorily. The set was a simple two-valve all-mains outfit, operated from A.C. supplies, and utilising a high-efficiency detector followed by a pentode. The trouble was that at odd intervals a terrible crackling noise would set up and it was found by the user that by stamping on the floor the noise could sometimes be stopped. Obviously, you will say, there was a loose connection; but read on. After some weeks it was suddenly noticed that when certain of the house electric-light switches were operated the noise would start and in some cases the volume would fall to less than

half. A technical man was called in and he replaced the earth connection, replaced the valves and examined every joint (soldering had been adopted) and could find no fault at all. Still the trouble persisted. You would never dream what was found eventually to be the cause, and probably it would not happen again once in a million times. The set was tuned by a two-gang condenser of a well-known make in which a bakelite dielectric was employed and the two condensers were controlled by a single spindle. This was hollow, and running through it was another spindle connected to a single-plate condenser used as a trimmer across one section of the ganged unit. The noises were found eventually to be due to the central spindle touching the sides of the main spindle, in spite of the fact that both spindles were connected to bushes which were provided with eyelets and were earthed. The way the trouble was finally cured was by connecting a lead to the very end of the spindle (just behind the control knob) and taking this direct to earth.

The Applausograph

YOU will remember my mention of the relay recording device and also the suggestion which followed it concerning an instrument which recorded how listeners were listening? Now comes another machine, but this time one which has been tested and approved and which judges the popularity of an entertainment by the amount of applause which is given. This machine has been developed by the Marconiphone Company, and is very much more sensitive than the human ear, which, of course, could not distinguish between 500 people clapping and, say, 550 people.



A new use for the radio.

It consists of a machine having a microphone, amplifier, and a registering meter. The microphone picks up the applause, converts it into electrical impulses, which are then amplified and passed to the meter. This consists of a glass-fronted box having two rollers, one at each end. One of these rollers carries a roll of graph paper, which passes beneath the glass cover to the other roller. Between the surface of the paper and the glass is a long needle which is called the stylus bar. This bar is supplied with a steady flow of ink, and the whole apparatus may be compared to the barograph which is used for recording changes in atmospheric pressure.

The mechanism inside this box is designed to pass the paper from one roller to another

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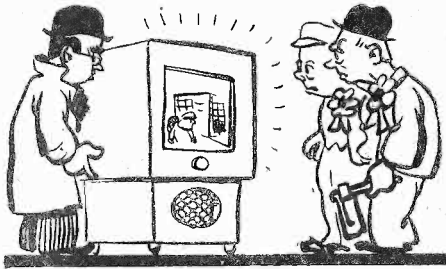
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at a speed of 9 ins. in three minutes, and as soon as the item being judged reaches its conclusion, the apparatus is switched on and the paper begins to move. As the volume of the applause mounts, so the microphone picks it up; it is amplified and passed to the mechanism connected to the stylus bar. This immediately begins to move under the influence of the applause, and traces a thin black line upon a chart. It will be seen, therefore, that the greater the applause, the greater will be the deflection of the needle, and consequently the higher will the black line rise upon the chart. In this way a permanent, visible, and valuable record of applause given to any particular item is easily and accurately recorded.

These charts are made of semi-transparent paper, and those for each item will be placed upon a ground glass screen having a strong light beneath it. They will be superimposed one upon the other, and the light shining through will give an instant and accurate comparison, thus the judging will be absolutely fair to everyone and will definitely be decided by the audience alone.

A Radio Cow

VISITORS to the Ideal Homes Exhibition who are radio fans are very interested in the radio cow which is supposed to be gifted with remarkable intelligence.



Television at the football match.

This animal, named Chrissie, is led up and down the United Dairies' exhibit and the visitors simply whisper in its ear, when it loudly proclaims the answer to the problem which has been set, or gives the date of any event. Of course, every modern scientifically-minded person immediately says that there is a loud-speaker inside it, and that a human being is secreted therein. But the latter is not true, although obviously a loud-speaker is responsible for the voice. But the mechanism which picks up the visitor's voice, selects the necessary answer, and gives tongue to it, is of an ingenious and intricate nature, and in this case has been devised by the Philco Company, who are also responsible for the public address equipment on this particular stand.

These robot mechanisms are extremely interesting, and it is most amusing to stand outside a crowd watching a demonstration and listen to the comments. Some most ingenious statements are made, whilst also there are a number of ridiculous remarks. I remember going to a very early demonstration of one of these robots, and in this case a sound-on-film track was installed, and a most ingenious selector device which, the inventor assured me, could not make a mistake provided he himself asked the question. Intonation had a great deal to do with the operation of the mechanism, and he had recorded practically all of the well-known historic events, dates, and other popular figures which were always asked by the audience. It was very expensive to operate, but gave a remarkable display of intelligence.



Portable Receivers

AS summer is approaching, many readers will probably be thinking of building a portable receiver. The frame aerial type of portable has lost its popularity during recent years and it is now customary to use a sensitive receiver in conjunction with a throw-out aerial. This type of aerial can consist of approximately 20ft. of flexible wire, which may be conveniently coiled inside the receiver cabinet when not required. When reception is desired in the open, the wire may be uncoiled and thrown over the branch of a tree, and a moderately efficient earth will be provided by tying a piece of bare wire to a screwdriver and pushing the shank of the latter into the ground.

Frame Aerials

THE frame portable is not obsolete, however, and we are now receiving quite a number of inquiries concerning the construction of frame aerials. Many readers ask us to let them know the number of turns they should use, but omit to state the size of the frame. The number of turns required is, of course, governed to a great extent by the dimensions of the frame. With the normal-sized frame (between 12in. square and 15in. square) approximately 70ft. of wire should be used for the medium-wave winding, and approximately 180ft. for the long-wave winding. If the frame is to be fitted with a reaction winding this should have a length of about 15 to 20ft.

Baffle Boards

MODERN moving-coil speakers of reliable design give an even response between approximately 50 cycles and 8,000 cycles, provided that they are correctly mounted. In most cases best quality reproduction is obtained when a large baffle-board is used. If a good response at 50 cycles is desired this baffle should be at least 3ft. square, and a 6ft. baffle may be used to advantage if space permits. If the speaker is mounted in a cabinet the baffle size is measured by adding the diameter of the cabinet face to the depth of the sides. If a very deep cabinet is used, however, a boomy effect is often produced owing to resonance. If it therefore advisable to use a shallow cabinet with the back completely open, and the wood should be at least 1/2 in. thick; if the thickness of the cabinet sides is less than this the inside should be lined with a non-resonant substance such as pulpwood.

Delay Switch

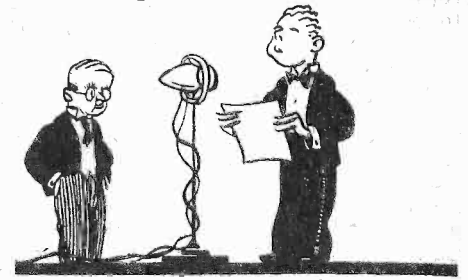
WHEN the voltage required on the anode of the output valve greatly exceeds that required by the preceding valves it is very desirable to use an indirectly-heated rectifying valve in the mains unit, otherwise a voltage surge will occur during the heating-up process and damage may be caused to condensers in the L.F. and H.F. circuits. A case in point is the quality type of set using a P.X.25, or similar type of valve, in the output stage preceded by indirectly heated L.F., det., and H.F. valves.

The Deaf and Dumb and Television

AT a lecture given recently on various aspects of television the subsequent discussion brought out very clearly that the high-definition television service would prove of extreme value to those persons who are deaf and dumb. At present they are unable to take advantage of ordinary radio in the home, but those who know and use the lip language are looking forward to the new service with keen anticipation. The clarity of the pictures received should ensure that deaf and dumb people will be able to see lip movement, and so enjoy at least some sections of the programme, a factor denied to them with sound alone. To this end it is suggested that some manufacturers should give serious consideration to the marketing of a vision set alone and so reduce the cost to those who from force of circumstances have no use for the accompanying sound. Furthermore, there may be many people with ultra-short-wave adapters fitted to their ordinary radio sets who would welcome this policy, so the suggestion is one which merits consideration.

A New Experience

EXPERIMENTS on quite a large scale are now being conducted by a Harley Street specialist, with a view to inducing sleep through the medium of both sound and colour. The doctor claims that with



Talking with a sweet in his mouth.

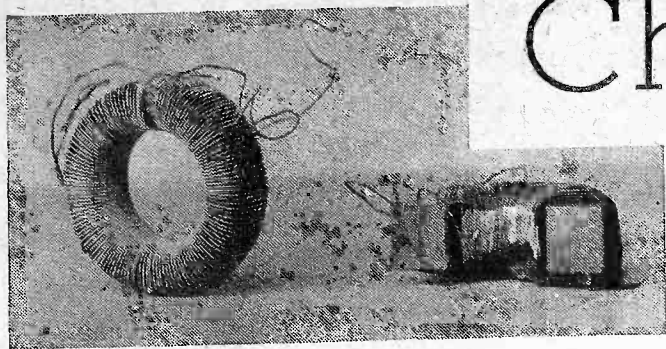
the correct lighting, coupled with soft music and talk suggestion, it is possible to bring about the condition of drowsiness and finally sleep, so that the subjects awake much refreshed. Looking well into the future he is already contemplating the time when the B.B.C. will operate to the extent of radiating slumber music, associated with the appropriate colour combinations radiated *via* the medium of television. The sarcastic will say that certain programmes now provided by the B.B.C. bring about a similar condition, and in any case the state of perfect monochromatic television has not yet been reached, so why prognosticate on what might happen with pictures in colour?

An Interesting Competition

THERE seems to have been a recent state of films which have introduced television in one form or another into the plot. Some are quite futuristic and savour of the stories of Jules Verne, while others merely look ahead to the time when television and the telephone are definitely linked together. To add a spice of material interest in the case of one film using television, a competition has been arranged whereby patrons to the cinema are asked to memorise four short sections of the dialogue, and then write a short criticism of the film. The prize in this contest is a Baird television receiver installed complete in the winners' home, with free service when necessary. Needless to say, since there is no entry fee, the number of competitors has assumed very large proportions.

Chemistry in Radio-1

In this Article Some Interesting Particulars Covering the Manufacture of Powder-iron Cores, and Their Characteristics, are Given. By G. V. COLLE



An experimental toroid coil, shown complete and in section. Note the spaced winding on the larger core.

IN common with many components used nowadays in radio receivers, iron-cored coils are the result of the work of a number of radio engineers, rather than one individual.

Their evolution dates back about eighteen years, and corresponds with the introduction of iron-cored loading inductances for telephone systems. To be strictly accurate, the use of iron cores in such circuits dates back long before 1916, and it is believed only a little while after Pupin originated the idea. The early loading coils, however, were fitted with iron cores consisting of bundles of fine iron wires, to be followed later with laminated iron strips, and similar variations.

Subsequent experiments indicated that greater intelligibility of speech could only be obtained by increasing the frequency spectrum, and this necessitated increased efficiency at the higher audio frequencies.

Engineers quickly discovered that subdividing the known types of cores partially brought about the desired results, although not to the extent required, and the first patents, Nos. 103,188 and 107,007, filed in 1916 by the original Western Electric Co. disclosed for the first time means of manufacturing cores from powdered iron.

It is an interesting fact that criticisms of then-known methods of iron core manufacture apply, perhaps in a more critical sense, to some present-day versions: "Attempts to increase the permeability beyond a certain point are frustrated by accompanying excessive hysteresis and eddy current losses, and by impairment of magnetic stability."

Iron Core Characteristics

It would be as well, at this stage, prior to describing the various commercial systems of manufacture, that a concise idea be obtained of the various core features. These have been clearly set out and described in PRACTICAL AND AMATEUR WIRELESS many times before, but it is necessary to summarise them here. For our present purpose, we can classify the factors which govern the efficiency of an iron core as follows: (1) Material characteristics, (2) Magnetic constituent, (3) Insulating constituent, (4) Configuration — characteristics, (5) Variation of actual permeability with frequency, (6) Effective permeability of iron-powder agglomerates, (7) The dependence of hysteresis on mechanical and thermal history, (8) Effective hysteresis of iron-powder agglomerates, (9) Variation of hysteresis and hysteresis loss with frequency, (10) Retardation loss, (11) Resistivity, (12) Eddy current losses at high frequencies, (13) Dielectric losses, (14) The total core losses expressed as a power factor.

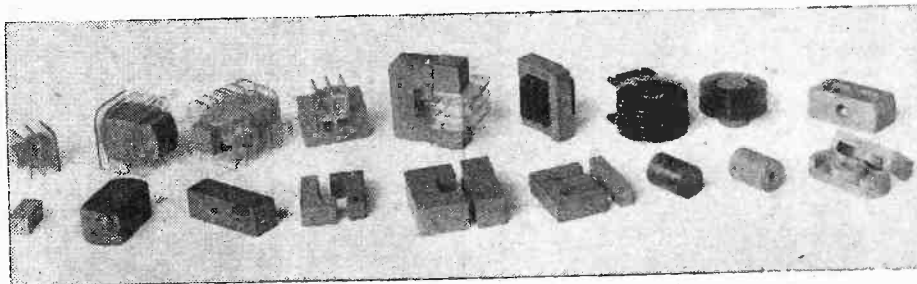
To understand in detail the technical aspect of each of these investigations necessitates a profound knowledge of magnetism, electricity, mathematics, and coil practice.

However, it is significant that even those engaged in this branch of electro-chemical engineering have so far been unable to evolve experimental means or formulæ for assessing the actual specific hysteresis-loss per cycle, beyond estimating that it increases with frequency. The A.C. factor, known as "retardation loss" is also unknown at radio frequencies. Owing to differences in technical circles as to the means of considering dielectric losses, their magnitude and variation so far have not been exactly computed. Hence the comparative "goodness" of any core can only be incorrectly arrived at by measuring its effect on a standard coil of known characteristics.

It seems clear that greater perfection in the operation of iron cores for H.F. circuits will not be attained until exact formula has been evolved to cover the above-mentioned points. There are indications that research will bring about some interesting modifications to existing ideas on the subject.

The maximum amount of iron powder that could be introduced into the "given space" is obviously an amount equivalent to a solid iron bar of equal dimensions. It follows that the iron powder would have to be highly compressed to make one homogeneous mass, necessitating a truly colossal pressure. In actual fact, owing to the 2 to 10 per cent. insulating binder, the most highly compressed powder iron core can never reach the same specific density, and hence the same weight, as a solid iron bar.

Apart from the necessary insulating binder to make the minute iron particles adhere to each other, the latter usually have a fine iron oxide coating which ultimately reduces the weight of the compressed mass. Assuming a standard square bar powder core is to be made $1\frac{1}{2}$ ins. long by $\frac{1}{8}$ in. square in a steel die fitted in a press having, say, a pressure of 200,000 lbs. per square inch, the factors which will govern the permeability of the finished core will be: (1) the size of the iron particles, (2) the composition of the iron particles, (3) the method of coating the particles to insulate them electrically, (4) the quantity of insulating binder to insulate



A group of "Gecalloy" cores and cellulose acetate formers, manufactured by Salford Electrical Instruments Limited.

Furthermore, the production of cores having improved characteristics is bound to popularise permeability tuning. The manner in which such tuners operate was explained in an article by the writer on "Modern Coil Connections" in the Feb. 22nd issue of this journal.

Powder Iron Cores

Basically, all powder iron cores are similar, consisting mainly of iron "powder" and a very small proportion of a binding medium. The size and variety of magnetic iron particles, and the insulating binder, vary according to the use to which the core is put, but the total content of the core remains substantially within the following limits:—

Iron 90 to 98 per cent. Insulating and/or binding medium 2 to 10 per cent. In popular parlance, the chief object of the core manufacturer is to put as much iron powder as possible into a given space, so as to provide a high "apparent permeability" factor combined with low core losses.

the particles magnetically and to render the mass homogeneous.

Testing an Iron Core

A most interesting test which the reader can apply is to measure the D.C. resistance of a powder bar core and a solid iron core of similar dimensions, and to the sizes given above. The solid iron bar will show a resistance which is but an infinitesimal fraction of an ohm, whereas the powder core (such the Standard Telephones type) will offer some 7,000 to 10,000 ohms, measured from end to end with point contacts. Considering the weight of the powder core is little short of the solid bar, the test shows a truly wonderful insulation between the iron particles. One may assume that the higher the resistance the more perfect the insulation and the lower the losses. Presumably, if these features could go hand-in-hand with the existing weight of iron particles (and not by employing a

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greater quantity of insulation), it would lead to the evolution of a more perfect core.

Preparing the Iron Particles

The methods employed in preparing the iron particles, insulating, and binding them together are the subjects of numerous patents. It has already been stated that Patent No. 103,188 is one of, if not, the earliest granted, and this discloses a process whereby thin sheets of iron obtained by electrolysis are broken up into small pieces and cominuted or reduced to small particles in a ball mill, to a size which allows them to pass through a hundred mesh screen.

Such particles are then annealed in a furnace to rid them of occluded gases, such as hydrogen. The annealed particles are insulated by oxidising the surfaces merely by a "rusting" process, which entails adding 10 per cent. by weight of water and heating and stirring the mass until dry. Large eddy current losses are avoided by compressing the treated particles into bars not thicker than $\frac{1}{4}$ in., but preferably into thin sheets. The pressure employed is such that the particles are interlocked by distorting them beyond their elastic limits. Cores from the thin sheets can be built up from twelve to fifteen sections with suitable insulating materials between each sheet.

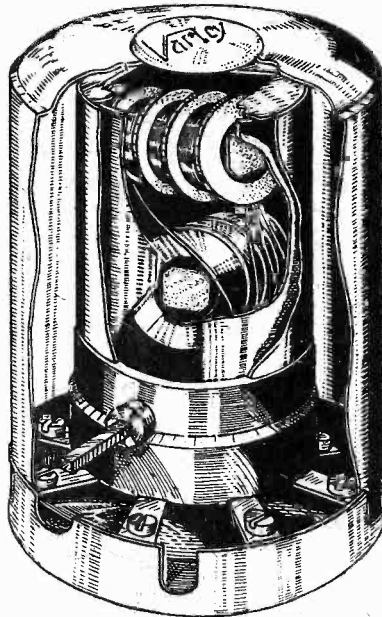
On the basis of present knowledge the method disclosed shows that the permeability factor cannot be high owing to the not inconsiderable amount of iron oxide insulation involved.

A later patent, No. 107,007 by the same company shows an improved method of manufacture. Here the iron particles are similar to those mentioned in Patent No. 103,188, but the powder is annealed at 760° C. in a furnace in a manner which does not allow the particles to oxidise. They are subsequently tumbled in a drum for about 36 hours, pieces of "feathered" zinc (produced by pouring molten zinc into water) being introduced to dry galvanise them. It should be noted that this process only *magnetically* insulates the iron particles. After "screening" the powder through a sieve to remove the lumps of zinc, it is immersed in a bath of weak shellac solution to insulate the particles electrically. The final method of making the cores is exactly the same as for the original type.

Early "Atmalloy" Coil

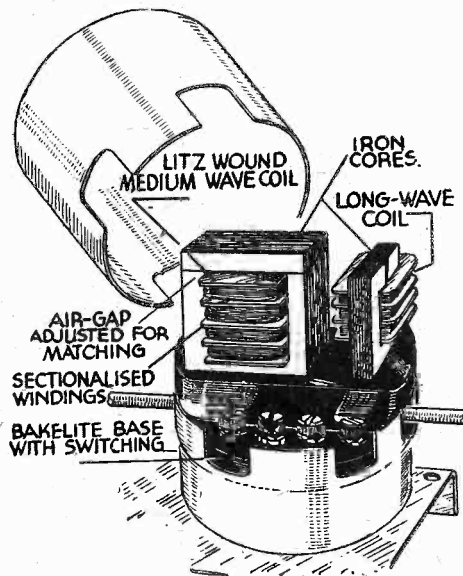
An iron-cored coil of an early type which the writer tested some years ago was the toroidally-wound "Atmalloy" made under Pat. No. 301,784. Although these coils showed distinct promise, their manufacture for radio purposes was not continued so far as it is known. Nevertheless, their core construction is of interest, because it provides another example of the ingenuity displayed in insulating the iron particles. Use is made of commercial iron powder (containing 2 to 8 per cent. silicon), which is annealed in a furnace at 660° C., in airtight pots to prevent oxidation. This annealing process, by the way, prevents the iron from retaining magnetism, and is equivalent to the use of charcoal iron or Stalloy, as compared to mild steel in the construction of bells, A.C. transformers, etc. Provision is made for magnetically separating any iron particles which have not been properly annealed, so as to improve the core characteristics.

After heat treatment, the iron powder is immersed in "Bakelite" synthetic resin varnish of suitable consistency. Air-drying with the insulated iron particles in a state



Part-sectional view of the Varley iron-core tuning coil showing its construction. Note the position of the coils for preventing interaction.

of agitation follows, and the then dried powder is stoved at 250° C. to polymerise the resin, to render it insoluble in the solvent used, and to make the whole heat-resisting. In this final state the iron particles are substantially electrically and magnetically insulated. However, a second coating of varnish is applied and air dried, but not stoved. The powder is ultimately compressed at 20 to 40 tons



The Colvern iron-cored dual-wave tuning unit.

per square inch (this is about half the pressure used on Standard cores) in ring-shaped moulds or dies heated to about 120° C. Ringed cores so produced are claimed to have a specific gravity of 6.2, but a further heating process in an oven at 150° C. follows in order to stabilise the synthetic resin and exclude any volatile matter.

Aladdin-Polydoroff Cores

These cores, together with the associated windings, are covered by about twelve patents. Four grades of cores A to D are manufactured, their construction being on similar lines to those already described. The binder employed is a phenol-resin or

moulding powder, and this substance, combined with very high pressure and heat treatment, results in cores having strong physical characteristics, which can be mechanically worked, turned, or threaded. According to published details, the specific gravities vary between 4.8 and 5.3, which would lead one to assume that a somewhat larger quantity than usual of binding material is employed, which is offset by higher compression, and hence the incorporation of a greater quantity of iron powder than what is usually possible.

We are not concerned here with the core shapes, as obviously, by the use of suitable dies, the "finished" iron powder can be moulded to any desired configuration, and thickness, within its desirable electrical and high-frequency limits.

Recognition of some of these facts, apparently, led to the claims made in Pat. No. 286,800, wherein the use of suitably prepared thin sheets of compressed iron powder interposed with solid iron laminations are claimed to improve the magnetic linkage of windings beyond that possible by the use of laminations above. Material made under this patent (it was little, if ever, exploited commercially) would apply more to coils used exclusively for low radio frequencies such as I.F.T.'s and to L.F. components.

Other Outstanding Patents

It would be impossible to describe here in detail all other patents on the manufacture of cores, because of their number. Outstanding among those filed in England are those due to the G.E.C. (Gecalloy), Paul D. Tyers (Nucleon), one due to the writer, comprising iron-charged cellulose acetate film, which is also coated on both surfaces, and numerous patents of importance due to Hans Vogt, covering the manufacture of "Ferrocort." The last-named core material has been well commercialised, a separate company having been formed to take over its exclusive manufacture.

Ferrocort differs materially from compressed iron cores, since fundamentally fine iron particles are deposited on rolls of paper which are then dried and compressed together. The process, briefly, is as follows. Iron particles, ellipsoid in shape and held in suspension in an insulating solution, adhere to a thin roll of insulating paper which is passed through the trough containing the former. The iron-covered paper strip then passes under combs, which stroke the insulated iron particles into the rows of equal width. Farther along, the strip passes through a coil connected to a D.C. supply, which excites the particles, in so far as to twist and align them so that they are end to end. This magnetic alignment causes the particles to separate transversely, due to their mutual repelling force caused by similar polarity. An orderly arrangement of the iron particles such as described provides these advantages: (1) the end surfaces, being difficult to insulate, are directed longitudinally to form an insulated broken up "filament" in the direction of the magnetic flux; (2) metallic contacts, where they occur, do not encourage eddy currents; (3) improved magnetic conductivity.

In consequence of these features, it is impossible to obtain a resistance reading across a built-up bar of Ferrocort, showing that electrical conductivity at least is non-existent. The building up of cores from numerous "sheets" reduces capacitive eddy currents to a minimum—a most important feature.

(To be continued.)

A PAGE OF PRACTICAL HINTS

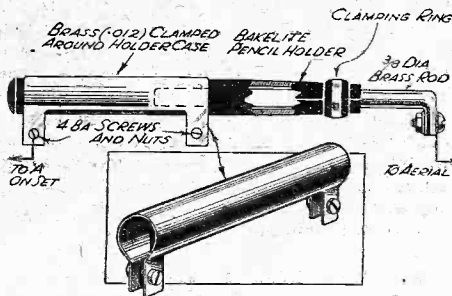
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Novel Pre-set Condenser

WHILST experimenting, I was unable to find a suitable semi-variable small value condenser, and ultimately constructed a very efficient component from an old bakelite pencil holder as

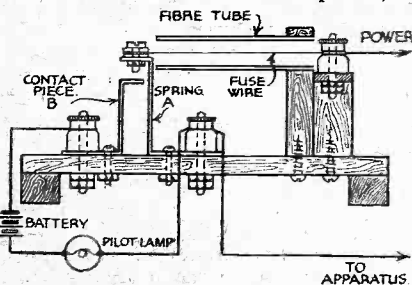


A small capacity pre-set condenser.

described in the following paragraph. The lower end of the holder was covered for approximately 2 1/2 ins. with a piece of brass (.012 in.) sheet, and clamped in position with two 4BA brass screws and nuts; the latter also served as terminals, whilst a brass plunger was made of 3/16 in. diameter rod, and clamped by the ring inside the holder, as shown. Thus the case was used as the dielectric and the capacity could be easily varied by clamping the plunger in various positions inside the pencil holder.—W. A. Harrison (Aintree).

An Alarm Fuse

THE accompanying drawings show an easily constructed fuse which, when it blows, may be made to give an audible or visual indication of its fusing. The fuse wire is stretched between two points, one



An easily-constructed fuse which gives an audible or visual indication when it blows.

is a terminal mounted on a small strip of ebonite fitted on wooden blocks about an inch above the baseboard, and the other consists of a small screw, nut, and washers mounted on a spring brass strip about 3/16 in. wide, shaped and fixed to the baseboard, as shown. The fuse wire maintains this spring strip in a state of tension, and when the fuse blows the spring makes contact with a second brass strip of stouter material and mounted a short distance away from the first strip. A circuit may thus be completed between the two strips to ring a bell or

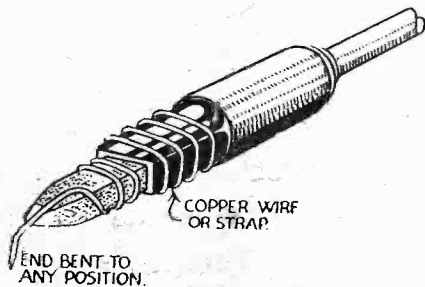
THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

light an indicating lamp. The fibre tube is merely a refinement to enclose the fuse wire and is glued into a small block of wood fixed to the base. Obviously two or more of these fuses can be fixed side by side, utilising the same terminal mounting strip and fibre tube mount, the contact springs being all connected to a common alarm circuit.—J. HADDON (Ibroy).

An Electric Soldering-iron Tip

HERE is a wrinkle for soldering delicate moving-coil instrument leads and wires in awkward places in modern set

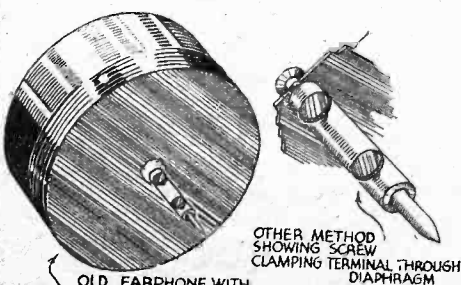


A useful soldering device for fine wires and awkward corners.

chassis, which cannot be reached with the usual soldering-iron tip. Simply wrap a piece of annealed thick copper wire or copper strap around the copper bit and bend the end to the desired position, as shown in the sketch. For meter repairs a smaller diameter wire can be wrapped around the bit.—J. E. RYAN (Cape Town, S. Africa).

An Improvised Pick-Up

AN efficient pick-up can be made from an old ear-phone in the manner illustrated in the accompanying sketch.

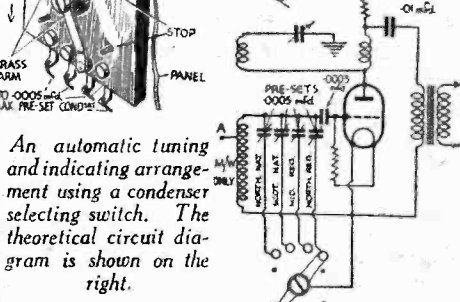
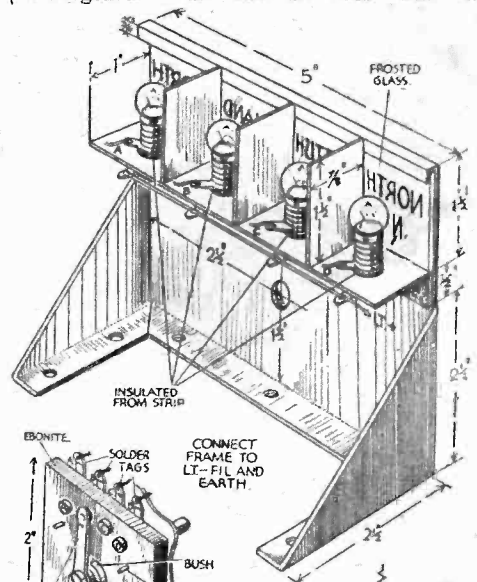


Adapting an old ear-phone for use as a pick-up.

One end of a double-ended connector is soldered to the centre of the 'phone diaphragm, so that the other end in the connector, with one of the clamping nuts, protrudes through the centre hole in the 'phone cap. An alternative method is to fix the end of the connector to the diaphragm by means of a small screw, as shown in the right-hand sketch. When in use an ordinary gramophone needle is fixed in the end of the connector by the small clamping screw.—J. PLATEN (Brixton).

Automatic Tuning

AS I had to design an automatic receiver for some old people, I incorporated automatic signalling at the same time, and the attached sketches show the complete arrangement. It will be seen that in



addition to the use of pre-set condensers for tuning to four stations, I also incorporated a fixed reaction circuit and made the condenser selector switch also change the small pilot bulbs housed in a small metal chassis behind windows carrying the station names. The framework is of aluminium, which is light and easy to work, and the entire assembly is very small indeed. Care should be taken to ensure that the ebonite spacer is large enough to keep the ends of the studs from touching the metal frame.—J. McLELLAND, (Liverpool).

Practical Television

April 11th, 1936. Vol. 2. No. 24.

CATHODE-RAY TIME BASES.

The Characteristics of these Television Circuits are Described in this Article.

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

THE electrical time base, having the dual function of providing the H.F. and L.F. current variations necessary to produce the fluorescent spot movement in a cathode-ray tube, is an extremely important piece of apparatus. Any failure to generate the correct saw-tooth action previously described will result in an imperfectly constructed picture, so that a fair knowledge of its characteristics is essential if the best results are to be obtained by the user.

Two Important Points

First of all, it should be quite linear in action, that is to say, the velocity of trace must be uniform with time. If this is not so, the picture will exhibit a crowding effect at the end traces in both the horizontal and vertical directions, and a reconstitution of the televised scene in its true dimensional ratios becomes impossible. Again, the flyback or return stroke at the end of each line and picture trace must be sufficiently

referring to Fig. 2, which shows the static characteristic for a pentode valve under these conditions of working.

Action

Referring back to Fig. 1, therefore, the action involved in producing the saw-tooth

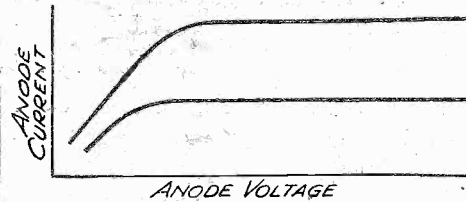


Fig. 2.—Showing how with a screened pentode valve the anode current is constant after a certain minimum anode voltage is reached.

pulses follows somewhat on these lines. First of all, the bias conditions for the indirectly-heated pentode valve are set by potentiometer adjustments as shown, the main H.T. supply voltage depending primarily on the total voltage required in order to make the beam of electrons in the cathode-ray tube make a full sweep across (or down) the available screen area on which the television picture is reconstituted.

The steady current from the valve V1 passes into the condenser C, and so charges it up uniformly. Due to this steady feed, the voltage across the plates of C rises uniformly with time which, as we saw earlier, was necessary to secure linearity of action in the time base itself. Neglecting for the moment the gas-filled relay, V2, the

course of manufacture. Furthermore, the current passed through the device is not a flow of electrons in the same sense as a receiving valve, but is an actual arc discharge between the positively charged anode and the heated cathode. This discharge is brought about by the process of ionisation, and for given conditions of electrode separating distances, gas pressure etc., there is a very definite minimum voltage, which must be reached before the arc or visible ionising discharge can take place inside the valve.

Then, again, the grid performs a function which differs from ordinary valve technique. Variations of anode current are not brought about through the medium of this electrode, but it alters the anode voltage value at which ionisation occurs in the relay. This measure of control is expressed as the "grid control ratio" which, in terms of figures in the case of a relay having a ratio of 25 and a negative grid voltage of 8, means that it would require $25 \times 8 = 200$ anode volts in excess of normal to cause an arc discharge.

Limiting Resistance

The grid exercises no further control when ionisation is present, and the discharge is stopped by interrupting the anode circuit or reducing considerably the voltage. Since the internal impedance drops to a very low value under ionising conditions, a limiting resistance is included in the anode circuit, as shown in Fig. 1, to ensure that the anode current does not exceed the maker's rating.

Different relays have different characteristics, but in Fig. 3 is reproduced the average characteristic curve for an Osram gas-filled (mercury vapour) relay type G.T.1, and it is seen that to increase the sweep voltage both the anode and critical negative grid volts need to be increased accordingly.

Having appreciated the relay's inherent action it is easy to see now how the time base functions in its saw-tooth manner. The steadily rising voltage across the condenser C (and hence between anode and cathode of the relay) makes the fluorescent spot move at constant velocity in its direction of trace until the limiting voltage set by the negative grid-bias and grid-control ratio is reached. Ionisation occurs at once, the voltage drops, and the condenser is discharged rapidly. This brings about a collapse in the electrostatic field between the pair of deflector plates, and the fluorescent spot flies back to its original datum line. The initial conditions being thus restored, the process begins all over again, and this spot motion (resembling somewhat that of a cam action) is repeated a number of times per second.

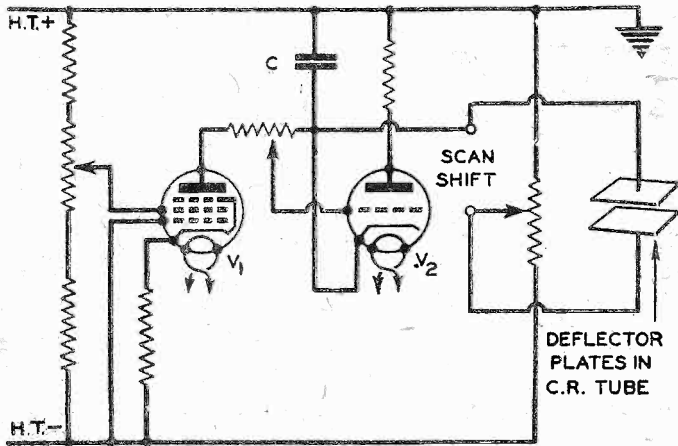


Fig. 1.—A typical time-base circuit using a pentode valve and a gas-filled relay.

rapid to remove any diagonal bright white lines across the picture. In developing time bases to conform to the rigid standards of television, many schemes have been tried, and although perfection has not been reached the arrangement shown in Fig. 1 is representative of a good quality time base scheme for use in conjunction with electrostatic deflection.

A simple form of time base, using a neon gas tube in conjunction with a diode valve, has been illustrated before to indicate the principles of action, but this arrangement suffers from many drawbacks. The voltage range between the values for ionisation to start and stop in the neon lamp is limited, while, in addition, the diode valve functioning in a saturated condition is unreliable. It is preferable, therefore, to replace the neon lamp with a gas-filled relay, and the diode valve with a pentode valve whose operating voltage conditions are such that the anode current remains constant over a relatively wide range of anode voltage variations. This fact can be verified by

which is in parallel with the condenser, C, the steadily rising voltage will be imparted to the pair of electrostatic deflecting plates marked "shift" and "scan" respectively in Fig. 1. The changing electrostatic field of force concentrated between the plates, and between which the beam of electrons is made to pass on its journey to the fluorescent screen of the tube, will cause the beam to move horizontally or vertically, depending upon whether the plates themselves are mounted in a vertical or horizontal plane. On the completion of the spot trace across the screen it is necessary to restore the electrical conditions to those which operated at the beginning, and it is here that the gas-filled relay V2 comes into action.

The Gas-filled Relay

Whereas in an ordinary valve the glass envelope is exhausted, with these relays a filling of mercury or helium vapour is given at a certain pressure during the

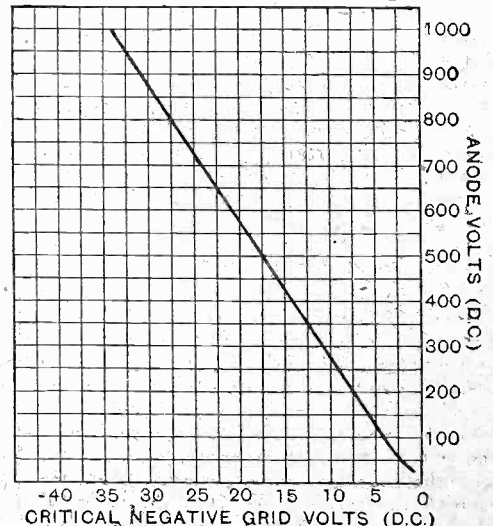


Fig. 3.—The characteristic curve of a gas-filled relay.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

A. S. D. (Harrogate).—The arrangement should be quite satisfactory, and the number of valves would depend upon the type of recording. No doubt, two valves would be adequate, and the arrangements of mike and cutting stylus would have to be chosen by experiment.

C. J. C. (N.W.2). We have no details of a superhet of the type mentioned in your letter.

R. A. (Swinton). The component in question is a standard tuning coil, covering the same range as the aerial coil. This is known as a tuned-anode coil. The crystal may be obtained from Electradix Radios, of Upper Thames Street, London, E.C.

J. Q. (Ramsey). The lack of voltage can only be due to a resistance in the L.T. wiring, and if the reading across the valveholder is only 1 volt, whilst all valves are out of the sockets, and at the accumulator it is 2 volts, we suggest that you examine the L.T. battery leads as well as the wiring in the set. Make certain also that the switch is clean and making good contact.

J. F. McL. (South Shields). It is impossible to give you the details asked for from the information supplied by you. No doubt that is why the firms in question did not give you satisfactory replies. If you will send a sketch of the set or give some further details we will endeavour to help you. There are many 7-pin valves, and the circuit employed must be known before the connections can be given.

N. L. (Bradford). The noises may be atmospheric, or local interference which is not picked up on the local due to the fact that you use an H.F. volume control which reduces sensitivity on the local.

W. S. (High Wycombe). You do not state what source of H.T. supply you are employing, and this may be the cause of the trouble. There should be no hum with a battery receiver, and this leads us to suppose that you are using a battery eliminator, which is unsuitable for this particular receiver.

A. R. (West Bromwich). We have not carried out any experiments in the direction mentioned in your letter, and are unable to advise you on the matter.

C. K. A. (Blackpool). The choke in question should be quite suitable, as also should your valve.

J. B. (Low-Fell). Full details of the set in question may be seen in PRACTICAL AND AMATEUR WIRELESS dated August 31st, 1935, and this issue may be obtained, price 4d. A blueprint is also obtainable (PW56), price 1s.

J. G. S. (Earl's Court). The crystal may be obtained, price 6d., from Electradix Radios, Upper Thames Street, E.C. A complete detector using the crystal is obtainable from the same source, price 2s.

R. J. G. (Denmead). No further details can be given concerning the transmitter, and if you are eligible for a transmitting licence you would be able to answer the points raised in your letter.

A. J. L. (Willaston). We cannot give the value of the resistance without knowing the current flowing. This will be the total of all the valves in the set, and it should be divided into the grid bias required and the answer multiplied by 1,000. The resistance should be included in the H.T. negative lead.

R. W. B. (Durham City). Back numbers of our issues are obtainable from this office, price 4d.

R. R. R. (Hove 2). The additional voltage is certainly not detrimental, and may be applied continuously in place of the 36 volts originally mentioned.

J. B. (St. Andrews). The trouble may be due to an overloaded H.T. supply, or to some interaction in the wiring of the set. Further details cannot be given without some circuit information and preferably a diagram of the set.

G. A. (Colombo). The blueprint in question costs 6d., but the issue in which the construction was described is now out of print.

R. E. (N.9). The defect is probably inherent in the instrument and it may not be possible to effect any improvement. On the other hand the trouble may be due to the circuit with which it is being used, in which case the remedy is obvious.

R. McQ. (Manchester). Write to the Radio Society of Great Britain, Victoria Street, London, S.W.

A. I. C. M. (Deaf). If your sketch is quite accurate your trouble is due to the fact that you have confused the grid and screening grid terminals on the detector valve-holder. As shown by you the grid condenser and leak is joined to the screening grid and the control grid is joined to the H.T. potentiometer.

C. D. R. (Skerton). We can supply blueprints of the Midget-Short-Wave Two (P.W. 38A), or the Ultra-Short Battery Two (WM. 402), or the Home-Made Coil Two (A.W. 440). The issue in which the construction of the latter was described is now out of print, but back numbers of the other two books are still obtainable.

W. C. (Turners Cross). Your coil idea is not new, but has been described by us on several occasions. It is quite in order and works quite satisfactorily.

A. P. (Everton). The H.T. battery is now probably run down and this would account for the bias not functioning. On the other hand, there is a possibility that the valve has been damaged, due to the non application of the bias and you should therefore have both the valve and the H.T. battery tested. Your difficulty with the Class B amplifier is probably due to the same cause.

L. R. M. (Chalfont St. Peter). A special Class B mains unit may be obtained and will prove quite satisfactory.

GET THIS IMPROVED REPRODUCTION FROM YOUR SET!

VOLUME 20% GREATER

The improved—and larger—"Mansfield" magnet brings a substantially higher sensitivity. The increased loudness, not being obtained at the expense of "balance," is comfortably accommodated by the ear. It materially increases the "realism" of the performance.

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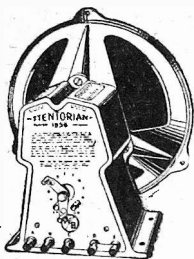
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1936 STENTORIAN

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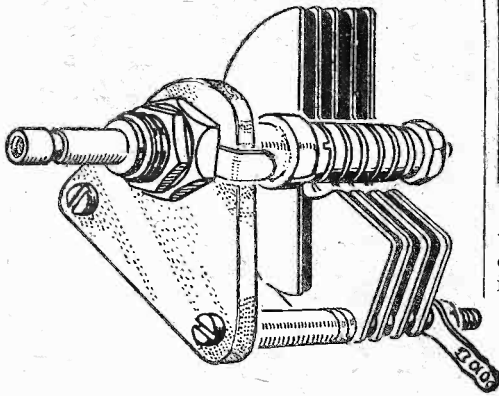
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Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

New Raymart Condensers

SOME new micro-variable condensers are being introduced into the Raymart range, and these will eventually supersede the micro-variables types VC15, VC40, and VC100. In general construction they are similar to those condensers, but possess an end plate of ceramic material which has been specially designed and has a remarkably low-loss factor. It is claimed, as a matter of fact, that this is one quarter of that which is claimed for the well-known American Isolantite. The condensers have the usual brass vanes, and the ball race which is fitted for smooth operation is electrically short-circuited to avoid noises. A direct connection is provided for the rotor section, and this avoids many of the difficulties which are met with in a pigtail, such as noises, variation in tuning due to inductive effects, etc. The condenser is



The new ceramic Raymart micro-variable condenser.

robust and is provided with a one-hole fixing bush, and where it is desired to effect screening from the hand of the operator, or for other mounting purposes, the small bracket shown in the centre of the page will be found ideal. This costs only 3d. and may be used for any standard one-hole mounting device or for extension handles, etc. The reference number of the 100 m.mfd. condenser illustrated is VC100X, and the price is 1s. 10d. Two other types are available, VC15X (15 m.mfd.), costing 1s. 4d., and VC40X (40 m.mfd.), costing 1s. 7d.

New Mullard Battery Valve

A NEW output pentode is announced from the Mullard company, and this is designed for the battery-operated receiver. It is claimed to be the first high sensitivity output pentode ever produced for battery receivers, and in most sets it will be interchangeable with the existing output valve with an amazing increase in volume. The valve is rated at 2 volts .3 amps., and the maximum H.T. is given at 150 volts, which value is applied also to the auxiliary or screening grid. At an average working voltage of 135 volts, with 2.4 volts grid bias, the average anode current is only 5 m/A. This particular grid voltage value is not obtainable directly from an ordinary bias battery (which is, of course, in multiples of 1.5 volts), and therefore it is necessary, in order to take

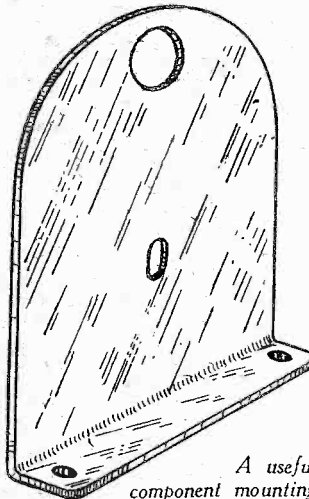
full advantage of the characteristics of the valve, to adopt a different method of obtaining the bias. The simplest scheme is to fit a potentiometer across the grid bias battery, as is done in the case of variable-mu H.F. stages, although, of course, a resistance in the H.T. negative lead may be employed to provide automatic bias of the required value.

To overcome inevitable variations in the consumption of H.T. current when a given output is demanded of individual valves, a system of grading has been adopted by the manufacturers, and this is arrived at in terms of auxiliary grid voltage, and correct replacement has been ensured by marking both valve base and glass envelope with the alternative grade letters A or B. The following table shows the appropriate grades for 120 volts and for 135 volts H.T. supplies:—

Grade	Auxiliary Grid Volts	Anode Volts	Grid Bias Volts	Average Anode Current
A	135	135	-2.4	5 m/A.
B	120	135	-2.4	5 m/A.
A	120	120	-2.4	3.8 m/A.
B	110	120	-2.4	3.8 m/A.

If the valve is used to replace some of the earlier types of pentode of the high output type, there will be a substantial increase in volume without any increase

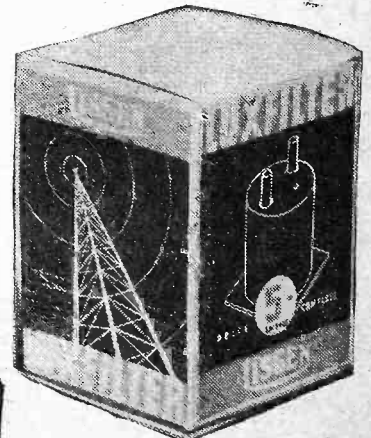
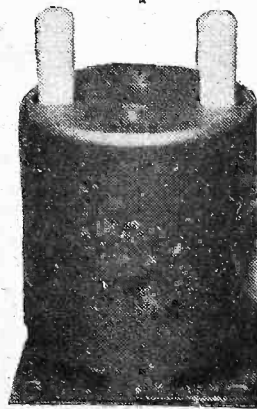
in anode current drain, although, of course, the L.T. load will be slightly increased. The latter point is of no moment in the majority of cases, as it only extends to .1 amp. The price of the valve is 13s. 6d., and the type number is PM22D.



A useful component mounting bracket from the Raymart range.

Pye Service Accessories

PYE RADIO are also introducing to the service engineer some interesting accessories designed to simplify the task of servicing modern receivers, and in the "Trimkit" a number of specially-made trimming tools are to be found in which a material known as "Tufnol" is employed, together with four resistances suitable for loading purposes. These are designed primarily for use with Pye receivers, but they are no doubt applicable to other types of superhet and will be found of the utmost use by service engineers.



This is the Lisen Luxfilter which was reviewed last week.

Another interesting service aid is found in a series of valve adapters for 4-, 5-, 7-, and 9-pin valves. A standard valve base, is fitted with a cable to a standard valve-holder mounted on a small switch panel, and this has sockets which enables meters to be connected to various parts of the valve circuit to measure voltage and current ranges. The Trimkit costs 10s. 6d., and the adapter for 4-, 5-, and 7-pin valves costs 10s. 6d. For 9-pin valves, the price of the adapter is 12s. 6d.

A New Wharfedale Speaker

FURTHER to increase the range of Wharfedale speakers a new Super Bronzian is now being added. This is designed primarily for use as an extension model and is fitted with a universal matching transformer. The "Truqual" volume control is fitted to the cabinet, which is further lined with Celotex in order to improve the tone and avoid difficulties due to resonance. Although designed primarily for use with a number of commercial receivers, the speaker will be found also of general use. The price is £3 7s. 6d., or without the matching transformer, £3.

New B.T.H. Pick-up

THE Minor pick-up, which has for a long time been popular amongst home-constructors, is now available in a lower-priced model with improvements in design which render it still more a valuable accessory for those who are constructing a radiogram or who wish to use their present receiver for record reproduction. In the new model the total weight has been reduced, and the effective weight on the record is now only 2½ ozs. In addition to this, the clamping has been made lighter, and the impedance has been increased. The results of these changes are shown by the fact that the output level has been raised and is now just over 1 volt at 1,000 cycles.

The general appearance of the pick-up is practically unchanged, a one-piece bakelite moulding being employed for the casing, and a volume-control is fitted to the rear, operated by a lever in the base. The resistance of this control has also been increased and is now 30,000 ohms instead of 10,000 ohms. The effective frequency range extends from 50 to 6,000 cycles, and the price is 17s. 6d.

50 Tested Wireless Circuits

By F. J. CAMM
(Editor of "Practical and Amateur Wireless")
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OUR FREE CATALOGUE SERVICE

EDDYSTONE SHORT-WAVE COMPONENTS

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prints" concludes this interesting catalogue and a full page is devoted to illustrations of the range of set-testing apparatus which will have a special appeal to the Service Engineer.

EDDYSTONE components are well known to short-wave enthusiasts for their careful design and efficiency, which is the result of years of specialisation and research work. A new list just issued by Stratton and Co., Ltd., covers a comprehensive range of these high-class components, covering every phase of short-wave work. Among the 'new' components listed is an air-dielectric microdenser for general short wave, and made in three capacities varying from 6.75 m.mfd. to 103 m.mfd. There is also a new "Scientific" S.W. Condenser of all-brass construction and soldered vanes, the capacity ranging from 13.5 m.mfd. to 180 m.mfd. This condenser has noiseless bearings, a special screened pigtail, and an extending spindle for ganging purposes. Other new components include a featherweight crossfeeder block of special design, and steel racks suitable for transmitting equipment, public-address amplifiers, and other apparatus. These racks are constructed of pressed sheet steel, and are black ripple finished. The popular types of coils, I.F. transformers, chokes, condensers, and insulators are also included in this useful and well-printed list.

WEARITE COMPONENTS

THE new edition of the Wearite catalogue includes the recently-introduced Uni-gen coil which is a modification of the Universal and Universal Type A coil. In this new model a tapping is provided on the primary winding, and in addition there are other modifications rendering the coil suitable for UNIVERSAL GENERAL use. Also included in this catalogue are the complete range of coils of the air-core and the iron-dust core types which cover ordinary aerial circuits, superhet circuits, and intermediate-frequency transformers. A useful wave-trap which is suitable for operation on both medium and long waves, and which employs an iron core, Class B and Q.P.P. transformers and chokes, mains components, and a wide range of switches also take their place in this interesting display of components. There are high-frequency chokes for all circuits from the simple type of small choke suitable for ordinary reaction circuits to the high-inductance model designed for H.F. coupling with high-impedance valves, and a short-wave section also provides a good idea of some of the useful short-wave components. A list of the Wearite "350" series of circuit "Black

BOOK RECEIVED

B.B.C. ANNUAL, 1936

WILL the listener of the future watch an orchestra playing throughout an entire concert, or will his listening to its music be merely reinforced by vision from time to time? Will talks be accompanied by continuous or intermittent pictures, showing the speaker or documentary material illustrating his theme, or a combination of both? What will be the effect on speakers if they have to consider the appearance which they are presenting to unseen audiences, as well as the effect of their voices upon them? These and other questions are discussed in chapters dealing with television in the "B.B.C. Annual."

A complete analysis by counties reveals that Selkirk, with 27 per cent., had more licences to population than any other county in the British Isles, at December 31st, 1935. Allowing four or five persons to each household it would seem that saturation point may have been reached in this single instance.

The message broadcast by King George V on the occasion of his Silver Jubilee on May 6th, 1935, and his late Majesty's Christmas broadcast to his people are reproduced in extenso.

The largest section of the Annual deals with British Broadcasting in 1935, sub-divided under programme headings such as music, drama, variety, and talks, and containing in addition informative articles on engineering, finance, and public relations. The whole division forms a comprehensive survey of the activities of the Corporation during 1935.

SPECIAL NOTICE

Indexes for Vol. 7 are now ready, price 7d. each. Binding case and index cost 3/6 by post from Geo. Newnes, Ltd., 8/11, Southampton Street, London, W.C.2.

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

THE WIRRAL AMATEUR TRANSMITTING AND SHORT-WAVE CLUB

THE inaugural meeting of the above club was held on March 25th at the secretary's house. There was a satisfactory attendance, and a committee was elected consisting of five of the members. This was followed by the drawing up of a series of regulations, and an informal discussion on "tri-tets." The next meeting is to be held in Heswall on April 22nd. Many more members are required, and those wishing to join should write to B. O'Brien, Hon. Secretary, "Caldy," Lrby Road, Heswall, Cheshire.

STRATHAVEN AND DISTRICT WIRELESS CLUB

A MOST interesting and instructive meeting of the above club was held on the evening of Wednesday, March 18th, when twenty-two members were present to hear a lecture on "Mains Transformers and Equipment," given by Mr. J. H. Clow, a member of the Radio Society of Great Britain.

The painstaking care of Mr. Clow to make the various points clear to all was greatly appreciated, and the manner in which he answered the various questions put to him after the lecture showed that Mr. Clow had made a very close study of the subject. This club has recently acquired its own premises which are open every night with the general meeting on Wednesday evenings. An attractive programme has been arranged and any person wishing to join is requested to get in touch with the Secretary, Wm. L. Howat, who will be pleased to give full particulars.

SHORT-WAVE RADIO AND TELEVISION SOCIETY (THORNTON HEATH)

THIS society held their Eleventh Annual Dinner at the Café Royal, Croydon, on Wednesday, March 18th. Unfortunately, the President of the Society, Lt.-Col. Hon. G. K. M. Mason, D.S.O., M.P., was unable to be present owing to political engagements, but during the evening a letter from him was read congratulating the society upon its activities and wishing it success in the future. The toast of The King was proposed by the Chairman, Mr. R. E. G. Copp.

After the dinner a concert was held, the artists being Mrs. D. Sharpe (soprano), Mr. Dudley Marchant (light comedian), Mr. L. Moscorp (baritone), and Mr.

O. L. Crossley, M.P.S. (chemical magic). The accompanists were Mrs. Mitchell and Mr. Webber.

The weekly meeting of the above society was held at St. Paul's Hall, Norfolk Road, on Tuesday, March 24th, presided over by Mr. R. E. G. Copp.

Mr. J. Hodges gave a demonstration of the new model Ekco Receiver AD37. Before demonstrating the receiver Mr. Hodges gave a short talk on its construction and pointed out that reaction was applied and controlled by a pre-set condenser at the rear of the chassis. The valves used are VP 13c, SP 13c and Pen 36c. The receiver is universal, the consumption on A.C. being approximately 81 watts and on D.C. 67 watts.

The meeting closed with a vote of thanks to Mr. Hodges. The Hon. Sec. is Mr. Jas. T. Webber, of 368, Brigstock Road, Thornton Heath.

WELLINGBOROUGH AND DISTRICT SHORT-WAVE RADIO AND TELEVISION SOCIETY

THE first meeting of members of this society took place at the Midland Hotel on March 23rd, and was attended by forty local enthusiasts. After the routine business of the meeting, an address was given by Mr. L. F. Parker, G5LP, on "The Design and Construction of a Modern Two-Valve Short-Wave Receiver." This was followed by questions, and an informal discussion, together with a demonstration of the receiver described in the talk.

All PRACTICAL AND AMATEUR WIRELESS readers in the district who are interested are invited to join, and full particulars and dates of meetings, etc., are available from Mr. L. F. Parker (G5LP), 127, Jubilee Crescent, Wellingborough.

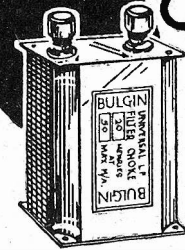
THE CROYDON RADIO SOCIETY

THE meeting on Tuesday, March 24th, of the Croydon Radio Society, in St. Peter's Hall, South Croydon, was of rather a novel nature. Five volunteers were called upon to lecture on any subject they liked for ten minutes. The first was the Technical Adviser, who spoke on how musical instruments worked, how notes were dependent upon their length, and what happened when air started vibrating in them. Mr. J. T. Haynes followed with a story of the weird behaviour of his apparatus, in which the loud-speaker at one side of the room gave full volume even when not connected to its amplifier across the room. Mr. M. G. Firmin, who caused such a sensation with his mica-cone triple speakers at the last loud-speaker night, spent an interesting ten minutes on mica cones, and Mr. V. C. Chubb described his public-address apparatus: The crooner, acoustically on a level with a crystal set, was most difficult to amplify. Finally came Mr. L. F. Marshall, who spoke on the grid system of electricity distribution, having many interesting technical points to relate.

Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, South Croydon.

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FOR POWER L.F. CHOKES



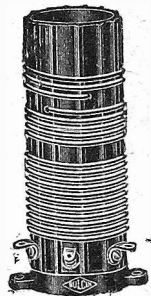
Here is a range of good quality chokes upon which you can rely for efficient and long service. In accordance with modern requirements they are suitable for heavy duty uses, having low D.C. resistance and generous magnetic cores. Aluminium finished metal screening cases for universal mounting.

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L.F.18	10 60 320	10/6 EACH.
L.F.14	20 50 400	12/6 EACH.

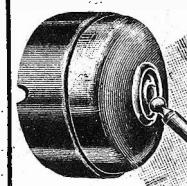
12-95 METRES 3-Range Coils

These three-range short-wave coils may be used in all sets and adaptors of both straight and superhet types. Covering three wavebands 12-25, 24-50 and 46-95 metres approx. One coil has additional windings on each range which may be used for reaction. The second is similarly arranged, with looser coupling for the aerial circuit.

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PRICE 3/6 EACH.		



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LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.



All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Reception of U.S. Amateur W2BSD

SIR.—We note that one of your readers, D. C. Locke, of Thorney, raises the subject of the American amateur station W2BSD in the issue of PRACTICAL AND AMATEUR WIRELESS dated March 7th, 1936. For some time past we have been receiving this station almost nightly, and he is probably one of the best U.S. amateur transmitters heard in this part of the country at the present time. The operator is Mr. Ted Healy, and the station is situated at New Rochelle, New York.

In a recent communication he informs us that his carrier is 700 watts, but he can, and does on occasions, increase this to 1 kilowatt at a frequency of 14,170 kc/s.

When reception conditions on the 20-metre band are favourable, his signal strength is regularly R8-9, QSA 5, and he appears to transmit most of the day and every day, except Saturday and Sunday, and may be heard on occasions re-transmitting other smaller-powered U.S. transmitters. Incidentally, the British station he often contacts is G5NI.

In passing, we might mention that the evenings of March 4th and 5th were, in our opinion, the most favourable to the 20-metre band for some months, and some thirty to forty U.S.A. amateurs were logged here on these two evenings.

Trusting the foregoing may be of interest to Mr. Locke and other readers.—NORMAN F. HOLDEN, B.Sc., H. WORSLEY (Assoc. Manchester College of Tech.) (Cheadle, nr. Manchester).

Correspondent Wanted

SIR.—I have been a regular reader of PRACTICAL AND AMATEUR WIRELESS for some time, and I wish you all the success you deserve for a very informative and interesting paper. I should like to get in touch with any short-wave enthusiast in the Royston, Herts, district.—E. P. ROSENDALE (Litlington, Royston).

From a Reader in Cairo

SIR.—In answer to the letter from D. C. Locke (Thorney) in the 7th of March issue of PRACTICAL AND AMATEUR WIRELESS I should like to state that I get W2BSD New York almost every night, or, rather, morning. A further sample of his calls are:

W2BSD working G5NI (Birmingham)
W2BSD working G5ML (Kenilworth)
W2BSD working G6XR (Coventry)
W2BSD working EA2BP (Spain?)
W2BSD working ON4PA (Belgium Experimental)

The Birmingham station G5NI is very popular with the Americans and well worth listening to. He also "comes over" at good strength. I should like to add that I always look forward to the PRACTICAL AND AMATEUR WIRELESS mail day, and how much I enjoy reading your excellent paper.—FRANK HARDY (Cairo, Egypt).

Good Reception of Addis Ababa

SIR.—On Sunday, March 22nd, at 21.35 G.M.T. I was lucky enough to hear the first of a series of broadcasts from Addis Ababa on a wavelength of 25.09 m.

The announcer said that the station (ETB) would be on the air again next Sunday night (March 29th) at midnight (Abyssinian time, or 21.30 G.M.T.) with a speech by the Empress of Abyssinia, and every Sunday at this time with other interesting items. The transmitter used was a standard telephone one using $3\frac{1}{2}$ kW power and di-pole aerial. The mike used was of the carbon type, but even so the quality was quite good. Using an 0-v-2 receiver the strength was R6-7 QSA 5. No QRM but slight QSB. Reception reports were invited and were to be sent to "Broadcast," Post Box 283, Addis Ababa, Ethiopia.—A. H. MUSTON (Weymouth).

Short-wave Correspondent Wanted

SIR.—I shall be glad to get in touch with a short-wave listener and constructor in my district.—L. COLLEY (age 16), Seabird Bungalow, Hollym Road, Withernsea, E. Yorks.

Address Wanted

IF Mr. Alex. Neill, of Belfast, will forward his address to this office, the back number of PRACTICAL AND AMATEUR WIRELESS he required will be sent on to him.—ED.

Back Number of "A.W." Wanted

SIR.—I should be very much obliged if any reader could supply me (on loan) with a copy of AMATEUR WIRELESS containing the wiring diagram, or blueprint, of the 1933 Ether Searcher. I shall be pleased to pay postage for same.—P. ROBERTS, 37, Princess St., Bury, Lancs.

Correspondent Wanted

SIR.—I have been a reader of your paper ever since it started, and I think it is one of the best wireless weeklies. I should like to see published particulars of a large all-wave superhet. with a push-pull output stage giving 12 watts undistorted output for quality reception.

I am also interested in 5-metre reception, and would like to get into touch with someone transmitting in this district who could help me in building a portable transmitter.—ROWLAND CRETNEY (Didsbury, Manchester).

[If any interested reader cares to write to Mr. Cretney, care of the Editor, the letter will be forwarded.—ED.]

Charging Accumulators

SIR.—Mr. Bolton reproduces part of his letter of Jan. 25th to show that I have misinterpreted the remarks in question. But perhaps a fuller quotation will show that the writer's real intentions were not so apparent as he would have us believe.

"Now, if the accumulator was disconnected with the power still switched on, there will be a potential difference of 250 volts between the cable ends, but, naturally, no circuit will flow as the circuit is disconnected. Bearing in mind that the resistance of a 100-watt lamp only permits the flow of .4 amp. in a closed circuit, if we did, accidentally, touch the live ends (on the accumulator terminals) the shock received would definitely not be drastic

provided the insulation of the mains supply, at this instant, was in good condition. Under normal conditions the person's body would scarcely be passing 4 amp., if we take into consideration the resistance of one's body, plus the resistance of the lamp."

In my criticism, I assumed, from the opening and concluding sentences above, that the person's body bridged the gap left by the disconnected accumulator, thus forming a series circuit with the lamp resistance. If, as the writer says, that is incorrect, how, then, can we "take into consideration the resistance of one's body, plus the resistance of the lamp"?

From Mr. Bolton's drawing, a person touching the accumulator terminals is in contact with the negative main. If he is well insulated, nothing happens. If he is in good contact with "earth," a small leakage current flows in parallel with the charging circuit. In neither case has the lamp resistance anything whatever to do with the result. Least of all does a "virtual short-circuit" take place.—JAMES J. BEVERIDGE (Glasgow).

Reception of VP3MR and W2BSD

SIR.—It may be of interest to Mr. D. T. Donaldson (whose letter appears in PRACTICAL AND AMATEUR WIRELESS dated March 7th, 1936), and other readers, to know that VP3MR, Georgetown, British Guiana, comes in here at R9, dropping to an occasional R7. It fades very little. Its quality is not up to the usual broadcasting standards, but this is perhaps explained by the fact that its power is only 0.05 kW, so that modulation would be sacrificed a little in order to "get over."

Re Mr. D. C. Locke's letter in the same issue of your splendid paper, he may like to know that W2BSD, of New York, on the 20-metre band, is usually an excellent signal here, and is certainly a most interesting station.

I use a very low aerial 15 feet long, and my set is an 0-v-1 with a pentode in the output stage, and all my listening is done on 'phones.—R. P. M. TILLEY (Norwich).

CUT THIS OUT EACH WEEK.

Do you know

—THAT as much as 15 watts may be obtained from a single power valve in a straight mains receiver.

—THAT in the push-pull circuit the undistorted output which may be obtained is nearly half as much again as is obtained from each individual valve.

—THAT an ordinary type of meter cannot be used for measuring the normal current in a Class B stage.

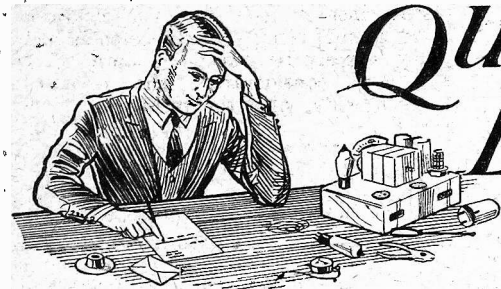
—THAT a badly arranged indoor aerial can be the cause of serious hum difficulties due to induction with mains wiring in the walls.

—THAT a mains receiver should always be joined to the mains via a suitable fuse.

—THAT special paxolin strips are obtainable to assist in the connection of a number of fixed resistances in a receiver.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, Gen. Nevenes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.



QUERIES and ENQUIRIES

Superhet Tuning

"I have decided to build a superhet, and obtained a number of components from a market stall which I recognised as being of standard and well-known make. Unfortunately, in my enthusiasm, I obtained a ganged condenser which was of the equal-section type and, on taking this back, the stall-holder would not exchange it for me. Is there any way in which I can utilise this condenser to save wasting it? I believe it is possible to use fixed or pre-set condensers to make up the circuit, but should appreciate values and connections for the purpose."—B. W. A. (Perth).

WE are sorry that we cannot give the information, although you are quite right in your assumption that the circuit may be built up with fixed condensers. The values of these will, however, depend upon the circuit which is being used and the intermediate frequency which has been selected, and in the absence of such information we are unable to suggest the necessary values and connections. The makers may be able to assist you if you know who made the components, or if you can let us have the necessary details we may be able to supply the correct connections.

The Monitor and a Mains Unit

"Will you please be so kind as to say whether or not the Monitor 3 could be worked to full efficiency from an H.T. eliminator?"—E. V. P. (Malta).

IN general it may be taken that a battery eliminator will deliver a more constant and better H.T. supply than a battery. Against this must be set the fact that the supply may not be so smooth, but it will be maintained at the same level all the time the set is in use and will not fall off after the set has been in use for some time. Thus it may be used with any battery receiver, and the only difficulty likely to be encountered is in instability due to the fact that the load is common to all the anodes. In this respect, however, it is no different from a run-down H.T. battery, and therefore the usual steps of introducing decoupling components in the anode circuit should be fitted, when the mains unit will be found perfectly satisfactory. It is possible in some circuits to dispense with the decoupling components, but they should be fitted as a matter of course when it is intended to use a battery eliminator.

Output Transformer Current

"I have been using a set in which I had the output transformer specially made by a firm which has now gone out of business. It was designed to match a valve having an impedance of 5,000 ohms and the makers provided at the time a centre tap. The rating of this component was 30 mA, and I am now anxious to modify my set to use a push-pull output stage in which I am going to use two valves each of which requires a load of 2,500 ohms and in which the anode current of each valve is 30 mA. Will my

present transformer be of any use in this circuit?"—B. E. A. (Birmingham).

AS the load of each valve is 2,500 ohms, two such valves in push-pull require a load of 5,000 ohms, and thus, in this particular direction, your transformer is quite suitable. Although the anode current of each valve is 30 mA, this current will pass only through one half of the winding in a push-pull circuit, and thus, although two valves are used, the total current flowing through the primary winding will still be only 30 mA. The fact that the current flows in opposite directions also balances out the usual magnetising effect, and thus the transformer may be used with perfect safety and with maximum efficiency in your proposed push-pull circuit.

RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querists.

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

Mixed Filaments

"I have a number of old D.C. valves of the indirectly-heated type and should like to incorporate these in a set to work from the D.C. mains. Is it absolutely essential that in these circumstances the heaters must have identical ratings, and, if not, how does one use them? Any other points on this subject will be welcomed."—E. A. S. (Winchester).

IN the usual D.C. circuit the heaters are wired in series, and the current in the heater circuit is limited to a definite value. Thus, each heater must pass the same current, and this necessitates that where heaters of a different rating are employed the circuit must be loaded to provide the equivalent current. For instance, you should select the valve with the highest current rating, and then across the remaining heaters must connect a load resistance to bring the total current up to that of the highest valve, but to leave the correct proportion for the valve in question. As an example, if you are using a valve rated at .2 and one of .1 amps., then the latter should have a resistance in parallel with it which will also consume .1 amps. at the applied voltage. It may in some cases be necessary to adopt both series and parallel connections for some of the valves in order to obtain the desired rating, and thus it is preferable to employ valves having the same rating.

Coil-winding Data

"I wish to wind a coil having an inductance of 200 microhenries. I have a length of paxolin tubing 2in. in diameter and would be glad if you could give me the necessary winding formula for the coil in question."—B. Y. O. (Petersfield).

A SIMPLE solenoid coil would, with 28 D.S.C. wire, using a total of sixty-four turns, be approximately the inductance you ask for. The length of the winding will be roughly 1.13in.

The Earth Connection

"I am rather in a quandary regarding my earth connection. I had just read of the importance of this part of the equipment, and whilst trying for foreigners I found that reaction was much more erratic than usual. I tried one or two things and found that when I took off the earth it made no difference to volume. Does this indicate that the earth is broken, as I am using a buried earth and do not want to dig up the ground unnecessarily especially as a flower bed is now over the earth. I used a flat sheet of copper with the lead soldered to it so I do not think it should be that which is the trouble."—L. A. (Rickmansworth).

THE fact that removal of the earth made no difference may be taken as an indication that it is ineffective. Whether or not this is because the lead has come adrift from the earth plate, or whether the earth is too dry for the connection to function efficiently we cannot say, but an examination of the ground should reveal the latter point. If the plate was buried in clay it is possible for the ground to have dried out and the clay to have cracked away from the plate, leaving a very poor connection. It is always preferable to use one of the special moisture-retaining chemical earths, or to pack coke or similar material round the plate to keep the ground in a moist condition. Thoroughly soak the ground and see if any improvement is obtained. If not, then the plate should be dug up for inspection.

Divided Mains Supply

"I enclose a list of parts which I have and with which I should like to build a powerful mains receiver. The mains transformer is a manufacturer's surplus and is supposed to give 250 volts at 60 mA, but I should like to include a push-pull amplifier on the output side. What valves do you recommend in order to get the utmost from this equipment?"—F. T. (Norwich).

FROM the list of your components you obviously have sufficient to build a good five- or six-valve superhet, but if you wish to include a good push-pull stage there are limitations imposed by the mains supply, which is only 60 mA. Really powerful output valves would take about 48 mA, and two in push-pull alone would run to 80 or 90, without the remaining valves. In this case the best plan would be to obtain additional mains equipment and use the present mains section to operate only the early stages in the receiver, say up to the second detector. The L.F. and output stages could then be designed on really sound lines and operated from their own mains pack. In addition to the advantage gained by using a higher output in this section, there would also be the advantage that hum difficulties would be removed to a very large extent.

The coupon on cover iii must be attached to every query.

Practical and Amateur Wireless BLUEPRINT SERVICE

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One-valve : Blueprints, 1s. each.

	Date of Issue.	No. of Blueprint
All-Wave Unipen (pentode)	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36D
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (trans.))	—	PW10
Sixty-Shilling Three (D, 2 LF (R.C. & trans.))	2.12.33	PW34A
Leader Three (SG, D, Pow.)	—	PW35
Summit Three (HF Pen, D, Pen)	18.8.34	PW37
All-Pentode Three (HF Pen, D (pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow.)	—	PW41
Hall-Mark Cadet (D, L.F. Pen (R.C.))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (trans.))	June '35	PM2
Cameo Midget Three (D, 2 LF (trans.))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-wave Three (D, 2 LF (R.C.))	31.8.35	PW55
The Monitor (HF Pen, D, Pen)	8.2.36	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	7.12.35	PW64

Four-valve : Blueprints, 1s. each.

Fury Four (2 SG, D, Pen)	—	PW11
Beta, Universal Four (SG, D, LF, Cl. B)	15.4.33	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's Superformer (SG, SG, D, Pen)	12.10.35	PW57

Mains Operated.

Two-Valve : Blueprints, 1s. each.

A.C. Twin (D (pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Power)	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow.)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, D.D.T., Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	15.7.33	PW25
A.C. Three (SG, D, Pen)	10.9.33	PW29
A.C. Leader (HF Pen, D, Power)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-wave" A.C. Three (D, 2LF (R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	31.8.35	PW56
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47

SUPERHETS.

Battery Sets : Blueprints, 1s. each.

£5 Superhet (Three valve)	—	PW40
F. J. Camm's 2-valve superhet (two valve)	13.7.35	PW52
F. J. Camm's £4 Superhet 4	16.11.35	PW58
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (three valve)	—	PW43
D.C. £5 Superhet (three valve)	1.12.34	PW42
Universal £5 Superhet (three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	7.12.35	PW59
F. J. Camm's Universal £4 Superhet 4	11.1.36	PW60

SHORT-WAVE SETS.

Two-valve : Blueprints, 1s. each.

Midget Short-wave Two (D, Pen)	15.9.34	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Power)	28.9.33	PW30A
The Prefect 3 (D, 2 LF, RC and Trans.)	8.2.36	PW63

PORTABLES.

Four-valve : Blueprints 1s. each.

Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12
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MISCELLANEOUS.

S.W. Converter-Adapter (1 valve) 23.2.35 PW45A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	—	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.

B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans.)	—	AW388
Full-volume Two (SG, Det, Pen)	—	AW592
Iron-core Two (D, Trans.)	—	AW395
Iron-core Two (D, Q.P.P.)	12.8.33	AW396
B.B.C. National Two with Lucerne Coll (D, Trans.)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans.)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426

Three-valve : Blueprints, 1s. each.

Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans.)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	—	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW443
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple tune Three (SG, D, Pen)	June '33	WM327
Economy-pentode Three (SG, D, Pen)	Oct. '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	Mar. '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
Graduating to a Low-frequency Stage (D, 2LF)	—	WM378
P.T.P. Three (Pen, D, Pen)	June '35	WM389
Certainty Three (SG, D, Pen)	Sept. '35	WM393
Minitube Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	Dec. '35	WM400

Four-valve : Blueprints, 1s. 6d. each.

65/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2HF, D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	Aug. '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	Feb. '35	WM381
The H.K. Four	Mar. '35	WM384

Five-valve : Blueprints, 1s. 6d. each.

Super-quality Five (2HF, D, RC, Trans)	May '33	WM320
New Class-B Five (2SG, D, LF, Class B)	Nov. '33	WM340
Class-B Quadradyne (2SG, D, LF, Class B)	Dec. '33	WM344
1935 Super Five (Battery Superhet)	—	WM379

These blueprints are full size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—
 "Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7d., and "Wireless Magazine" at 1/3d., post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send (preferably) a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Mains Operated.

Two-valve : Blueprints, 1s. each.

Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C./D.C. Two (D, Pen)	Sept. '35	WM394
Three-valve : Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW390
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen)	July '33	WM329
Harris Jubilee Radiogram	May '35	WM386

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.

Modern Super Senior	—	WM375
Varsity Four	Oct. '35	WM395
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	10.3.34	AW425
Heptode Super Three, A.C.	May '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	Apr. '35	WM385

PORTABLES.

Four-valve : Blueprints, 1s. 6d. each.

Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW638
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)	Aug. '34	WM367

SHORT-WAVERS—Battery Operated.

One-valve : Blueprints, 1s. each.

S.W. One-valve converter (price 6d.)	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SGdet, Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	Jan. 19, '35	AW463
The Carrier Short-waver	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World Beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver	Mar. '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-wave Super	Nov. '35	WM397

Mains Operated.

Two-valve : Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	Aug. '34	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	Aug. '35	WM391

MISCELLANEOUS.

Enthusiast's Power Amplifier (1/6)	June '35	WM387
Ljstener's 5-watt A.C. Amplifier (1/6)	Sept. '35	WM392
Radio Unit (2v.) for WM392 (1s.)	Nov. '35	WM398
Harris Electrogram (battery amplifier)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram	Mar. '36	WM403
New style Short-wave Adapter (1s.)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter	Dec. 1, '34	AW456
Superhet Converter	Dec. 1, '34	AW457

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ACHL, ACL, SG. Variable Mu. 1, 3 and 4 watt directly heated Output Pens. H.F. Pen. Variable Mu H.F. Pen. 250 volt 60 m.a. Full-wave Rectifiers. All 4/6 each. 20 volt 18 amp. AC/DC types. Screen Grid. Variable Mu. H. HL. Power. Pen. All 4/6 each. 350 volt 120 m.a. Full Wave Rectifiers. 500 volt 120 m.a. Full Wave Rectifiers. 2 1/2 watt indirectly heated Pens. 2 1/2 w. directly heated Power. All 5/6 each. 2 volt Battery types, H.F., L.F., 2/3. Power. Low Consumption Power. Super Power, 2/9. Screen Grid. Variable Mu 4- or 5-pin Pens. Variable Mu., H.F. Pen. H.F. Pen. All 5/- each. Class B Valves, 3/6. American Types: 250, 210, 245, 47, 46, 24, 35, 37, 51, 55, 57, 58, 80, 6A7, 2A7, 2A5, 27, 77, 78, 281. All 4/6 each. All the following super quality American types. Hytron Brand, 5/6 each: 1A6, 1C6, 2A5, 2A6, 2A7, 2B7, 6A4, 6A7, 6B7, 6C6, 6F7, 12A5, 19, 24A, 26, 27, 30, 31, 32, 33, 34, 35/51, 36, 37, 38, 39/44, 41, 42, 43, 45, 46, 47, 49 6D6, 53, 55, 56, 57, 58, 59, 75, 76, 77, 78, 79, 85, 89, 6A6, 83, 5Z3, 25Z5, 12Z3, 1V.

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Lissen 3-gang Band Pass Screened Coils, complete with switching and blueprint, 6/11. Lissen All-wave 2-gang Screened Coils for Screened Grid Tuned H.F. stage; and Detector, 12 to 2,000 metres. Complete circuit diagram supplied, 12/6. Selective Iron Cored Coils with circuit, 2/11 each. Varley Band Pass Aerial Coils, B.P.7, 2/9. Special Offer. Set of three Lissen Band Pass Screened Coils with Switching, Utility 3-gang Condenser and Illuminated Disc Drive, 4-valve Chassis and Valve holders and blueprint, 14/6 the lot.

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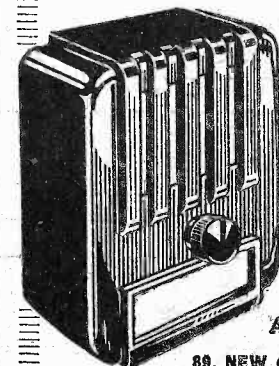
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BRYCE MAINS TRANSFORMERS. 250-0-250, 80 M.A. 2-0-2 Volts, 2.5 amps., 2-0-2 Volts, 4 amps. Shrouded.

9/6 350-0-350 volts, 120 m.a., 2-0-2 volts, 2.5 amps., 2-0-2 volts, 4 amps. Shrouded.

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17/6 DITTO. With H.T.S. Metal Rectifier.

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(Continued at top of column two)

(Continued from foot of column one)

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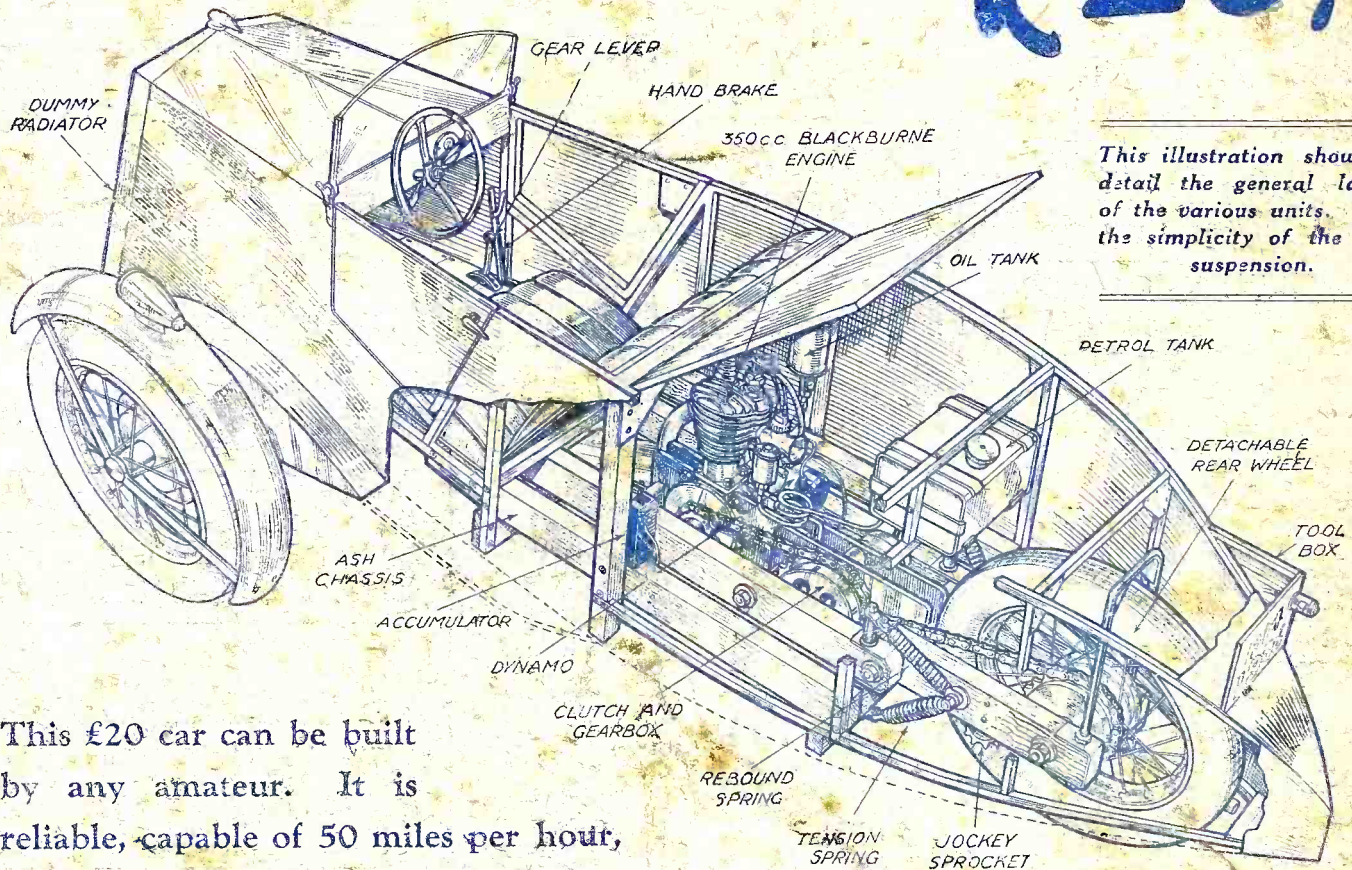
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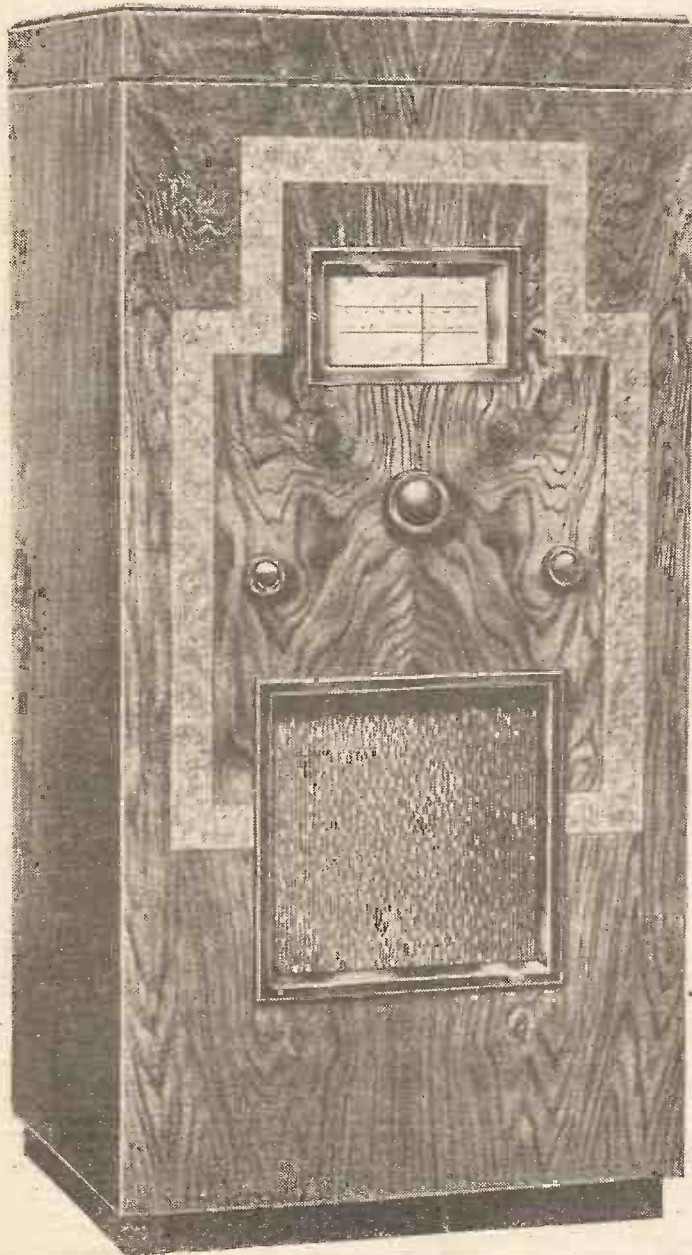
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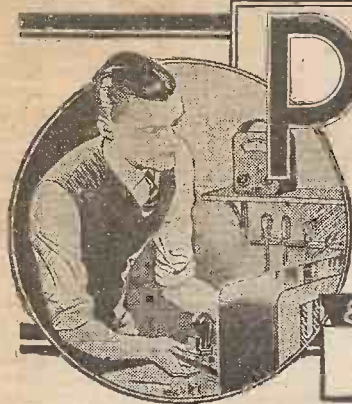
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VOL. VIII. No. 187. April 18th, 1935.

ROUND *the* WORLD of WIRELESS

Quarterly Dutch Changeover

FROM April 1 the Dutch studios exchanged transmitters for a period of three months. During this period the programmes of the A.V.R.O., V.A.R.A., and V.P.R.O. programme companies will be transmitted through Hilversum 2 on 301.5 metres (995 kc/s); the K.R.O. and N.C.R.V. radio entertainments through Hilversum 1, on 1,875 metres (160 kc/s). Both are high-power stations.

More Sponsored Concerts?

ALTHOUGH rumours are current to the effect that a proposal is to be put forward to the House of Keys (Isle of Man) in respect to the installation of a broadcasting transmitter in that island, for the purpose of supplying sponsored concerts, it is more than doubtful whether the scheme will mature.

Scotland Yard's New Wireless Station

WORK on the construction of the £10,000 police radio transmitter now being installed at Grove Park (Camberwell, S.E.) is rapidly nearing completion and it is hoped to carry out tests by early May. Through this channel, communication will be made possible between Scotland Yard and some 500 wireless-equipped motor-cars patrolling London and its suburbs. It will also act as a direct link with other similar stations to be installed in provincial areas.

Radio Programmes in U.S.A.

IN 1925 there were 566 broadcasting stations in the United States of America, with a total output of 121½ kilowatts; ten years later the number had increased to 637 transmitters giving a gross output of 2,685.75 kilowatts. As the power of several stations is to be increased shortly, it is expected that by the end of this year the kilowattage will be in the neighbourhood of 3,000.

An Elusive Station

IT will be a difficult matter to tune in Jerusalem broadcasts, as although the transmitter is rated at 20 kilowatts, the channel used is 449.1 metres (668 kc/s), a frequency shared with the B.B.C. North Regional station. Moreover, temporarily transmissions will only be made from G.M.T. 15.30-20.30.

U.S.A. to Relay Vatican Broadcast

THE Columbia Broadcasting System will relay from Rome on April 12th the Pope's Easter Blessing, which will be transmitted over the entire C.B.S. network, including the short-wave stations.

High-power Station for London?

TO improve reception of the London Regional broadcasts, there is every possibility that a new and more powerful transmitter will be built in the course of 1937. So far, the Lucerne Plan has limited the power of stations on the medium-wave band to 100 kilowatts, but interested nations are disposed to think that this power should be raised—and the matter will be discussed at a future conference.

International Broadcasts

FOLLOWING the world broadcast to be carried out by the U.S.A. on September 20th, in accordance with arrangements made at the recent Paris International Short-wave Conference, the Argentine Republic will carry out a similar transmission in February, 1937, when the Argentine Tango Congress is in full swing at Buenos Aires.

U.S.A. Time Signals

SO far official time signals have not been broadcast over the N.B.C. or Columbia Networks; in future, however, the N.B.C. will give the Arlington Time Signals daily for thirty seconds at G.M.T. 16.58. They will also be transmitted by the short-wave stations in operation at the time. Eastern Standard Time is five hours behind G.M.T.

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Modern One-mast Aerials

MUCH of the improvement in reception of foreign broadcasts lately has been due to the fact that many stations have replaced their horizontal aerials by single-mast aerials. The new Lisburn transmitter near Belfast has a mast 475ft. high, and its success may induce the B.B.C., if authority can be obtained, to erect a similar aerial system at many of its other stations. At Brookmans Park, London, permission was only granted to install 200ft. masts, in view of possible risk to aeroplanes.

An Unfortunate Loss

IT is very regrettable that the B.B.C. have been unable to take advantage of the experience which has been acquired by Eustace Robb. He was television producer in the days of the thirty-line service which terminated so abruptly in September of last year. Although faced with great difficulties and hampered by lack of funds, he was instrumental in building up a really first-class low-definition programme within the limits set by the scope of the mirror drum equipment, and the relative coarseness of the resultant pictures. It was thought that his knowledge of television productions would have been of considerable value, at least in the early days of the high-definition service, but apparently satisfactory arrangements could not be made between Mr. Robb and the new television section under Mr. Cock, so the programme side loses one of its pioneers.

ROUND the WORLD of WIRELESS (Contd.)

Television in U.S.A.

IT is expected that the R.C.A. Experimental Television transmitter which is being installed on the summit of New York's highest skyscraper, The Empire State Building, will be brought into operation on or before July 1st. Moreover, in order to accelerate the progress of television in the United States, a coaxial cable is to be constructed by the American Telephone and Telegraph Company between New York and Philadelphia.

Tax on Foreign Programmes

THE French Chamber has passed a Bill whereby the State will collect, as tax, 25 per cent. of the moneys paid to any station in France broadcasting sponsored programmes in a foreign language. A portion of the income derived will be used for the subsidy to French theatres and other places of entertainment.

New Interval Signal

THE Saarbruecken (Germany) broadcasting station on 240.2 metres (1,249 kc/s)—the channel previously used by Nice-Juan-les-Pins (France)—has adopted as a signal a short excerpt from the patriotic song: *Deutsch ist die Saar*. The station is now working with a power of 17 kilowatts.

Palermo Joins Rome Network

FOLLOWING the completion of the special pupinised cable connecting Palermo to the Italian capital, the Sicilian station has now been included in the Southern network, and will exchange programmes regularly with Rome, Naples, and Bari.

The Dance of the Cuckoos

THE P.T.T. Nice-Corsica high-power station has been using this melody to identify itself to its listeners. In future, it will broadcast during intervals in the programme a well-known aria: "Knowest Thou the Land," from the opera "Mignon."

How it is Done in Germany

WHEN Chancellor Hitler recently broadcast a speech at Munich, in order that the audience of 100,000 people on the Theresienwiese should hear every word, 200 powerful loud-speakers were installed. To connect these with the amplifiers near the speaker's platform, some fourteen miles of cables were used.

Royal Marines Band

THE Band of His Majesty's Royal Marines, Plymouth Division (by permission of Brigadier H. C. Pope), conducted by Captain F. J. Ricketts, Director of Music, Royal Marines, will broadcast on April 16th. Vera Devna (soprano) will be the soloist.

The Musician at the Gramophone

A SERIES of broadcasts under the title "The Musician at the Gramophone" was given last year by Leslie Heward; it is being resumed this spring with a number of different musicians, of whom the first, on April 16th, is Eric Bloom, the music critic of a Birmingham newspaper.

INTERESTING and TOPICAL PARAGRAPHS

Troise and his Mandoliers

THIS popular band will be heard in a Variety programme to be broadcast from the Palace Theatre, Plymouth, on April 16th.

A DOUBLE ATTRACTION



Miss Leonora Corbett, starring in the new picture, "Living Dangerously," tunes in some music on her Cossor radio set.

Variety of Theatres

THE Empire Theatre, Peterborough, had its first broadcast in November, 1933, and has had about a dozen since. In

SOOLVE THIS!

the broadcast from the Midland Regional on April 17th, a variety bill will be preceded by some account of the theatre's history elicited in an interview by David Gretton. John Robertson was one of the first owners of this theatre, and his daughter, Dame Madge Kendal, was associated with it. Since 1919 the owner has been Mr. J. A. Campbell, O.B.E., the playwright, who had the interior entirely modernised. The resident manager for the past seventeen years has been Mr. John H. Stevenson.

A New Revue

ON April 18th Martyn C. Webster will produce a radio revue entitled "Song of Spring," which will have had an afternoon performance on the previous Thursday. Charles Hatton has written the book and lyrics, and the music is by Michael North. A lugubrious reporter is sent out by his News Editor to get a "story" about spring, and after each attempt at catching the right note and the full human interest, returns to the office. There is a surprise twist in the last scene. Reginald Burston will conduct the Revue Orchestra and B.B.C. Midland Revue Chorus.

Organ Recital

REGINALD NEW, who made his name as a cinema organist in the Midlands, returns periodically to give recitals on the Burrows concert organ in Cheltenham Town Hall. By the way, he was a church organist before he became a cinema organist. In his programme for the present recital, to be given in the Midland Regional programme on April 19th, is one of his own compositions "Memories."

programme on April 19th, is one of his own compositions "Memories."

A Victorian Evening

NEWCASTLE goes "all Victorian" on April 25th, when a programme designed to conjure up something of the atmosphere of a drawing-room concert in our grandfathers' day will be broadcast. Popular songs of yesterday, such as "Killarney," "Come into the Garden, Maud," and "Caller Herrin," will be "resurrected" by those well-known North-East artists, Gwladys Garside (contralto), Hector Hall (tenor), and Gladys Willis (piano).

A Bricklayer and His Gramophone

GEORGE LEVARNE is a Birmingham bricklayer who has laid bricks not only in different parts of this country, but also in France, Germany, and Russia. His hobby is the collecting and playing of gramophone records, and he has a library of over 250. In January he gave an illustrated talk on "What my Gramophone Means to Me," but as he by no means exhausted the subject then, he is to give a second broadcast on April 20th, in the Midland Regional programme.

Fancy Free

STUDENTS of Aberdeen University will occupy the studios for forty-five minutes on April 17th in a programme of varied entertainment. Hoots, mon, Hoots!

THE WESTINGHOUSE COLD VALVE

Some Interesting Facts About the Metal-Oxide Rectifier
and its Various Applications in Modern Wireless Receivers
for Rectifying High-frequency and Other Types of Current

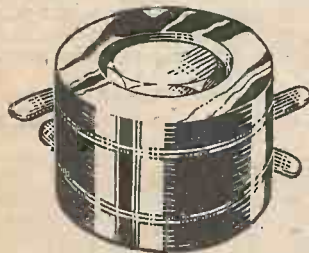
By W. J. DELANEY

IT is doubtful whether there is any wireless component which has the wide field of usefulness that is covered by the metal rectifier, or as it is commonly referred to, the "cold valve." The latter term is, of course, not strictly correct, as the device is not actually a valve, but in certain forms it may be inserted into a wireless circuit to carry out functions which are normally performed by a thermionic valve, and owing to the fact that no filament or heater supply is needed the device is likened to a cold valve. There are, however, other types of rectifier in which the function is not that of a valve, but this will be explained in its place in this article.

The device is actually a number of metal discs clamped together and prepared in such a manner that a current will only flow in one direction. In other words the device acts exactly as a crystal in the ordinary simple crystal set, and any alternating current applied to it becomes rectified, but not smoothed. Thus, in the majority of circuits it is necessary to include some smoothing arrangement after a metal rectifier, but the extent of the smoothing and the best arrangement will depend upon the circuit.

The H.T. Rectifier

In the commonest form this type of rectifier is made up to form a large unit which is connected in the H.T. supply from an A.C. mains transformer and it rectifies the A.C. supply in order to provide



An instrument type of rectifier.

the necessary direct current to operate the valves. The rectifier may be connected in three different ways, either as a half-wave rectifier, in which case a low output is obtained, in a voltage doubler circuit, or in a bridge circuit. It is not proposed to go into the merits of the various circuits here, but merely to show the applications of the device.

The rectifier may be obtained with many different ratings and may be used for high-voltage supplies or for low voltages, such, for instance, as battery chargers or trickle chargers, where the output is only of the order of 2 volts or so.

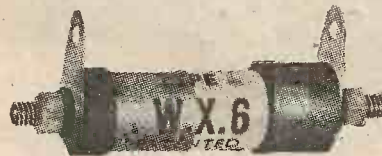
H.F. Rectifiers

In recent times, however, the general design of this type of rectifier has been improved and very small models have been made up of such a nature that they may be used at high frequencies, and it is this type of rectifier which first gained the name of the cold valve. The trade name applied to it is the Westector, and it is obtainable in several different patterns, designed for

use under different circumstances. Its most useful application is as a second detector in a superheterodyne receiver, and it is necessary to select the correct type according to the intermediate frequency which is being employed. Thus the type W is intended for use on frequencies from 100 to 200 kilocycles, but at higher frequencies the type WX should be employed. In the normal circuit the rectifier is connected to act as a half-wave rectifier and in this respect it resembles a diode valve, but it is possible to employ a full-wave rectifier, although there are no advantages to be gained from this arrangement.

A.V.C. Circuits

In addition to its use as the second detector it is also possible to employ the Westector to rectify the H.F. currents in



This is the popular high-frequency rectifier or cold valve.

order to employ the automatic volume control arrangements, and again a single or a combined Westector may be employed for half-wave or full-wave rectification. To enable maximum performance to be obtained the separate components of the Westector may be used in place of the special combined component, and in an ambitious circuit three of these rectifiers may be employed together in order to carry out the functions of second detection, delayed and amplified A.V.C. Some circuits were given in last week's issue.

Battery

Economy

Another use of this same type of rectifier is seen in the so-called battery economising circuit, where the Westector is included in the anode circuit of the output stage in order to reduce the total anode current consumption of a high-efficiency pentode valve. This produces an effect similar to that obtained in a Class B or Q.P.P. circuit, where the anode current varies with the strength of the signal. This is carried out by reason of the fact that the bias applied from a normal grid-bias battery is much

greater than is required by the valve, but the Westector is connected through a resistance network to the biasing circuit. A portion of the signal voltage at the anode is then applied to the Westector and this is rectified and applied to the bias circuit in opposition, thus reducing the bias. The larger the signal voltage the greater the reduction of the applied bias and consequently the greater the anode current. In this manner practically any type of signal may be handled without distortion, but the anode current drain on the H.T. battery is kept low.

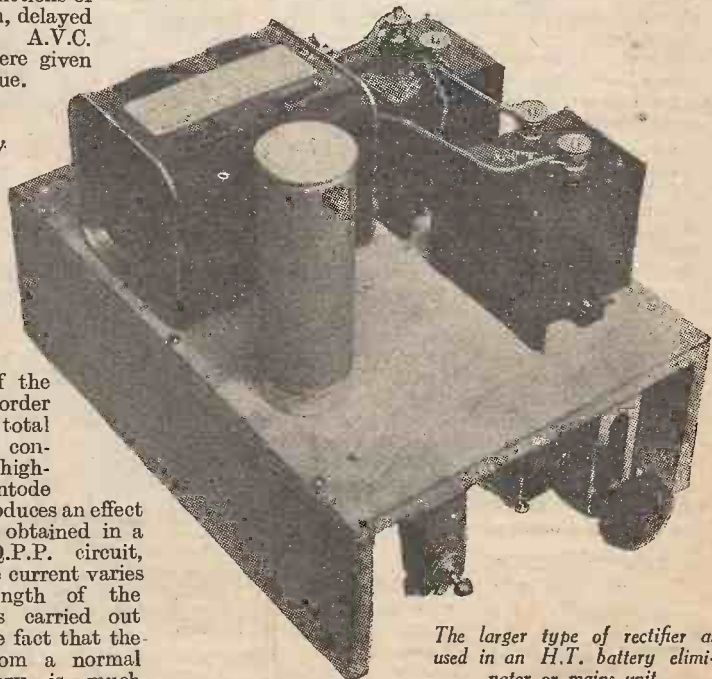
High-voltage Rectifiers

For special circuits such as will be required for television apparatus utilising the cathode-ray tube, special types of rectifier are now obtainable capable of delivering up to 7,500 volts.

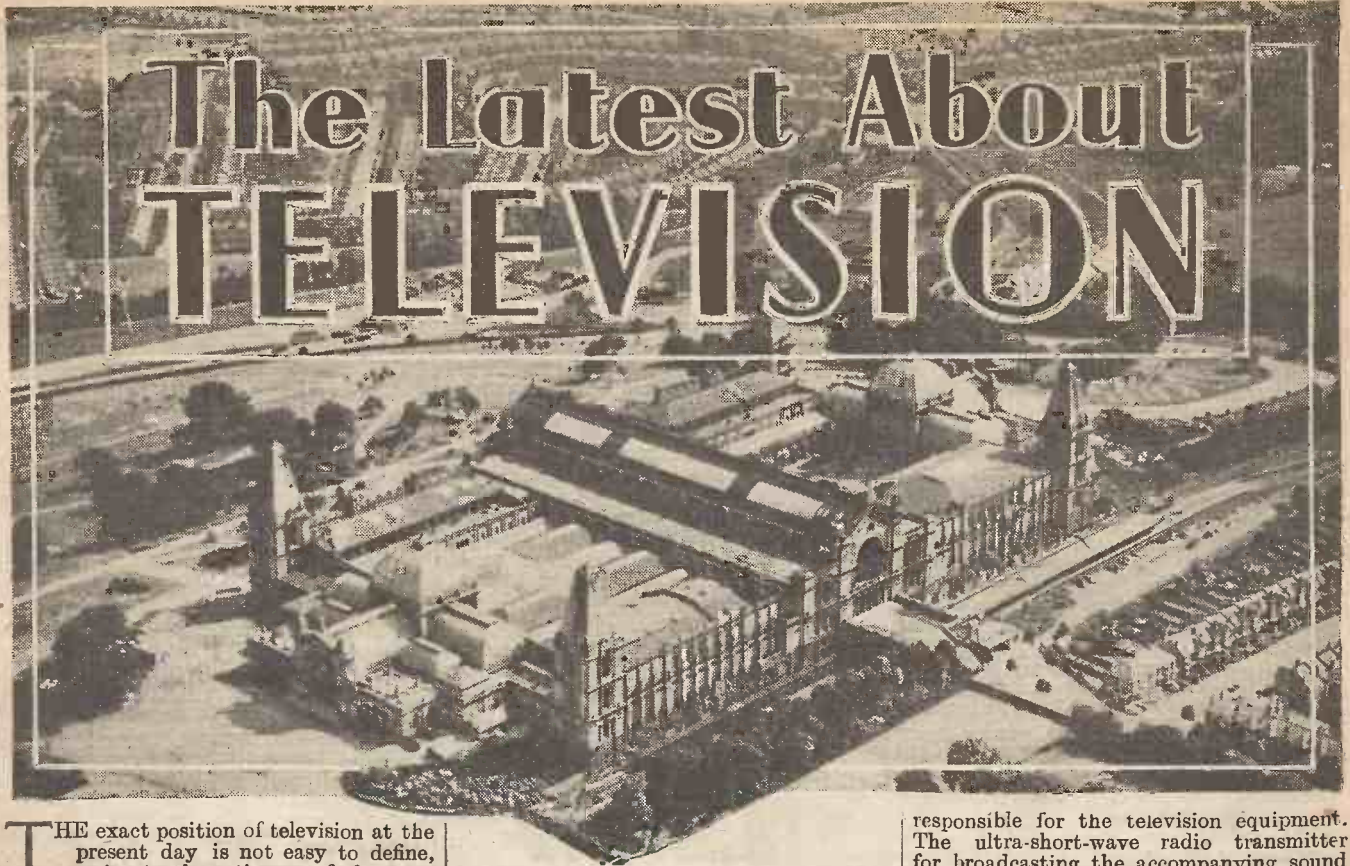
The advantages of all of the above-mentioned types of rectifier are long life, with practically no risk of damage provided the connections are correctly made, and no additional drain on the supply to the receiver or equipment in which the rectifier is employed.

Instrument Types

A final form of this unique device is found in the small unit which is designed for incorporation with a small meter in order to enable it to measure sources of alternating supply. Thus, an ordinary milliammeter may be made up with one of these units, and with various shunts and series resistances, so that it may read any value of voltage or current on either a direct or an alternating supply. The rectifier for this purpose must be chosen according to the meter with which it is employed, and there are three types rated for 1, 5 or 10 milliamps.



The larger type of rectifier as used in an H.T. battery eliminator or mains unit.



THE exact position of television at the present day is not easy to define, owing to the reticence of the companies engaged on its development in disclosing complete details of their up-to-date equipment either at the transmitting or receiving end. Certain facts have been made public, however, and the whole situation can, therefore, be summarised by collating this data.

Structural Alterations

It is now over a year since the Television Committee presented its report to the Government, and although the suggested rate of progress, as judged by the initiation of the first high-definition television service, has not been followed, the recommendations as laid down by that Committee have been observed. First of all, the B.B.C. were charged with taking the service in hand, and what was regarded in the early days as something savouring of marked opposition to its growth has now manifest itself as a whole-hearted co-operative effort. After a very long investigation, the Alexandra Palace was chosen as the site for the studios, television scanning equipment, and ultra-short-wave radio transmitters (one for sound and one for vision). The structural alterations entailed in converting this mid-Victorian North London rival to the South London Crystal Palace have been of a very wide character, especially in connection with the tower which had to accommodate the tall mast, which in turn had as its termination the double-tier arrangement of aerials. The early foundations had to be reinforced, a somewhat tricky job for the workmen engaged upon it, but at the time of writing the scaffolding surrounding the tower is almost removed.

The Aerial System

The next task is to surmount this tower with the mast, for the mast has already been completed in sections ready for assembly. This should take about four to six weeks, giving finally an aerial system of special design towering some

600ft. above sea level. A specially matched feeder system has been designed to ensure that the cage array of aerials will propagate with equal strength, and so give a signal distribution as near equal at every point of the compass.

The B.B.C. are themselves responsible for this part of the equipment, and also with the structural alterations inside the section of the Palace, which is to be accommodated, these alterations being made to meet the requirements of the two companies

responsible for the television equipment. The ultra-short-wave radio transmitter for broadcasting the accompanying sound is the entire responsibility of the B.B.C. engineers, but the control and sound-conversion apparatus (microphones, amplifier racks, correctors, etc.) are being made by both the Marconi-E.M.I. and the Baird companies. In addition, each company is building and supplying its own ultra-short-wave radio transmitter for the vision signals, together with the modulation amplifiers.

The Radiated Signals

Under the general supervision of the



A corner of the G.E.C. Research Laboratories at Wembley, showing a cathode-ray tube being exhausted.

B.B.C.'s Television Director, Mr. Gerald Cock, the Baird and E.M.I. companies will radiate the signals from their own particular system on alternate weeks; three one-hour periods daily—afternoon, early evening, and late evening—being proposed for the initial stages of the service. The exact nature of the signals which are to be radiated, together with technical data concerning the proportion of total modulation allotted to the synchronising and vision signals, picture proportions, extent of line definition, method of scanning (sequential or interlaced), and pictures per second, were described fully in PRACTICAL AND AMATEUR WIRELESS dated October 5th, 1935.

Each company employs quite a different method for generating the television signals, for in the case of the Marconi-E.M.I. company the Iconoscope scanner is to be used, the camera equipment being named the Emitron. The principle on which this operates is by now quite familiar to readers. The Baird company, on the other hand, use both mechanical (disc scanning) and wholly electrical (image dissector tube or electron camera) scanners, and, according to reports which have already been published in the Press, three types of scanners will be installed—namely, spot light, tele-cine and intermediate film, all of which will no doubt employ disc scanning. It is learned that the pictures which have been shown when using the tele-cine equipment are remarkably clear and possess considerable detail. According to one writer who witnessed a demonstration, the pictures were the best yet seen and worthy of the best programmes the B.B.C. can devise. The scanning disc is driven at 6,000 revolutions per minute, while the apertures located on the circular scanning trace are very minute.

The complete equipment of both companies when installed at the Alexandra Palace (so far only a few of the machines for supplying the electrical power have been delivered to the station, although further deliveries of other apparatus are expected shortly) will be capable of transmitting a wide range of programme subjects which will give full rein to the ingenuity of the B.B.C. director. Excerpts from talking films or trailers will be featured, talks on subjects of national or domestic interest, revues, dance bands, variety turns, indoor or outdoor sketches, or small

plays, etc., will all come within the ambit of home television pictures, so that not only will novelty appeal be a predominant factor, but also the more important one of sustained entertainment value.

Receivers

On the receiving side it is an open secret that many manufacturers are concentrating their energies on perfecting satisfactory sets which will be relatively simple to install and operate in those localities which come within the range of the radiated signals. It seems a foregone conclusion that the sets will be wholly electrical in character in order to meet the present standards of picture definition (a minimum of 240 lines per picture); that is to say, they will incorporate the cathode-ray tube as the picture reproducer.

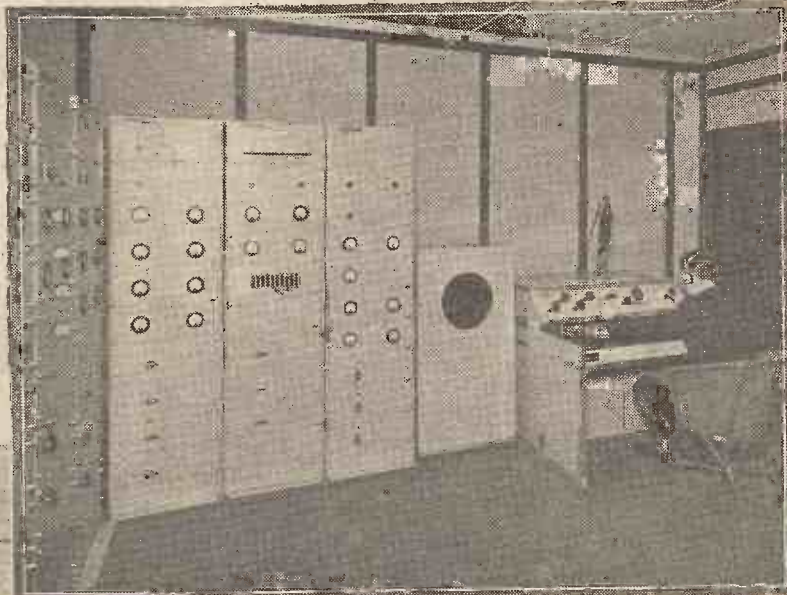
These tubes, originally proposed for this purpose by both Campbell Swinton and Boris Rosing just twenty years ago, are now being produced specially for television purposes, and the best have a screen composition which gives a brilliant black-and-white picture. The largest have a screen diameter of 15ins., permitting a picture size of at least 12ins. wide by 9ins. high. This contrasts very favourably with the 2ins. by 1in. of the early 30-line disc model receivers, which, although cumbersome, achieved a considerable measure of popularity. The electrode assembly and focusing adjustments are being simplified, while it is stated that the life of these tubes will be at least 1,000 hours. They need a relatively high voltage to operate them—

sometimes as high as four or five thousand volts—but the unit employed for this purpose delivers only a very minute current, so that it can be protected very readily from any possibility of shock. In any case, the user will not have to touch the tubes' auxiliary equipment when in use any more than he would fiddle about inside a mains-fed radio set while the current was switched on.

Operation

In using the complete sets no difficulty will be experienced for, although dual in character—that is to say, the cabinet will house both a vision-receiver chassis and a sound-receiver chassis to line up with the double-signal radiation—the controls to be handled by the operator are quite simple. First of all there is tuning. Only one station will be in operation at the start, so there is no question of ether search, and, as the wavelengths to be employed for both sound and vision have now been definitely decided upon—namely, 7.23 metres for the former (41.5 megacycles frequency), and 6.67 for the latter (45 megacycles frequency)—it will be possible to gang both the tuning condensers for the sound and vision sets if such a course is felt desirable.

Two other controls are for raising or lowering the level of the sound from the loud-speaker to suit room size and environment, and for adjusting the degree of gain or magnification in the vision set according to the distance of the receiver from the transmitter, coupled with the position chosen for the receiving aerial. Then it



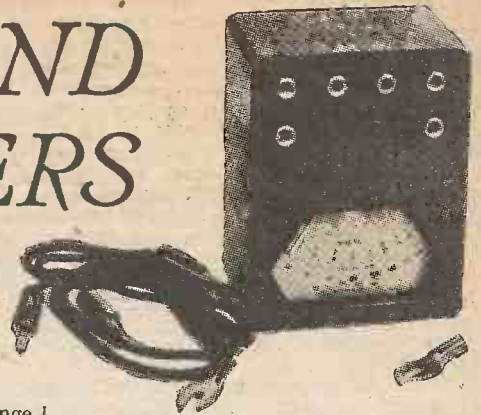
Above is seen the sound racks, control desk, and check loud-speaker, whilst on the left is a close-up view of the arc lamp, optical system, and disc scanner for one of the Tele-cine scanners.



will be an advantage to be able to adjust the degree of focus of the lines of light, building up the picture so that the detail is clear and clean-cut. Any blurred or out-of-focus effect will mar the picture just the same as with any optical system or camera. In addition, the degree of brightness is another factor which should be under the control of the user in order to satisfy individual requirements. Finally comes the question of contrast, whereby it is possible to secure at one extreme a relatively harsh black-and-white picture, or at the other

THE CHOICE AND USE OF METERS

A Brief Review of Some of the Better-known Instruments of Both Single- and Multi-range Type - - By FRANK PRESTON



A useful low-priced meter from the Telsen range.

A RELIABLE meter is an absolutely essential part of the experimenter's equipment, for without it all tests must be the result of guess-work. The question which arises, however, is what kind of meter should be chosen, and how much should it be necessary to pay in order to obtain one of sufficient accuracy for the purpose. A good deal must essentially depend upon how much the purchaser can afford, as well as upon the extent to which it is hoped to pursue serious experimental work.

There is no doubt that a multi-purpose instrument, reading milliamperes, amperes, volts and ohms is desirable, but it is far better to purchase a high-grade milliammeter than a cheap and unbranded multi-range affair. If accuracy is the first essential—and it is when anything in the nature of research work is proposed—and when the outlay must be limited to, say, thirty-five shillings, a high-grade milliammeter cannot be bettered. It will be of the moving-coil type and will be accurate to within about 2 per cent. This instrument, although actually a milliammeter only, can be used with the addition of shunt and series resistances to read amps., volts and ohms simply by buying or making suitable resistance units and connecting them as has been described in previous articles in this journal. Generally, it will be found best to obtain a meter with a full-scale deflection of 5 milliamps., and with a large-diameter scale which is easy to read.

If still more accuracy is required it will be necessary to pay two pounds or so, and for this sum a degree of accuracy within approximately 1 per cent. is to be expected.

D.C. or Universal

The above details assume that the meter is required for measurements of D.C. only, since if it is necessary to measure A.C. as well a more expensive article must be obtained. This is because the two-purpose instrument must contain a rectifier which can be brought into circuit when dealing with A.C., and also a resistance device for compensating for the difference between A.C. and D.C. readings. In consequence, an average price for a first-grade instrument is something like four pounds. In general, however, universal-current meters are made only in "multiple" types; that is, the meters are designed to include a switching system whereby various current and voltage readings can be taken. One of the best-known of these multiple-range universal meters for measuring current, voltage and resistance is the Universal Avometer, and this costs twelve guineas, although there is another universal instrument by the same makers, known as the Universal Avominor, which costs only five pounds. The latter is extremely good, and is sufficiently accurate for nearly every purpose, but has fewer ranges than the larger instrument and is, naturally, not made to such an extreme degree of accuracy.

The Avo Meters

There are two other popular multi-range meters made by the same firm, these being for D.C. only, and known as the Avometer and Avominor; they are made to the same degrees of accuracy as the others mentioned above, and are priced at eight guineas and two pounds respectively. The smaller instrument is to be particularly recommended to the amateur, whilst the larger is recognised as a standard part of the equipment of the radio test engineer.

All of the Avo instruments are made to read current, voltage and resistance by the rotation of a switch, or by the use of alternative socket connectors.

Inexpensive Eight-range Instrument

Other combination instruments which we have tested and found to be eminently satisfactory for either experimenter or service man are the Pifco Rotameter and Radiometer, the Ferranti (various models at prices from five pounds fifteen), the Wearite (several types), and the Sifam. This short list is by no means comprehensive, and there are several other makers of high-grade meters. Of those mentioned, the Pifco Rotameter is of particular interest in view of the rather unusual and ingenious method incorporated for changing from one range to another. There are eight scales mounted on a rotor of octagonal section,



For the service engineer these meters from the Wearite range will be found invaluable.

and by turning this so that the appropriate scale is exposed the correct shunt or series resistance is automatically brought into circuit. The instrument incorporated is of the moving-coil type, whilst readings from 5 to 400 volts and from 10 to 250 milliamps can be taken, in addition to which there is provision for inserting a valve and testing its filament for continuity. There is a cheaper model of the unit with moving-iron meter costing twenty-nine and six.

Another Useful Universal Meter

In the Ferranti range the so-called A.C./D.C. circuit Tester is worthy of special mention, since it can be used to cover fifteen ranges of voltage and current, and costs only £5 15s. It is guaranteed within two per cent. at full scale deflection,

and is provided with test cords and crocodile clips as well as necessary shunts; additionally, it is complete with neat protecting pocket case.

In the Wearite range particular interest attaches to the Multimeter, which is suitable for either A.C. or D.C., has ten ranges and reads current, voltage and resistances from 100 to 2,500 ohms, and 200 to 500,000 ohms. Like other meters designed for resistance measurement, it is fitted with a self-contained dry cell which has a very long life. Additionally, and this applies to all of the higher-priced instruments, it is fitted with a safety fuse which safeguards the meter against short-circuits which may occur due to applying the terminals to a high-voltage source without first setting the rotary switch to the correct position. It has a scale which is 2½ in. in diameter, and which is therefore very easy to read.

The Sifam unit mentioned above is for D.C. only, and covers nine ranges with commendable accuracy. It is listed at four pounds five, and is fitted in a compact case with lid. The full-scale milliamperage readings are from 2.5 to 250, and there is

in addition, a range up to 1 amp. and four voltage ranges from 10 to 500. This instrument is not designed for resistance measurements, but can be used for this purpose in conjunction with an external battery.

Single-range Meters

With regard to meters of the single-range type there is an extremely wide range, and the name of Bulgin is very prominent. In this make there are moving-coil milliammeters reading from 1 to 200 milliamps, and having resistance values from 100 to .5 ohms respectively. The prices range from thirty-five shillings for the 1 mA meter to thirty shillings for those reading between

(Continued on page 137)

On Your Wavelength

A Strong Hint to the Railway Companies

THE line on which I travel between the Thermionic domicile and the scene of my labours, if any, is a suburban branch of the Southern Railway, and I am wondering how long it will take the Southern Railway to synchronise the various clocks located at the stations at which my train stops. The train journey is one of about twenty-five miles, and owing to the activities of jerry builders they seem to be erecting stations at about every hundred yards along that twenty-five miles stretch. The train, of course, stops at nearly every one of them, and the journey is proportionately longer in time. You must do something to while away the time, and as I happen to possess a very accurate watch, for horology has been one of my hobbies for many years, I have developed the habit of checking the station clocks against Greenwich Mean Time, to which my watch is set. My watch has a rate of about five seconds plus or minus a month, and I take it that most members of the public now set their timekeepers by the six pips. The amazing fact emerges that very few of these station clocks keep accurate time and also that very few of them are set each day. I know they are supposed to be, and that a station clerk can ring up Waterloo and get what most people now regard as a joke,



A novel tuning unit.

namely, "Railway Time," which seems to be different from any other sort of time, sidereal or otherwise. It is a rule of the railway companies (who are autocratic bodies and can run their businesses on lines which would put any other commercial undertaking in the Bankruptcy Court) that their trains are started and despatched according to their own time, and in cases of dispute it is their time upon which they rely, and not the real time. This is an anachronous state of affairs, for the public have become "six-pip minded" and it is really high time that the railways descended from their autocratic throne and did the same. One would not mind so much if railway time was constant, but it is not. For example, the station clock at Richmond is often as much as two minutes fast or slow according to Waterloo. Twickenham differs from Richmond quite often by a similar amount. You will find that other stations down the line are similarly inaccurate. What are the railway companies going to do about it? Nothing is more aggravating

The B.B.C. Year Book

DO you want something really interesting to read? Novels may come, and novels may go, but if you really want to know some interesting details of the working of the B.B.C. organisation, and of the developments and research which has been carried out, you should get a copy of the B.B.C. Year Book. I had no idea of the interest which such a book could arouse until I took one home the other day and sat down to ascertain one or two facts. This interesting book gives not only a diary of the B.B.C. events for the past year, but also a diary of all our national history. I shall keep this in my bookcase, and try to obtain all the back numbers to make a complete file, for there will be great interest in comparing the annals of each year and comparing the developments and the ideas which at one time are thought to be right, with the changes which are afterwards made as previous ideas were all wrong.

An Announcers' Union

I READ that the B.B.C. announcers are getting together to form a sort of trade union. Well, I have read that when you are in a union you can come out on strike if a member disobeys some law and gets the sack. Therefore, I can picture the contretemps which may arise if this



Summer offensive has started.

idea is carried out by the announcers. Imagine one of them getting the sack for mis-pronouncing a Czecho-Slovakian peasant's Christian name, and the remainder downing microphones in protest. But it surely won't come to this. Extremism is only for the few, and our golden-voiced announcers are surely too dignified to protest at anything, and I don't think we need have any apprehension that we shall be cut off in the middle of the News Bulletin one evening owing to the action of the union.

One Man's Meat

I AM glad to see that readers take up the cudgels against each other, and the letter which was printed on page 46 of the March 28th issue has drawn the fire of a gentleman at Birmingham, who has been a wireless enthusiast since the early crystal days, but he admits that he has a lot to learn. He says "The more I know the less I seem to know." He goes on to say:—

(Continued overleaf)

(Continued from previous page)

"Some of these so-called experts who have probably purchased 'posh' sets on the hire-purchase system seem to think they know all there is to know about wireless matters. It is a most extraordinary thing, but when I want to know the meaning of technical terms used in wireless, these so-called experts can never give me a real scientific explanation.

"The articles in PRACTICAL AND AMATEUR WIRELESS are most helpful and enable readers to take an intelligent interest in wireless set construction, and I trust the Editor will continue with his good work. I still consider myself a beginner and hope to be treated as such. Your correspondent complains that 50 per cent. of the contents are unreadable, but surely he cannot expect the Editor to study *his* particular wishes only, and to neglect those who are not just content to construct a wireless set blindly from a blueprint.

"I am not asking for 100 per cent. readable matter for my particular benefit, but I do hope we shall get further articles such as 'Resistance, Inductance, and Capacity,' 'Wireless Arithmetic,' 'From Studio to Listener,' etc., etc."

International Relay

THE Council of the Union decided to organise another international relay, similar to that of October last, known as "Youth Sings across the Frontiers," to be held in the second half of December next. The details of this programme will be drawn up by a special group, which will make its recommendations to the Union at its summer meeting.

A number of new proposals for the development of an international exchange of programmes were accepted for study in the near future. The Council, on the recommendation of the Legal Commission, decided to accept an invitation to be represented at the new Congress of the International Academy of Comparative Law, to be held at The Hague in 1937.

The new Palestine Broadcasting Service was admitted to the Union as an active member. The broadcasting service of the Vatican was admitted also in the category of a special member.



A valuable diary.

The next meeting of the International Broadcasting Union, including the annual General Assembly, will be held at Lausanne-Ouchy (Switzerland) between June 22nd and July 1st next.

The winter meeting also includes the first inter-continental meeting of broadcasters. This meeting, convened by the International Broadcasting Union for a study of the several problems created by the development of inter-continental broadcasting on short wavelengths, is being attended by representatives of broadcasting activity in forty-three countries, including sixteen countries overseas. All the continents are represented, as well as the broadcasting service of the League of Nations. The Presidency General of the Conference was accepted by M. Georges



Notes from the
Test Bench

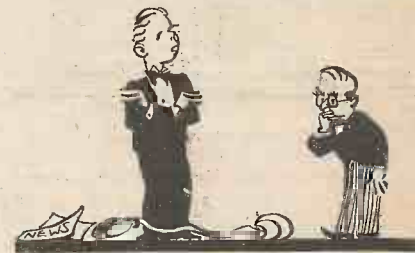
Mandel, of the French Ministry of Posts and Telegraphs. The direction of the work of the Conference is in the hands of M. Rambert, the President of the International Broadcasting Union, who has the assistance of three vice-presidents, Dr. Joliffe, Chief Engineer of the Radio Corporation of America; M. Mugica, representing the Argentine National Association of Broadcasters; and M. Kee Tsing Li, a special envoy of the Chinese Ministry of Telecommunication at Nanking.

Signal Interference

AT quite regular intervals the problems associated with interference in so far as ultra-short-wave signal reception is concerned, are brought up for discussion. The idea seems to have got abroad that vision signal interference is going to mar completely the pictures as seen on the cathode-ray tube. This is far from the truth, and, in any case, is a matter for individual attention at the time of installation of the receiving equipment. The worst offenders are the ignition systems of motor cars which are not fitted with suppressors. Fortunately, the range over which the interfering waves can be received is quite small, and it therefore behoves prospective users of television receiving equipment to see that the aerial employed is accommodated as far from the road as possible. The correct type of aerial and associated feeder will then ensure that the results seen (and heard) are almost, if not completely, free from any trouble traceable to this source of electrical worry. Every effort must be made to position the aerial as high as possible and "point" it in the direction of the station radiating the television signals. This will overcome screening and ensure that the received signal is well above the mush level. The gain or degree of amplification in the receiving set can then be reduced and satisfactory results accrue.

A Novel Television Scheme

WHEN dealing with the building up of a picture in lines of light on the front screen of a cathode-ray tube, it is stated in general terms that the thin layer of powder, cemented to the inside of the tube face during manufacture, fluoresces at every point where it is bombarded by the elec-



An announcer downs microphones.

trons constituting the stream directed from the cathode. Picture shade is brought about by intensity modulation, whereby the density of the electrons in the stream reaching the screen is varied in exact conformation to the varying strength of the incoming picture signal. In an effort to improve matters a very interesting patent has been issued which combines fluorescence, phosphorescence, and incandescence in order to increase the degree of visibility seen by the observer of the television pictures. It is stated that the incandescent coating is made up from finely divided carbon which may or may not have platinum black added to it. This is carried by a form of lattice or mesh which is just slightly removed from the fluorescent material in order to counter the effects of over-heating.

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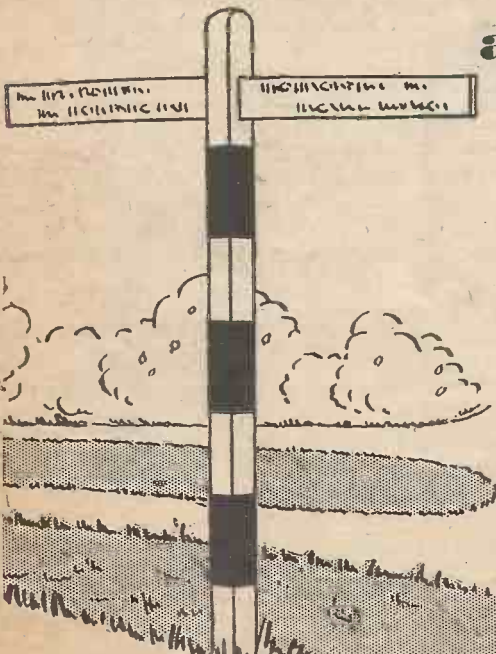
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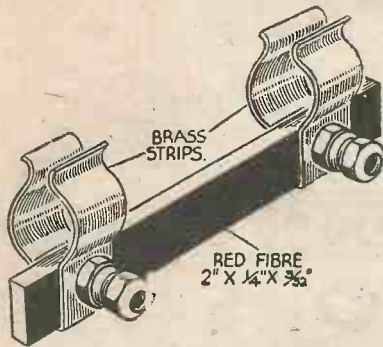
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READERS WRINKLES

THE HALF-GUINEA PAGE

A Resistance Clip

EXPERIMENTERS will find this quick-change resistance clip extremely useful because of its lightness, and also the fact that it can be suspended on connecting wires in the same way as ordinary wire-ended resistances.

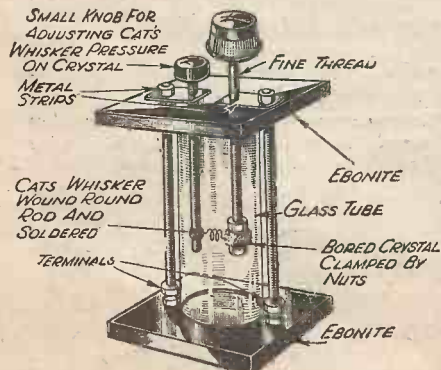


A simple resistance clip.

It consists of a length of red fibre and two brass strips (the long lengths taken from ordinary flash-lamp batteries being just the right size). These are bent round the fibre, one at each end, formed into clips, and drilled to take screws and terminals. Several of these can be made in a very short time and will prove invaluable where resistances have lost their connecting wires.—C. G. BUCK (Cambridge).

A Variable Crystal-holder

THE accompanying sketch gives details of a variable crystal-holder which I have found very useful. It is very simple to make and the parts can be found in the junk box. When the large knob is turned it turns the crystal round and also makes it descend. In this way the cat's-whisker touches the whole surface of the crystal. The smaller knob is for adjusting the pressure on the detector, or if there are holes in it a slight turn of the knob will send the point of the wire into the hole.—B. SNOWDEN (Hull).



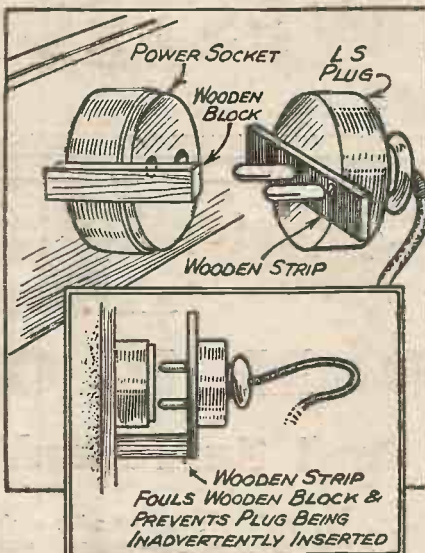
A variable crystal-holder with fine adjustment.

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

A Simple Safeguard

MANY readers who use "five amp." sockets for loud-speaker extensions and for electric light points may have lost loud-speakers through accidental plugging in the wrong socket. The risk of this may be avoided if a small block of wood is



A handy dodge to prevent plugging into the wrong socket.

mounted by the power socket, and a disc or strip of wood, or ebonite, is mounted on the loud-speaker plug so that it will foul the block if anyone tries to insert it. This may be easily and neatly done with thin three-ply wood painted black, and is much cheaper than replacing the plugs and sockets.—M. L. HASEL GROVE (Dorchester).

Converting a Wave-change Switch

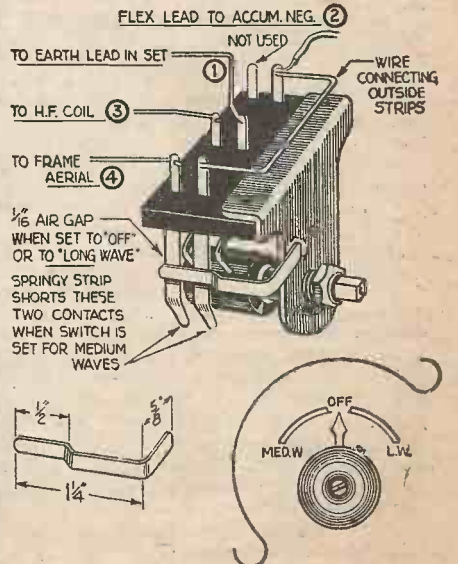
THOSE amateurs who have by them one of those excellent "Utility" type of switches, as in sketch, may, by the simple

addition shown, utilise same as a combined on-off and wave-change switch, for use in such a circuit as that of the "Car and Radio Portable," described in issue February 23rd, 1935, and it is for this reason the numbers for connections agree with those for the home-made rotary switch illustrated in that article.

The alteration necessary is quite simple. Make up the springy brass strip as shown, and solder to the front plate (the spindle being first turned to the central position) allowing a 1/16in. air gap between the springy strip and the two left-hand contact strips of the switch. This is the only addition necessary.

As will be noted from the inset, the operation of the converted switch is slightly different, in that "off" is the central position, with the medium and long-wave positions left and right respectively. On rotating the spindle from the off position to the left for the medium waves, the two contact strips of the switch bear against and are in turn shorted by the springy brass strip. The long-wave windings of both the frame aerial and H.F. coil are thus shorted, whilst the valve filaments are switched on. On rotating the spindle from the off position to the right, the filaments are again switched on, but the long-wave windings remain in circuit.

This switch arrangement is not in any way meant as an improvement over the home-made switch described in the constructional notes of February 23rd issue, but is merely suggested as an alternative for those constructors having by them one of these commercial switches, which they may like to convert in the manner described.—R. L. GRAPER (Gillingham).



A method of converting a wave-change switch.

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THE LATEST ABOUT TELEVISION

(Continued from page 121)

more of a soft toning or shading in the picture. Once adjusted, it will be appreciated that several of these controls need not be touched when a transmission is to be watched, so that it is possible to say straight away that the present standard of reception will in no way tax the capabilities of the user.

Those who have been fortunate enough to witness the reception of television pictures by radio have marvelled at the measure of detail, quality, and brightness of the picture, extreme steadiness due to the remarkable improvements in synchronisation (the H.F. and L.F. synchronising signal pulses are injected into the vision signal so as to be radiated on the same channel), and the scope of the subjects which can be covered by the transmission.

Perfecting Details of Equipment

It is, no doubt, disappointing that the service has been so long delayed after the enthusiasm which followed the original report over twelve months ago, a delay which has been contributed to by a variety of circumstances. This extra time, however, has been used to good advantage by all those concerned with television's development, for it will ensure that the transmitting equipment will be a very thorough job in every respect and will be submitted to exhaustive tests before the radiated signals become "public property" and ready for criticism. At the receiving end, too, since an entirely new radio technique has had to be developed (frequencies ranging up to at least two million cycles, free from mutilation by phase or amplitude distortion, have to be handled by the sets designed for this purpose), the purchasing public will be safeguarded by the thought that components and sets have not been rushed prematurely on to the market to be rendered obsolete or be found quite unsatisfactory after a few months' use.

The outwardly apparent lack of interest has been just a cover for the hive of activity in the television world, and the promised inauguration of the high-definition service from the Alexandra Palace this coming summer can be anticipated with every degree of confidence. Technician and novice, purchasers of complete sets, or builders of home-constructed apparatus, will be able to participate in the pleasures associated with the new science of combined sound and vision, and the industry as a whole should experience a degree of success which even the most optimistic would not have thought possible some months ago.

Another Invention

It is learned that a Manchester engineer is engaged in the perfection of a television invention which claims to make use of a new type screen capable of giving life-size projection. No technical details are available, but it is said that whereas it was necessary previously to use high-powered illuminants for projection purposes, with this equipment only low powers are required. An ordinary Pathoscope projector in full daylight has been employed for some of the demonstrations. The idea is to use this apparatus for sponsored television programmes in open spaces, halls, or even large stores. Provided the results are quite satisfactory this application of television should be a fruitful source of income, for it has a topical and novelty appeal.

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RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

DEPTFORD MEN'S INSTITUTE RADIO CLUB

THIS club has now decided definitely to cater for short-wave enthusiasts, and with its coming session commencing April 21st, "Short-wave Radio" in all its phases will be the motive, and among the present membership are several R.S.G.B. members and licensed transmitters, and the club is now licensed for the use of transmitting apparatus. It is hoped, if facilities are available, to put a club transmitter into operation, and with this in view, some members have availed themselves of the Morse practice sessions which have been held during the past three months.

The club had a very interesting visit in March when twenty members and friends visited the London National and Regional transmitters at Brookmans Park, and a very informative afternoon was spent looking over the "Twin Station."

During next session it is hoped to organise a "Field Day" on one of the commons adjacent to S.K. London. Meetings are held every Tuesday evening at 8.30 p.m., at the Deptford Men's L.C.C. Institute, Clyde Street, S.E.3, and the subscription per session is 1s. 3d. Next session will commence April 21st, and all short-wave people are invited.

TOTTENHAM SHORT-WAVE CLUB

THE Tottenham Short-wave Club recently held a very interesting meeting at which the President, Mr. Ballard, gave a lecture on Ohm's Law, explaining its theoretical application to the various problems we meet in our experiments with radio apparatus.

A great number of requests have been made for me to arrange a series of Field Events, and I now have much pleasure in announcing that the first one will be held during the month of May, and any one interested can obtain further particulars by writing to me—L. Woodhouse, Secretary (G2BQY), 57, Pembury Road, Bruce Grove, Tottenham, N.17.

JERSEY SHORT-WAVE CLUB

IT is hoped to form a short-wave club in Jersey (Channel Islands), and interested readers residing in this island are invited to communicate with Mr. M. G. Bourke (BRS 1784), "Creditor," Samares, Jersey.

THE CROYDON RADIO SOCIETY

MR. R. P. JONAS, Hon. Librarian, demonstrated his new receiver to the Croydon Radio Society on March 31st, in St. Peter's Hall, S. Croydon. It incorporated variable selectivity, by which quality was very good on local station, and extra selectivity could be used for foreign ones. The circuit was certainly fascinating, with a conventional H.F. amplifier, triode heptode frequency changer, intermediate frequency stages, diode detector, and so to a special paraphase amplifier and Hartley-Turner loud-speaker. Of much interest also was the muting valve, the purpose of which was to cut out static noises, which rose to unpleasant heights when tuning between stations with an A.V.C. controlled receiver such as the one demonstrated.

SHORT-WAVE LOG

(Continued from page 132)

ON some evenings, I am informed, you may hear a Spanish programme through W2XAF, Schenectady (31.48 metres—9,530 kc/s); this would appear to be an exchange of programme with Buenos Aires from which city a special entertainment is relayed. Occasionally you may pick up tests carried out by W2XAF with LSX; Monte Grande (28.98 metres—10,350 kc/s), used as the air link for this purpose. It should be borne in mind, however, that LSX is not in the accepted sense a broadcasting station, and therefore does not possess a regular schedule.

If you can successfully tune in W2XAD, Schenectady, on 19.56 metres (15,330 kc/s), try for HAS3, Budapest, on any Sunday between G.M.T. 14.00-15.00, on a slightly lower channel (19.52 metres—15,370 kc/s). On this day a special broadcast is made for Hungarian nationals dwelling in the United States. The power of the Szekesfehervar station carrying out the transmission is 6 kilowatts, and in consequence the signal is a very good one.

Trujillo City

HIZ, Trujillo City, 47.50 metres (6,310 kc/s), with the slogan: *La Voz de los Muchachos*, and to which I referred in previous notes, has been logged several times in the British Isles this winter. The signal used is a distinctive one: 2 strokes

Then Mr. Jonas showed what could be done on distant stations, and the feature of variable selectivity was carefully examined here as to effect on quality, while the advantages of the muting valve were made very obvious.—Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

BRADFORD SHORT-WAVE CLUB

THE membership of the above club is now steadily increasing, and on Friday, March 20th, we had a demonstration of a Philco all-wave receiver.

On April 3rd, Mr. J. S. Johnson brought a Marconi-phone all-wave receiver along with him, and demonstrated its capabilities to the members. We are very glad to say that we have now got a Morse instructor, and shall be starting a Morse class to begin at 7.30 p.m. one week and 10.0 p.m. the following week, alternately. This is to enable those who are unable to attend early to practise, and the class will be under the leadership of Mr. W. F. Battery.

Messrs. Lissen, Ltd. have promised to attend on Friday, April 17th, to give us a demonstration of their short-wave sets and equipment; we shall be pleased to welcome anyone who cares to come along. Club meetings are held every Friday evening at 7.30 p.m. in Bradford Moor Council School, Leeds Road, Bradford. The Hon. Sec., Mr. G. Walker, 33, Napier Road, Thornbury, Bradford, Yorks, will be pleased to give further particulars to anyone interested.

THE RADIO PHYSICAL AND TELEVISION SOCIETY

THIS society welcomed as a lecturer on Friday, April 3rd, Mr. Menage of R. A. Bothermel, Ltd., and his subject, which was "Piezo Electricity," is one which, in the past, has, of course, aroused much interest among members.

The properties of Rochelle salt or Sodium Potassium Tartrate is now well known, and these the lecturer briefly explained. The bimorph element, consisting of two plates of Rochelle salt cut in a special manner, cemented together in opposition, will exhibit a bending action on being charged with an electrical potential. The convex of this is, of course, true. The Piezo electric crystal is now being put to many uses, said the lecturer, due to its several advantages over its moving-iron or moving-coil contemporary. Used in a pick-up, it was explained that a Piezo electric element will give at 3,200 cycles an output of .5 volts, and on lower frequencies it will at times give an output of 6 volts, which is, of course, far in excess of that given by any other type of pick-up. The frequency response is particularly good in the case of the pick-up, especially in the upper register, and lightness is another important factor.

Other applications of the crystal are in speakers, microphones, stethoscopes, headphones, and also for use in vibration-detecting apparatus as used on bridges. The crystal microphone is finding its place in film studios and in many broadcasting stations, owing to its particularly good quality, if not large output. A sealing compound which renders the crystal impervious to damp has been produced, and Piezo electric apparatus may be used from temperatures below 0 deg. F. to 131.2 deg. F.

Field days are approaching, and the society is planning an interesting field day programme for the summer months. Those interested are asked to apply to the Hon. Sec., M. Arnold, 12, Nassau Road, Barnes, S.W.13. The next meeting, which is open to all readers of PRACTICAL AND AMATEUR WIRELESS, will be held on Friday, April 17th, at 8 p.m., at 72a, North End Road, West Kensington.

on a gong (one high and one low note) Two broadcast sessions daily, the first at G.M.T. 16.00 and the main entertainment from G.M.T. 22.00-02.00. Listeners in the United States report the reception of a newcomer, HIG, also in the capital, on 47.77 metres (6,280 kc/s) which identifies itself to the world by a sound reminiscent of a calf bawling for its mother—possibly a siren!

Higher up on the scale, H11A, at Santiago de los Caballeros, gives out its call: *Estacion Achay-ee-ono-ah, La Voz del Yaque*, on 48.5 metres (6,185 kc/s). Slow chimes will be heard between broadcasts.

H15N, in the same city, on 48.78 metre (6,150 kc/s) is on the ether at the same time (G.M.T. 00.30-02.40). H19B, apparently newly installed at Santiago, on 49.59 metres (6,050 kc/s) calls itself: *Broadcasting Columbus*, and advertises as a daily schedule transmissions from G.M.T. 22.00, with a special English programme on Mondays between G.M.T. 05.15-06.15. Note that this station is exactly on the channel used by GSA, Daventry.

Finally, at Trujillo City, with the phonetic call: *Achay-ee-ay-kis*, regular weekday broadcasts are made by HIX, between G.M.T. 21.40-22.40, with extra transmissions on Wednesdays and Saturdays between G.M.T. 01.00-03.00. The station does not work on Sundays.

THE CHOICE AND USE OF METERS

(Continued from page 122)

20 and 200 mA. For those who require a lower-priced instrument there is a number of moving-iron instruments which can be used for A.C. or D.C. at will, and which are guaranteed accurate to within plus or minus five per cent. The price of any of these meters is twelve and sixpence. Incidentally, there are several voltmeters and ammeters in the same range and at the same price. For those who require a still cheaper job there are some miniature panel-mounting instruments—for volts, amps. or milliamps.—at only seven and sixpence. These are not as accurate as the others, of course, but are nevertheless perfectly good when it is required only to make normal tests.

Other instruments of similar types are made by Ward and Goldstone and Sifam, amongst others, whilst Ferranti are also makers of a very wide range of single-purpose meters of all kinds. These are generally of the more expensive pattern, and they are made to fine limits of accuracy.

A Few Hints

It is obviously impossible to give even brief details of all the meters which are



Another Telsens meter which will be found very useful for battery tests, etc.

on the market, so we will give a few simple rules which should be observed in choosing a suitable meter. The first is that the instrument should be of well-known make—that is a valuable safeguard and ensures a degree of accuracy compatible with the price charged. Buy a moving-coil meter if you can afford it, and if D.C. only is to be measured. If price is an important consideration and you have to measure both D.C. and A.C. a moving-iron meter must be obtained. In buying a milliammeter get one with a low resistance, but when buying a volt meter see that it has a high resistance—1,000 ohms per volt is the ideal, but 250 ohms per volt is fairly satisfactory for ordinary test purposes. It is better to buy a really good single-purpose meter than a mediocre multi-range instrument.

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Raymart Stand-off Insulator

FOR supporting short-wave coils, and also for leading-in wires in transmitters, a good low-loss insulator is essential, and it is also desirable in many arrangements to keep the wires away from other bodies in order to reduce capacity losses. The stand-off insulator shown on this page is obtainable from the Raymart range, and has an overall height of 1½ in. (excluding the terminal). It is made from a highly-glazed vitreous porcelain, and the terminal parts are nickel plated. The price is 6d., and where a smaller insulator is required the type SS may be obtained with an overall height of 1 in. at a cost of 4d.

A Unique Band-spread Unit

THE advantages of band-spreading on the short waves are now familiar to all short-wave listeners, and in the usual way two separate condensers are employed. For the benefit of those to whom the scheme is not so well known, it may be briefly explained that a normal short-wave



A neat and efficient stand-off insulator which may be obtained for 6d. from Raymart.

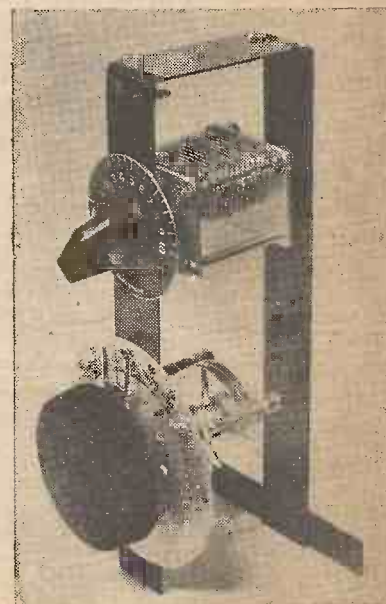
condenser is employed in conjunction with a very small condenser in parallel, and the larger condenser is referred to as a "tank" condenser, and is used to obtain an approximate setting of wavelength, after which the smaller, or band-spreading, condenser is turned throughout its complete range in order to find an intermediate capacity, and this greatly simplifies the process of tuning, which is so very critical when working at the high frequencies. As may be gathered from the above details, when ordinary components are employed, it is extremely difficult to repeat a given setting when searching on various occasions, and, therefore, the new band-spread combination introduced by Messrs. Stratton and Co. (makers of the Eddystone short-wave components) will be found invaluable. The tank condenser is a standard air-dielectric short-wave condenser with a maximum capacity of 140 m.mfd., but fitted to the rotor spindle is a disc in which ten holes are drilled over one half, and this disc is mounted close to one of the end plates, and held between them are two steel balls which engage in the holes, and thus provide ten definite settings, each of which has a change in capacity of 14 m.mfd. The remaining component is a microcondenser having a maximum capacity slightly greater than 14 m.mfd., and, therefore, when this is turned through its complete range, it spreads out each adjustment of the main or tank condenser. The dial to the band-spreading condenser is operated through a

9 to 1 reduction gear, and the scale is divided into 100 divisions. Thus, each tenth section of the main condenser is divided into a further 100 sections, and, with the slow gearing, gives an equivalent tuning ratio of 90 to 1, with the further advantage that exact indications are provided on each dial to facilitate resetting when desired for a particular station. This combination is invaluable to the short-wave experimenter, and the two components are obtainable for 12s. 6d., 6s. for the tank condenser and 6s. 6d. for the band-spread condenser. The mount shown in the illustration is purely for show purposes, and the two condensers may be mounted side by side on the panel if desired.

An Aerial Equaliser

THERE are seven million radio aerials in this country; less than a million of them are efficient, according to a leading radio engineer. "Sets have had to be designed to give satisfactory results on practically any type of aerial," said the Chief Engineer of E. K. Cole, Ltd., recently, after the announcement of two new Ekco receivers. "Some aerials are long and high, others are merely odd lengths of wire hung along a wall. There is no uniformity at all. An aerial is an important part of the receiving circuit, and if it is not as carefully selected as the other components, the set cannot be expected to give its best performance.

But now the problem has been solved—an "Aerial Equaliser" has been invented and built into the new Ekco sets. This device matches the set with the aerial and improves the performance obtainable from a poor aerial by six or seven times.



When constructing a short-wave receiver this band-spread unit will be found invaluable. It is an Eddystone product.



IMPRESSIONS ON THE WAX

By
T. Onearm

The King's Speech

THE "His Master's Voice" record of H.M. King Edward's Message to the Empire on *HMV RB8417* makes us realise how surely the gramophone record is becoming a historian as well as an entertainer. King Edward's very pleasant, almost conversational voice is reproduced excellently, and it is looked upon as one of the most successful records of a speech yet made. The profits from the sale of this record are being paid, by His Majesty's command, to the King George Jubilee Trust.

Bird Mimicry

KREISLER'S Caprice Viennois is becoming very popular. Elisabeth Schumann now sings it very charmingly on *HMV DA1455*, together with Weingartner's Vogel Lied (Bird Song). In this she gives another display of her remarkable powers of bird mimicry. Very little of Chopin's music has yet been transcribed for the voice. Miliza Korjus sings on *HMV C2832* two of the Nocturnes, Op. 9, No. 2 ("O Night! O Dreams!"), and Op. 37, No. 1 ("Ah, let me weep"). The first of these is the best known of the series, and in the other a vocal quartet is introduced very effectively.

Vivian Ellis's piano medleys are becoming quite famous and his admirers will want his latest—"The Town Talks," on *HMV BD337*.

Friml Reminiscences

REGINALD FOORT returns to the record lists with "Reminiscences of Friml," played on the organ of the new Paramount Theatre, London, on *HMV BD338*. The ever-popular American tenor, Richard Crooks, has made a most successful recording of "Garden of Happiness" and "Arise, O Sun," on *HMV DA1449*.

A Football Pools and Totalisator Game Record

THIS extremely ingenious puzzle record makes it possible for you to have your own Football Pools at home. The record announces results of twenty-four different matches, either Home Win, Away Win, or Draw, and as the results have been based on statistics of thousands of results it is a real test of your knowledge of football. On the other side of this record is a Totalisator Game covering twenty-four different races. With this a chart is provided. By means of one of the most amazing feats of technical recording yet achieved, you can enjoy the thrills of the football field, or the racecourse (with appropriate realistic noises) whenever you wish. *BD333* is one of the cleverest records that has ever been produced.

From the Films

THE large number of musical films now running provides many of the hits. Nelson Eddy, who stars in "Rose Marie," sings "The Mounties" and "Rose

Marie" on *HMV DA1449*, this being the "Record of the Month." Jack Hulbert has three songs from "Jack of All Trades"—"Where there's you; there's me," and "You're sweeter than I thought you were" on *HMV BD334*, and "Tap your Tootsies," which is coupled with "Celebratin'" from the film "Limelight" on *HMV BD335*. These are good songs, showing this artist in his characteristic vein. A newcomer to the lists is Evie Hayes, with a contralto voice, who sings, "My heart and I" from the film version of Charlot's show, "Anything Goes," and, "If you love me," on *HMV B8421*. This, which is Ray Noble's latest composition, bids fair to become very popular indeed. Webster Booth adds to his reputation with "Vienna, City of my Dreams," coupled with "Stay with me for ever" on *HMV B8421*. Gertrude Lawrence contributes a delightful selection from her successes of the last few years on *HMV C2835*.

Dancing Time

RAY NOBLE, composer of "Goodnight, Sweetheart," "Love is the Sweetest Thing," and many other dance hits of recent years, has just composed a new tune, "If you love me," which he recorded in America with his band for "His Master's Voice." It is released this month on *HMV BD5046*, and will, in the opinion of experts, become one of the biggest sellers of dance records for many years.

Many other famous bands are also featured in the current "His Master's Voice" list. Jack Hylton plays, "This'll make you whistle" and "There isn't any limit to my love" on *HMV BD5037*, whilst Roy Fox has made two brilliant records, "Life begins when you're in love" coupled with "I feel like a feather in the breeze," and "Please believe me" coupled with "Saddle your blues to a wild mustang." "Whispering" and "Nobody's sweetheart," are two old favourites which are played with sparkling rhythm by the Ballyhooligans. Other specialised dance bands, such as the Darktown Strutters, play "Darktown Strutter's Ball" and "A Broken Doll," and The Continentals, a tango medley.

Listeners who want records in strict dance tempo should hear the Film Hit Medley by Joe Loss and his Orchestra on *HMV BD5044*. Enthusiasts who enjoy swing and hot music will want "I'll be a friend 'with pleasure'" and "Deep Down South" played by Bix Beiderbecke's Orchestra, which is one of the exceptionally good *HMV* releases of three records of this type.

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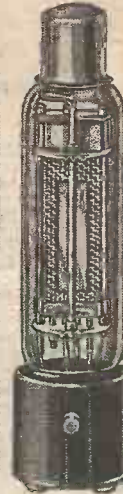
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	Date of Issue.	No. of Blueprint
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Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36D
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (R.C. & trans.))	—	PW10
Sixty-Shilling Three (D, 2 LF (R.C. & trans.))	2.12.33	PW34A
Leader Three (SG, D, Pow.)	—	PW35
Summit Three (HF Pen, D, Pen)	18.8.34	PW37
All-Pentode Three (HF Pen, D (pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow.)	—	PW41
Hall-Mark Cadet (D, I.F. Pen (R.C.))	10.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (trans.))	June '35	PM2
Cameo Midget Three (D, 2 LF (trans.))	8.0.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-wave Three (D, 2 LF (R.C.))	31.8.35	PW55
The Monitor (HF Pen, D, Pen)	8.2.36	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	7.12.35	PW64

Four-valve : Blueprints, 1s. each.		
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Beta, Universal Four (SG, D, LF, Cl. B)	15.4.33	PW17
Nucleon Class B Four (SG, D (SG, LF, Cl. B))	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's Superformer (SG, SG, D, Pen)	12.10.35	PW57

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Selectone A.C. Radiogram Two (D, Pow.)	—	PW19

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Double-Diode-Triode Three (HF Pen, D, D.T., Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	15.7.33	PW25
A.C. Three (SG, D, Pen)	10.9.33	PW29
A.C. Leader (HF Pen, D, Power)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-wave" A.C. Three (D, 2LF (R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	31.8.35	PW56

Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Half-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47

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F. J. Camm's 2-valve superhet (two valve)	13.7.35	PW52
F. J. Camm's £4 Superhet 4	16.11.35	PW58
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (three valve)	—	PW43
D.C. £5 Superhet (three valve)	1.12.34	PW42
Universal £5 Superhet (three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	7.12.35	PW59
F. J. Camm's Universal £4 Superhet 4	11.1.36	PW60

SHORT-WAVE SETS.

Two-valve : Blueprints, 1s. each.		
Midget Short-wave Two (D, Pen)	15.9.34	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Power)	23.9.33	PW30A
The Prefect 3 (D, 2 LF, RC and Trans.)	8.2.36	PW63

PORTABLES.
Four-valve : Blueprints 1s. each.
Featherweight Portable Four (SG, D, LF, Cl. B) PW12

MISCELLANEOUS.
S.W. Converter-Adapter (1 valve) 23.2.35 PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

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STRAIGHT SETS. Battery Operated.

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B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449

Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG, Det, Pen)	—	AW392
Iron-core Two (D, Trans)	—	AW395
Iron-core Two (D, Q.P.P.)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW388A
Lucerne Minor (D, Pen)	—	AW426

Three-valve : Blueprints, 1s. each.		
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher : Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher : Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Coscor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	—	AW377A
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three : De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen) "Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple tune Three (SG, D, Pen)	June '33	WM327
Economy-pentode Three (SG, D, Pen)	Oct. '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	Mar. '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
Graduating to a Low-frequency Stage (D, 2LF)	—	WM378
P.T.P. Three (Pen, D, Pen)	June '35	WM389
Certainty Three (SG, D, Pen)	Sept. '35	WM393
Minutube Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	Dec. '35	WM400

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"A.W." Ideal four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2HF, D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above : blueprints 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	Aug. '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	Feb. '35	WM381
The H.K. Four	Mar. '35	WM384

Five-valve : Blueprints, 1s. 6d. each.		
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New Class-B Five (2SG, D, LF, Class B)	Nov. '33	WM340
Class-B Quadraduyc (2SG, D, LF, Class B)	Dec. 33	WM344
1935 Super Five (Battery Superhet)	—	WM379

These blueprints are full size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows : "Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7d., and "Wireless Magazine" at 1/3d., post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send (preferably) a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Mains Operated.

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Economy A.C. Two (D, Trans) A.C.	—	WM28C
Unicorn A.C./D.C. Two (D, Pen)	Sept. '35	WM394

Three-valve : Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	—	AW333
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
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1934 A.C. Century Super A.C.	10.3.34	AW425
Heptode Super Three, A.C.	May '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	Apr. '35	WM385

PORTABLES.

Four-valve : Blueprints, 1s. 6d. each.		
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW638
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)	Aug. '34	WM367

SHORT-WAVERS—Battery Operated.

One-valve : Blueprints, 1s. each.		
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S.W. One-valve for America	—	AW429
Roma Short-waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SGdet, Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	Jan. 19, '35	AW463
The Carrier Short-waver	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World Beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver	Mar. '35	WM383
Superhet : Blueprint, 1s. 6d.	—	—
Simplified Short-wave Super	Nov. '35	WM397

Mains Operated.

Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	Aug. '34	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	Aug. '35	WM391

MISCELLANEOUS.

Enthusiast's Power Amplifier (1/6)	June '35	WM387
Listener's 5-watt A.C. Amplifier (1/6)	Sept. '35	WM392
Radio Unit (2v.) for WM392 (1s.)	Nov. '35	WM398
Harris Electrogram (battery amplifier)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram	Mar. '36	WM403
New style Short-wave Adapter (1s.)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter	Dec. 1, '34	AW456
Superhet Converter	Dec. 1, '34	AW457

LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.



All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Short-wave Reception

SIR,—In a recent issue you have attributed the poor reception which some S.W. listeners experience to be due to their lack of skill in tuning, or to what you term lack of "tuning sense." I don't entirely agree with you in this. I do agree that skill and practice in tuning means a great deal to get the best out of the signal strength which the set is capable of giving, but no "tuning sense" can make for good reception if the signals are too weak, and weak signals are not always the outcome of bad circuits or badly constructed ones, no more than want of tuning skill.

From my experience of short-wave reception I find that reception generally is influenced by general and local conditions. General conditions certainly affect one particular band, or all wave bands, at a particular time of day or night, and local conditions affect reception at all times. In the forenoon I can seldom receive even our Empire stations. About 5 p.m. I may receive them, and others, on the 'phones at good strength, but at night they usually become dull and almost inaudible. A friend of mine in London has a similar receiver and gets good reception on a 40 to 50ft aerial. I could get nothing on one more than about 5ft. long. The difficulties and disadvantages due to bad local conditions have at times almost exhausted my patience. There are probably many other readers who experience the same trouble.—**M. BERRY** (Bangor, N. Ireland).

An Appreciation from S. Africa

SIR,—I have taken your excellent paper for a number of years, and am very pleased to note how the short-wave section has grown. I feel quite sure that in publishing details of transmitting, etc., you would be pleasing a number of readers. I have learnt a lot from your most valuable paper and am very interested in short wave work, as well as transmitting, and spend most of my time listening to amateur transmissions during the week-ends.

Wishing PRACTICAL AND AMATEUR WIRELESS every success in the near future.—**JAMES GAYES** (Kimberley, S. Africa).

W2BSD and Research Work

SIR,—Several of your readers have reported reception of W2BSD, and details of the station were given by Mr R. D. Addie in March 28th issue.

No mention, however, has been made of the research work carried out by this station, which lies in the freak condition effecting short-wave reception; a mystery still unexplained.

This research work is dependent on the assistance of a group of selected receiving stations located in various parts of the world.

My own station, one selected from this country, has been co-operating with W2BSD for the past month, so perhaps some readers may be interested in how these selected stations help in the actual research work. Each station receives prepared log sheets, which are filled in daily, or each time W2BSD is received together with details of strength, fading weather conditions, temperature, barometre and wind.

Reports are sent in monthly, and later, it is hoped, some valuable data will be obtained, which, with the permission of W2BSD, I hope to pass on to interested readers.

In conclusion, the research station is owned by Mr. G. C. Cannon, but licensed under the operator's name, Ted Healy. Mr. Cannon is truly a pioneer in radio, dating back to the days of 1910, and he directs the research work at the Cannon Laboratories situated at New Rochelle, N.Y.

Useful reports are welcomed and always acknowledged.—**ERNEST J. LOGAN** (Hertford).

received, it seems that the offer was appreciated, so I am quite happy.

Letters have arrived from England, Wales, Ireland, Scotland, France, Belgium, and Germany.—**E. WEBSTER** (Ruelle Braye, Guernsey).

[We fully appreciate Mr. Webster's enterprise and the trouble he has taken to oblige other readers of PRACTICAL AND AMATEUR WIRELESS.—Ed.]

Back Numbers of "Complete Wireless" Wanted

SIR,—I am very anxious to obtain copies of "Complete Wireless," parts 10 and 11, dated November, 1932, which, upon inquiry, I find are now out of print.

I wonder if any reader would either loan or sell me these copies. In either case, I will pay postage.—**W. BROOK** (631 Royds Terrace, Linthwaite, Nr. Huddersfield).

Back Numbers of "Amateur Wireless" Available

SIR,—No doubt many readers will be interested to know that I have the complete file of *Amateur Wireless* with blueprints, and will be pleased to lend or sell any of them to any reader who states his requirements.—**P. A. MANCHÉE** (8 Brewer Street, Maidstone, Kent).

A Good Log from Dublin

SIR,—I submit the following log on the 14 m/c band, taken on Sunday, the 29th, and Monday, March 30th, between 22.00 and 00.15.

W. Stations: 1XA, 1ATD, 1BR, 1AIQ, 1IAR, 1DML, 1ILQ, 1HAD, 1GJX, 2EOY, 2CUZ, 2HAN, 2HFS, 2HS, 2EYY, 2CWS, 2EEN, 2BSD, 2DYR, 3BHJ, 3MD, 3BBO, 3CNY, 4EX, 4CDY, 8HEQ, 8KQ, 8CMA, 8GLA, 8VLE, 8WA, 8MBM, 9JKA, 9RDS, 9AR; Canadian VE2BG, VE3JV, VE3EO; Cuban: CO6OM, CO2HY.

I am only a beginner, and should like to get in contact with anyone interested in S.W. work in my district. I am using a four-valve superhet on A.C. mains.—**D. LEET** (Weston, Elton Park, Sandycove, Co. Dublin).

CUT THIS OUT EACH WEEK.

Practical Wireless

The Editor will be pleased to consider articles of practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.



QUERIES and ENQUIRIES

Transmitting

"I am becoming interested in transmitting and I should be glad if you would give me as much information about the subject as possible. I am an expert operator, but my technical knowledge is only slight. I have operated a small amateur station, but the technical side was handled by a friend. Could you assist me to build a station and give me the cost?"—F. M. Q. (Padstow).

WE have already given details concerning the transmitting licence, and it is not possible to commence transmitting activities until a licence has been obtained. You would be unlikely to obtain a licence, in view of the fact that your technical knowledge is nil, and as you are an expert operator, we think the best plan would be to take a correspondence course from one of the training institutes in order to acquire the necessary knowledge; but it must be remembered that the licence is not issued simply to enable you to transmit and carry out working with various amateurs, but is granted to permit of some definite line of research, which must be stated in your application. The first step, however, is to communicate with one of the training institutes regarding a suitable course.

The Simplest One-Valver

"I built a one-valve set, and then tried to reduce its size by a process of elimination. I found eventually that I could still receive the Scottish Regional with just the valve. The aerial was connected direct to the grid, and the 'phones to the anode, with H.T. and L.T. applied in the ordinary way. I did not think this possible, as there is

results would, of course, have been obtained if the aerial was tuned exactly to the wavelength of the Scottish Regional.

D.C. and Hum

"I have a home-made D.C. set which gave me good results before I moved down to this place, but I find that now hum is rather prominent. It is not too bad, but is sufficient to be distracting in quiet programme items. I have made sure of the earth, and have generally carried out all

the usual dodges without effect. I wonder whether you can suggest anything that I have not tried to cure this trouble?"—G. E. R. (Framlingham).

IF you have tried all the usual remedies without success we suggest that you examine the supply, when you may find that you are on the negative side of the supply. In this case improvement may be effected by removing the present smoothing choke (which is presumably in the H.T. positive lead) and connecting it in the H.T. negative circuit. This has been found in many cases to effect an immediate improvement, but, of course, is only applicable where the positive is earthed.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

A. J. B. (Hull). We do not anticipate the description of a mains set on the lines of the Tutor.

H. L. (Worcester). It would appear that your valves are the cause of the trouble and we also advise you to check the wiring carefully.

J. S. M. (Larkhall). Any good meter could be used and it would be preferable to obtain one with a full-scale reading of only 1 mA, and to make up a number of shunts so that various higher ranges could be read. The meter could also be used for measuring voltages by connecting various resistances in series, as has been explained in these pages from time to time.

W. S. (Manchester). We have no blueprint of a unit of the type mentioned. You need only a Class B input and output transformer and a 7-pin valveholder, but the output valve of your receiver should preferably be of the small power type in order to act as an efficient Driver for the Class B stage.

A. W. S. (Bishop Auckland). We suspect a defective valve or a valveholder in which the pins of the QP21 valve do not make firm contact. Examine the pins and make certain they are not bent and also have the valve tested.

W. D. M. (Radford). Whilst the components in question may function quite satisfactorily, we prefer to specify only one type and to request the constructor to adhere to the specification to avoid difficulties.

W. B. (Eardisley). A four-pin valve could be used and the anode connection would then be taken to the normal anode pin on the valveholder instead of to the cap. The present connection to the normal anode pin should be ignored.

F. T. (Preston). The set could be made up in the manner outlined by you, although we are not certain of your intentions regarding the components which are normally mounted beneath the chassis. Your Eliminator may be suitable, but we cannot guarantee this as we have not tried it with this particular set.

A. W. C. (New Eltham). We are unable to supply a circuit for the purpose, but band-pass tuning could certainly be employed. One of the band-pass coils should be provided with the necessary reaction winding, and this coil should be used in the detector circuit, with the coil which has no reaction winding connected in the aerial circuit. As separate condensers are to be used the variation in tuning due to the reaction will not affect you.

J. W. (Dundee). The fact that the wires are covered does not prevent signals, and therefore you have either wired the set wrongly, or have some faulty components. We cannot help you further from the information given.

R. G. (Malta). The equivalents in the Mullard range are VP.2, PM.2DX and PM.22A, whilst in the Marconi-Osram range the equivalents are VP.21, HL.2 and PT.2. The H.F. pentode is obtainable either with a 5-pin or a 7-pin base.

S. T. (Manchester). The components cannot be identified from the numbers, and we regret that we cannot assist you in this particular connection.

F. S. (Exeter). The Data Sheet was published in our issue dated 4th April, and this will no doubt prove of use to you. We shall be glad to hear from you again if you are still unable to obtain satisfactory results. A postal reply will be sent if you enclose a stamped and addressed envelope.

A. J. (St. Helens). The connections to your coil are as follows: Aerial to terminal 3, Earth to terminal 4. Detector anode to terminal 2, and reaction condenser to terminal 1. The coil was used in conjunction with a broadcast coil in the All-Wave Two described in our issue dated Aug. 19th, 1933.

H. McH. (Co. Cavan). The ganging should not be affected on long waves, and the pre-set condenser should only be operative on the long wave-band. Therefore, trim on the medium waves, ignoring the pre-set, and when switched to long waves, adjust only the pre-set, and do not touch the remaining trimmers. A superhet converter could be used but some complication is generally introduced by the double frequency changing.

J. W. (Rhondda). We regret that we are in the same position as the manufacturers, and we have no details of the set. We cannot recommend any of our blueprints for your assistance in this particular case.

D. R. B. (Chelsea). We suggest you obtain one of the commercial all-wave aerials, or build your own from good 7/22 enamelled wire. The horizontal portions should be about 20ft. long, and the down-lead should be brought at the most direct angle possible to the set. Insulation must be carefully attended to.

L. T. (Hadeleigh). We cannot give all the transformer winding details in the form of a reply. Many more facts are required before the winding data can be ascertained, and we refer you to the various articles which we have published on the subject.

S. L. (Townhill). We no longer include station identification in our queries service, and regret that we are unable to assist you in this particular instance.

J. W. C. (Manchester). O.S. corresponds to Grid, I.S. to G.B. and O.P. to Plate. I.P., of course, corresponds to H.T. The letters actually stand for Outer and Inner Primary and Secondary. The makers of the coil in question can supply all winding details as well as Black Prints of circuits employing them.

E. D. (Ilkeston). Write to the makers of the set. It would appear that there is some fault, but we are not familiar with the set and its service difficulties.

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Utility 0.0005 2-gang bakelite dielectric, semi-shielded condenser. Slow Motion and Uniknob Trimmer, 3/11. Utility 0.0005 3-gang fully screened with Trimmers and Illuminated Disc Drive, 7/6. Polar Star, 3-gang, 0.0005, fully screened with Trimmers, 5/6. Polar 0.0005 with slow motion, 3/11. Lissen 2-gang 0.0005 with Front Trimmer and Disc Drive, 5/11. Bakelite Reaction and Tuning Condensers. 0.0001, 0.00015, 0.0002, 0.0003, 0.0005, 0.00075, 9d. each. Presets, .002 max., 6d. each.

FIXED CONDENSERS

Electrolytics.	Paper Types.	
T.C.C.:	Dubilier:	
8mf. 650v. (surge) 4/-	4mf. 500v. working .. 4/-	
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15mf. 100v. .. 1/-	4mf. 1000v. working .. 10/6	
50mf. 12v. .. 1/-	4mf. 2000v. working .. 13/-	
Dubilier:	Western Electric:	
4mf. 500 v. .. 3/-	4mf. 250v. working .. 2/-	
8mf. 500v. .. 3/-	2mf. 250v. working .. 1/-	
8+4mf. 500v. .. 4/-	1mf. 250v. working .. 6d.	
50mf. 50v. .. 1/9	4mf. 350v. .. 2/6	
12mf. 20v. .. 6d.	2mf. 350v. working .. 1/6	
25mf. 25v. .. 1/-	Condenser Blocks	
U.S.A.:	All 250 volts working.	
4, 8, or 12mf.	Dubilier:	
530v. peak each 1/9,	2+2+2mf. .. 2/6	
8+4mf. 500v. peak .. 2/3	2+2+1+1+1mf. .. 2/-	
4+4mf. 500v. peak .. 1/6	H.M.V.:	
8+8mf. 500v. peak .. 2/6	4+1+1+1+1+5+ .. 1/6	
12+8mf. 500v. peak .. 2/6	5+5mf. .. 1/6	
12+4mf. 500v. peak .. 2/6	Lissen:	
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Wego 1mf. 450v. working 1/-, 2mf. 1/9, 4mf. 3/-.

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British-made Moving Iron Meters. Flush mounting, 2 1/2" diameter. 0-10, 0-20, 0-30, 0-50, 0-100, 0-150, 0-250, 0-500 milliamps; 0-1, 0-3, 0-5 amps. All read AC and DC, 5/9 each. Moving Coil Milliammeters. B.E.S.A., first grade. 0-1 M.A., 2 1/2" diameter, 18/6; 0-1 M.A., 3 1/2" diameter, 22/6. Multipliers for same, any range 1/- each. All Meters flush mounting bakelite cases. Visual Tuning Meters 6 and 12 milliamp types, 5/- Neon Tuners, 3/- each.

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SPECIAL PURCHASE OF FERGUSON 6-VALVE SUPERHETS. 17-2,000 METRES, 100-250v. A.C./D.C. £7-15-0. Ferguson 8-valve Superhets. 12 1/2-2,000 metres. 100-250v. A.C. or A.C./D.C. 16 tuned circuits. 7 watts output £12-10-0.

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G.E.C. A.C./D.C. Receiver. 200-2,000 metres. S.G. Detector, Super Pentode, Rectifier, self-contained M.C. Speaker. 200-250 volts, in handsome Bakelite Case. Listed £7-10-0 at 79/6.

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Clarion Moving Light Slow Motion Dial, with 2" knob. Ideal for Short Waves, 2/-. Utility Disc Drive, complete with 2" knob. Ideal for Short Waves, 2/-. 4" Bakelite Knob-Dials, 6d.

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4 watts, any value up to 50,000 ohms, 1/- each. 8 watts up to 50,000 ohms, 1/6 each. 15 watts up to 50,000 ohms, 2/- each. 25 watts up to 50,000 ohms, 2/6 each. 15- and 25-watt Resistors can be supplied semi-variable at 6d. extra. 1,000 ohm, 150 m.a. semi-variable Resistance, 2/-. 1,000 ohms, 250 m.a. Resistance tapped for any number of 0.18 amp. valves, 3/6. 800 ohm 350 m.a. tapped resistance, 2/-.
POTENTIOMETERS
By best manufacturers. 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg. 2/- each: 5,000, 10,000, 15,000, 100,000, 500,000, 1 meg. with switch, 2/6 each. Dual Potentiometers: 10,000 and 50,000; 5,000 and 50,000; 5,000 and 100,000; 10,000 and 100,000; with switch, 1/6 each.

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All incorporating Westinghouse Rectifiers, high quality Mains Transformers and Chokes. Generous Smoothing and Decoupling Condensers and Resistances. 120 volts 20 m.a., 20/-; with Trickle Charger, 28/-, 150v. 50 m.a. 4v. 3a., 27/6; with Trickle Charger, 35/-, 150 volts 30 m.a., with 4v. 3-4a. C.T.L.T., 25/-; with Trickle Charger, 32/6. 250 volts 60 m.a. with 4v. 3-5a., C.T.L.T., 30/-, 300 volts 60 m.a., with 4v. 3-5a., C.T.L.T., 37/6. 200 volts 100 m.a. with 4v. 3-5a. C.T.L.T., 42/6.

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Soldering Irons, 200-250 volts; consumes 0.2 amps, 2/6.

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Premier Screened H.F. Choke, 100-2,000 metres, 1/6 each. Premier Screened H.F. Choke, for Short Waves, 10-200 metres, 1/6 each. Premier Short Wave H.F. Choke, 10-200 metres. 9d. Premier Mains H.F. Choke, carry 1 amp., 1/6.

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25 M.A., 20 henrys 2/9 250 M.A., 15 henrys 20/-
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COMPLETE kit matched superhet components, with diagrams, including Lissen coils, illuminated drive, calibrated. The complete kit, for battery operation, worth pounds, while stocks last 20/- Heavy metal chassis ready drilled, 7/6. Valves 24/- (carriage 1/6).

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SHORT-WAVE Ormond, slow motion .00015, .0002, .00025, .00035 mfd. 1/9. Band-spread Condensers, .000005 mfd. 1/6. .00015 to .0003 mfd. reaction, 6d. 2-band short-wave coils, Litz wire, 13-55 metres, 1/10. Switch for same 5d. S.W. Plug-in coils (Eddystone pattern), 4-pin 13-26, 22-47, 41-94, 76-140 m., 1/10 each. 6-pin type 2/3. 150-325, 250-500, 400-800, 1,100-2,000, 4-pin 2/3. 6-pin 2/6. Volume controls, 10,000, 25,000, 1 meg., 1/-; 50,000 with switch 1/11. Dual Range Coils with diagrams, 1/5. L.F. Transformers 1/4. Ormond Disc drives, 1/5. Radiophone straight line drives 1/11. Radiophone 110 kc/s. I.F. Transformers 1/11 (screened with trimmers). 3, 4-gang condensers 2/6 (post on all component orders 6d.).

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COILS—Varley square peak coils B.P.5, complete, 2/3 each; Telsen latest type iron cored coils, type W349, midget size, 4/6; type W478 (twin) 9/- pair; type W477 (triple), 16/- set; type W476 (triple, superhet, selector and oscillator), 16/-; all ganged coils are mounted complete with switch; I.F. transformer coil, type W482, 5/6; all new and boxed.

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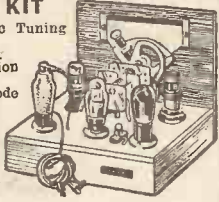
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PRACTICAL AND AMATEUR WIRELESS, 18/4/36.

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NO CHANCE OF ESCAPE!

There was no chance of escape for that glittering prize of a Staff car. The road continued straight for another four miles. Hedges on either side would prevent any attempt to leave it. It was my meat.

Understand my excitement. The destinies of nations have been altered by little chance happenings like this, the arrow that pierced King Harold's eye at Hastings, the chill caught by Napoleon on the road to Moscow. I was all keyed up.

When I had passed the car by a couple of miles or so I banked round. Pushing forward the stick, I dipped my nose until I was no more than twenty feet above the ground and went racing back towards it.

The setting sun was behind me. The road was a streaking white blur beneath me. I shifted in my seat and gave a final glance round. I was all set.

I was going to give those German Generals a long burst of twenty or more. The burst I would give them would begin at one hundred and fifty yards and last till my wheels were within a few feet of their radiator. I was going to dose that Mercedes and its occupants with the juiciest, deadliest burst in the history of machine-guns. I did nothing of the kind. . . .

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Practical and Amateur Wireless, April 25th, 1936.

SIMPLE UNIVERSAL MAINS SETS—See page 149

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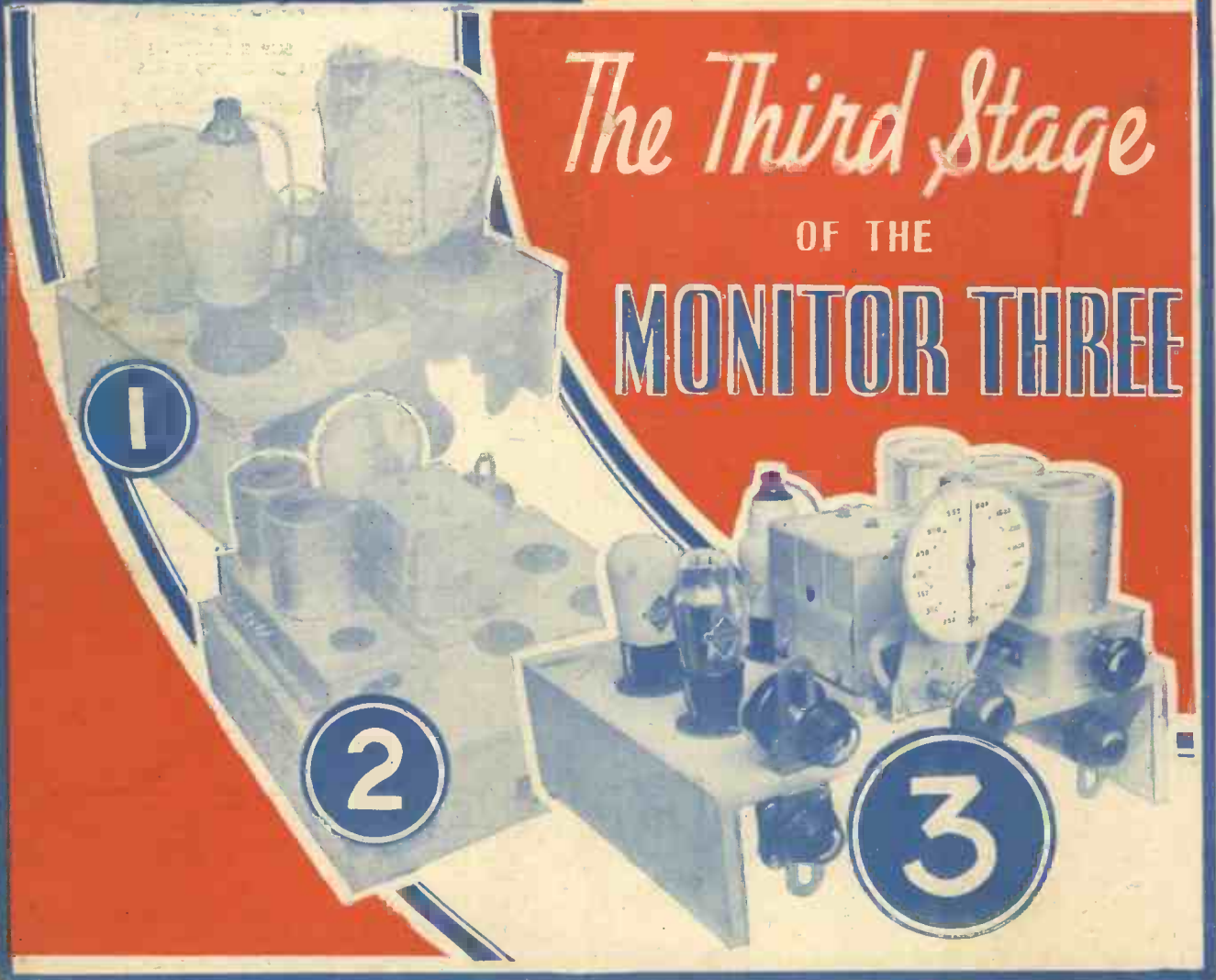
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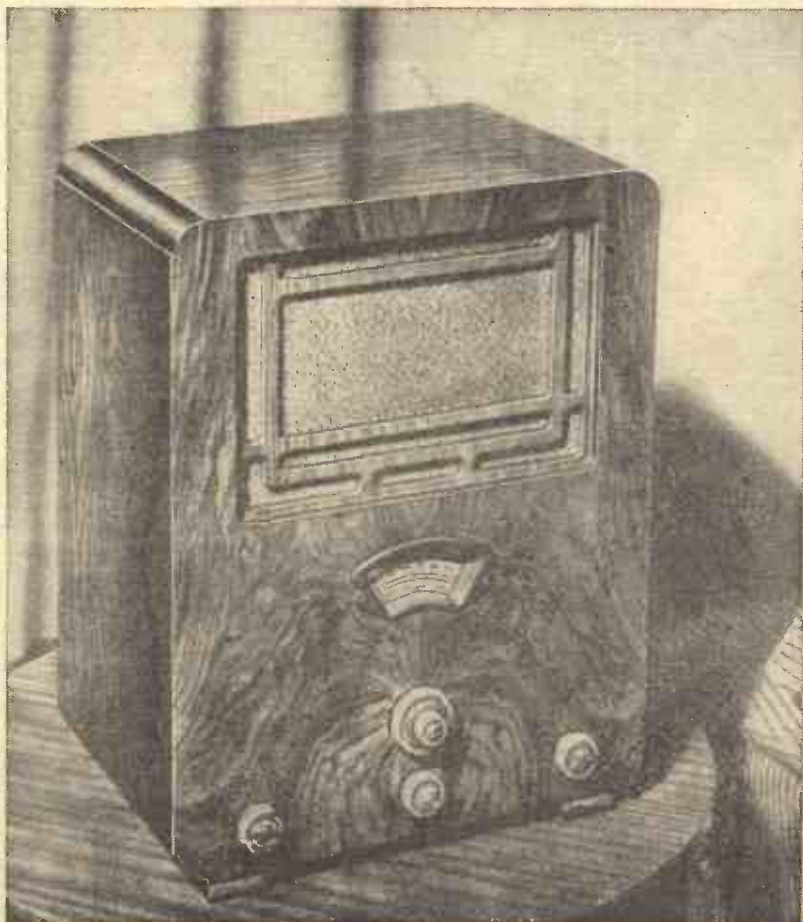
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ABOUT MIDGET COMPONENTS See Page 147



Practical

and Amateur

Wireless



Edited by **F. J. CAMM**

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VIII. No. 188. April 25th, 1936.

ROUND *the* WORLD of WIRELESS

First Radio Broadcast

ALTHOUGH in Europe the first concert of any importance was broadcast from the Chelmsford station on June 15th, 1920, transmissions had already been made as far back as 1913-14, from a small station at Laeken, near Brussels (Belgium). On March 28th, 1914, a complete radio programme was broadcast, but the transmitter was dismantled on the outbreak of the Great War.

Berlin Radio Exhibition

THE date for the 1936 wireless show in the German capital has been fixed for the period August 28th—September 6th, in order to “rope in” the visitors to the Olympic Games, held at Berlin this summer.

Czecho-Slovakia Plans Ahead

THE full scheme of the reorganisation of broadcasting comprises a second station at Prague of a power of 60 kilowatts; a similar station to replace the present Kosice transmitter, and new 100-kilowatt plant for Brno. In addition, during 1937, a further station is to be built in the neighbourhood of Bratislava.

Down Headphones!

FRENCH listeners to the Marseilles radio programmes have threatened to strike, refuse to pay their licences, and seal up their wireless receivers until better entertainments are provided by the local station. The main grievance appears to be the reiterated postponement of the opening of the new Marseilles-Realtor 100-kilowatt transmitter.

Radio and the Thames Police

SEVERAL of the patrolling Thames Police launches are being equipped with wireless transmitting and receiving apparatus to permit them to keep in touch with Scotland Yard, and also with the radio-equipped flying squad cars ashore.

High-power Transmitter for Estonia

THE Estonian State Broadcasting Service has placed an order with British manufacturers for the supply of a high-power station to be installed in the neighbourhood of Tallinn. It is also reported that the relay transmitter at Tartu is to have its output increased. Tallinn works on 410.4 metres (731 kc/s), a channel shared by two Spanish stations.

Italian Radio Medical Service

FOR dealing with accidents or illness at sea, the Italian authorities have inaugurated a complete medical service at Rome. Aeroplanes and seaplanes are at the disposal of the doctors for the conveyance of special serums or medicines if required. By a new invention, it has been made possible to transmit to the medical radio centre in the Italian capital the actual heart beats of patients for whom a diagnosis is required.

How Prague Outwits Thieves

IN order to ascertain whether radio receivers have been honestly acquired the Czech Post Office compels owners of wire-

Strasbourg's Mobile Studio

TO permit of direct relays from various neighbouring districts, the Strasbourg station has now equipped a large saloon railway wagon with anteroom, studio, two sleeping berths, small kitchen, as well as a special compartment for housing amplifying apparatus. The mobile studio, wherever it is stationed, is then connected to the nearest telephone point, and the broadcast is passed on to the main transmitter.

Is This a Record?

VK2UW, Sydney (New South Wales) boasts that it transmits radio programmes during twenty-four hours every day of the year. It operates on 1,110 kilocycles (270.3 metres).

New Direction-finding Station

AT a cost of £2,500, the Air Ministry is installing at Eastleigh, near Southampton, a D.F. wireless station for the aeroplanes landing on the Municipal Airport. For the air traffic it will fulfil the same duties as those carried out by the Nab tower radio transmitter for seaborne craft.

Vienna Goes One Better

HAVING visited all countries in which broadcasting systems are soundly established, the Austrian authorities have planned a new Broadcasting House which, when opened at Vienna in the spring of 1937, will prove to be the most up-to-date radio centre in Europe. The scheme brings all studios, the concert hall, theatre, variety, cabaret stages and lecture rooms under one roof.

More Macabre

THE B.B.C. Drama Department some time ago produced a programme called “Macabre.” The idea behind the production was that listeners sitting round the fire sometimes enjoy a really grim story. Felix Felton, who was responsible for the first “Macabre” programme, will produce “More Macabre,” on May 2nd, in the National programme. Good story-tellers are born, not made, and the voices have been most carefully chosen. For broadcasting purposes, the stories have been dramatised. The first story will be based on Gwendoline Foyle’s “The Picture.” The second story-teller will then introduce Walter Hudd’s “Lights Out,” and the third uncanny tale is E. F. Benson’s “Thursday Evenings.”

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less sets to declare the make, trade mark, manufacturer's number, and valve classification of all receivers registered.

Tides, Fog and Micro Waves

ACCORDING to a recent report on the working of the 17.4 centimetre micro-wave transmissions between Lympne (Great Britain) and St. Inglevert (France), both tides and weather affect reception, as changes in temperature or barometric readings exert considerable influence on these ultra-short channels. It would also appear that whereas some waves travel in direct line from station to station, others are reflected from the surface of the sea between the two points.

ROUND the WORLD of WIRELESS (Contd.)

Programme of May Day Music

THE B.B.C. Welsh Orchestra will broadcast a programme of May Day Music on May 1st, beginning with a May Day overture, by Haydn Wood; going on to "Le Joli mois de Mai," by Schumann; and ending with the "Chanson de Mai," by Bantock, and the "Entry of the Rose Queen," by Hollaender.

INTERESTING and TOPICAL PARAGRAPHS

cast several times with a Birmingham dance band, and as a soloist under his family name, Victor S. Gamson; he is also well known as a cartoonist.

MAKING CONES FOR H.M.V. LOUDSPEAKERS



Removing a cone from the blocking machine which reduces it from a thick pulpy cone to a closely-woven cone of the correct thickness and weight.

Melody and Song

THOSE popular entertainers, Leslie and Lewis, who hail from Wembley, will broadcast from the Leeds studios on April 30th. Their act is entitled "In a Whirl of Melody and Song," and, besides singing, they play the piano and piano-accordion. Listeners may remember that they broadcast from the Winter Gardens, Morecambe, in February last.

Organ Recital from Nottingham

THE organ of St. Mary's Church, Nottingham, will be heard in the Midland Regional programme on April 30th, when Henry Hodgson, Organist and Choirmaster there, is to give a recital. It is a four-manual instrument erected in 1915. Notable features are the huge pedal organ with its thirty-two-foot reed and the fine tuba on the solo organ. The organ case is the original one designed by Gilbert Scott in 1872.

Variety from Cardiff

A VARIETY programme will be broadcast from the New Theatre, Cardiff, on April 28th.

Kettering Rifle Band

THIS band, which is one of the oldest in the country, is to pay a return visit to the Midland studios on April 27th, when Percy Cook will conduct a popular programme. As interludes Paul Brittain will play some of his own arrangements of popular modern melodies. He has broad-

"Western Cabaret"

WESTERN Cabaret No. 6 comes from The Palace Hotel, Torquay, on May 2nd, when listeners will hear Arthur Askey (entertainer) and Stanley le Marchant and his Band. Stanley le Marchant was for three years one of the principals in the Bournemouth Symphony Orchestra with Sir Dan Godfrey, and his present combination of nine musicians can play straight music in the dining-room as well as the dance music which listeners will hear.

"Mr. Mike Presents . . .!"

THIS is the first of a series of topical revues produced by Martyn Webster on the same lines as his monthly "Cocktail," but on a bigger scale. Reginald Burston, who came to the B.B.C. after distinguished experiences in Cochran revues, will conduct the B.B.C. Midland Revue Chorus and Revue Orchestra. The artists will include Cora Goffin; Dorothy Summers; Marjorie Westbury; Hugh Morton (as compère); Denis Folwell; Warwick Vaughan (who is a son of Madame Alice Vaughan, the singer); Harry Hartland, a young Birmingham tenor; and Those Three, a close harmony trio from Nottingham. This broadcast will be given in the Midland Regional programme on April 30th.

Gypsy Girls

IT is said that only Hungarian gypsies can play tzigane music, yet Don Rico's Gypsy Orchestra, which broadcasts from the Newcastle studios on April 26th, is composed of girls drawn from Sheffield,

Hull, Manchester, Glasgow, Plymouth, and, in fact, from every part of the British Isles. Don Rico himself, as his name would suggest, is a Spaniard. While a student at the Paris Conservatoire of Music he made a name for himself with compositions such as "The Gypsy Love Song" and "The Tzigane Life"—compositions which he played before the Tsar of Russia at the Imperial Palace. In his time he has achieved fame as a trumpet-player, a cellist and conductor of a brass band.

Variety of Theatres

COVENTRY Hippodrome was to have been the first of the Variety of Theatres series, but there was a postponement owing to the King's death. The story of the theatre will be told, on April 28th, by Mr. S. H. Newsome, joint managing director, in an interview with David Gretton, who is in charge of the series. The theatre was built in 1906 and extended and restored in 1921.

Shakespeare Birthday Speeches

ON the afternoon of Shakespeare's birthday, April 23rd, the speeches at the luncheon in the Conference Hall, Stratford-upon-Avon, will be broadcast. This year Dr. Lascelles Abercrombie, the poet, who is Professor of English Literature at Bedford College, University of London, is to propose the toast of "The Immortal Memory." Sir John Squire will propose "The Drama," and Bronson Albery will reply. The unfurling of the flags of the nations in Bridge Street, Stratford, will take place as usual in the morning, and later there will be a procession with flowers to Shakespeare's tomb in Holy Trinity Church. The Birthday Play at the Memorial Theatre this year is "Much Ado About Nothing."

"For Western Gardeners"

THE introductory talk in a new series called "For Western Gardeners" will be broadcast on April 30th by Dr. Harris. This series will deal with many aspects of gardening and will be of interest to the allotment-holder as well as to the head gardener. Mr. Harris has been a successful exhibitor for many years and has lectured for the Wilts County Council.

SOLVE THIS!

PROBLEM No. 188.

Ambrose constructed a four-valve short-wave superhet, but although telephony reception was particularly good, he could not pick up half as many more stations as he could with his old straight three receiver. Why was this, and how could results be improved? Three books will be awarded for the first three correct solutions opened. Address your letters to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 188 in the left-hand corner, and must be posted to reach this office not later than the first post, Monday, April 27th, 1936.

Solution to Problem No. 187.

When a bias resistance is connected between the H.T.— and L.T.— terminals of a battery set its required value is governed by the total consumption of the receiver valves and not by the consumption of the output valve only. Joyce should have used a much lower value of resistance.

The following three readers successfully solved problem No. 186, and books are accordingly being forwarded to them:—A. S. Denby, 48, Church St., Ecclesfield, Nr. Sheffield; H. T. Small, 151, Thicketford Rd., Bolton, Lancs.; J. Gardner, 2, Bower Lane Square, off Bower Lane, Hollinwood, Lancs.

About Midget Components

A FEW years ago it was quite usual to judge the "goodness" of components by their physical dimensions just as much as by their electrical characteristics, but that would be impossible to-day. The time is not far removed when a transformer which did not measure at least 4 in. cube and weigh several pounds would be looked upon as "cheap," and a coil that was not fully 3 in. in diameter was considered as necessarily inefficient. If such standards of comparison were applied to-day it would be difficult to find a "satisfactory" component on the market. Fortunately, however, new standards have been established, due in large measure to the improvement in design and in the materials which are employed by the manufacturers. In fact, in many cases

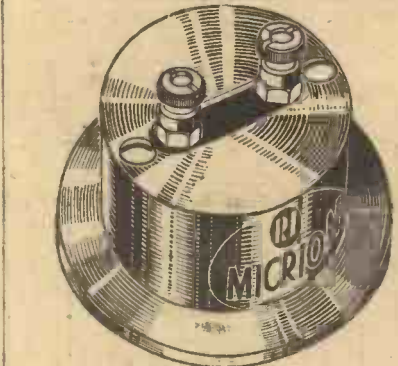
Great Strides Have Been Made in the Production of Efficient Midget Parts, and these are now Listed in the Catalogues of Nearly Every Component Manufacturer

available mention can be made of the midget L.F. transformers of Bulgin and B.T.S.; the resistances of Ferranti, Erie, Bulgin and Rotor; the coils of Graham Farish, B.T.S. and Bulgin; the variable condensers of Jackson Bros. and Polar; the volume controls of Ferranti, Erie and Polar-N.S.F.; the valveholders of Wearite and Bulgin; the speakers of Rothermel, Amplion, Ferranti, Celestion and Epoch; and, of course, the midget Hivac valves. This list could be extended almost

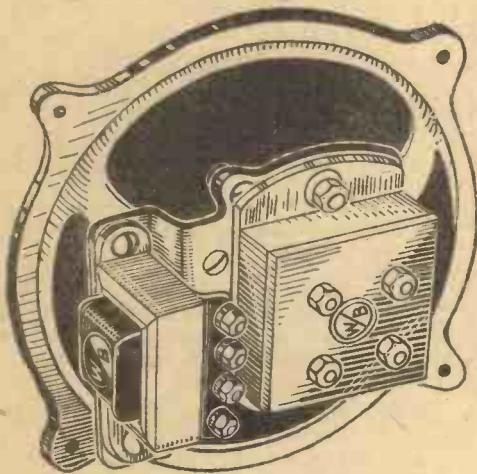
assistance, with the result that there are now available to every constructor midget components for almost every purpose.

Efficient Midget Valves

Our efforts were crowned by the introduction of the Hivac midget valves which are to-day made for every stage of the simpler type of receiver. By the use of these valves in conjunction with the diminutive components, it is possible to make a real receiver in a cigar case, whilst a loud-speaker set can be made in a carrying case no more than half the size of the average attaché case. Since last summer we have continued our experiments with midget receivers, with the result that we shall, during the coming summer, be able to offer to our readers at least one design which will surprise them with its excellent results and low price. But that is a matter which should not be discussed at greater length here; you must wait a little longer for the complete details.



A typical midget iron-cored H.F. choke.



The W/B Midget Stentorian speaker.

it would be true to say that a small component is often looked upon with greater favour than a larger one of the same type. And this is not because of a craze for midget parts, but due to a better understanding of the function of the components.

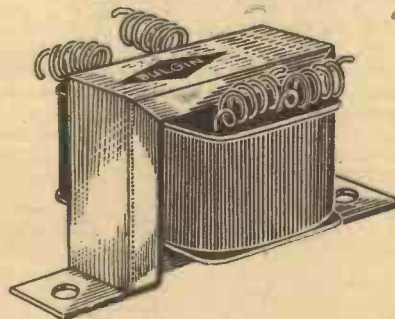
Our Pioneer Efforts

So great is the skill which has been applied in the design of components that real midgets are perfectly satisfactory, besides being more convenient. We, of PRACTICAL AND AMATEUR WIRELESS, believe that we have been responsible in no small measure for the introduction of "efficient components in miniature," since we were the first to impress upon our trade friends the need for these components. We proved that it was possible to make them efficient, and that it was possible by their use to produce satisfactory portable sets which could really be carried without undue effort. About a year ago we led the way with a series of pocket portables, although we had published designs for midget sets long before that.

We showed that it was possible to make efficient coils no larger than standard H.F. chokes, and that transformers of no more than 3 cubic in. could be used in such a manner that they provided the necessary step-up effect without introducing distortion, and we also made it clear beyond doubt that smaller variable condensers, chokes and resistances were completely effective. Manufacturers immediately came forward and gave us their backing and

"Pocket" Sets For All

As to the actual components, it would be far easier to give a list of those manufacturers who are not making them than it would to attempt to specify those who are. The idea of midget parts has certainly "caught on"; it could do no other, for car-radio is becoming increasingly popular, and the use of small receivers in



A midget transformer made by Messrs. Bulgin.

aircraft is quickly extending. We foresee the time when every touring cyclist, and every hiker will have a complete receiver in his kit-bag, ready for use at a moment's notice for bringing in the weather forecast or news, or half an hour's concert. At this very moment there is no reason why a set should not be carried in the pannier of a bicycle, for a suitable set can be made which weighs very little indeed, and which takes up no more space than a light waterproof.

A Few of the Makers

Among those components which are

indefinitely, for the range is so wide. It is sufficient, however, to emphasise that all of the well-known manufacturers have given their serious attention to the problem of size reduction and have achieved remarkably satisfactory results at astonishing prices. Additionally, it should be pointed out that, so far, this important field has been left almost entirely to the home constructor, although there are a few complete midget receivers on the market. Those few have helped to prove our original contention that reduction in dimensions is no means synonymous with loss of efficiency, for they have already attained a surprising degree of popularity. As times goes on we are quite sure that still further reductions in size and weight will be found possible, and the "pocket" radio will eventually become universal. If this is not so we shall not be to blame, for we shall continue to demonstrate the advantages of the miniature receiver for portable use.



This illustration shows a home-made midget set.

SIMPLE UNIVERSAL MAINS CIRCUITS

Essential Details are Given of Two Receiver Circuits Having Two and Three Valves. By FRANK PRESTON

DESPITE the tendency for the D.C. receiver to be relegated because of the rapid change-over which is being made to A.C. supplies there is still plenty of use for the universal (A.C./D.C.) circuit. Not only can a circuit of this kind be used at will with either A.C. or D.C. mains without any alterations being required, but it is often cheaper than the A.C. set due to the fact that a mains transformer is not required. It is fair to say that, as a general rule, the universal set is not quite as efficient as a corresponding type of A.C.

and the P.P.4118 a pentode output valve. The former has a heater rated at 20 volts, .18 amp., and the rating of the latter is 40 volts, .18 amp. Thus, it will be seen that the total voltage dropped across the heaters is 60, which means that the difference between this voltage and that of the mains has to be dropped in an external circuit. A barretter is ideal for this purpose, since its resistance varies according to the applied voltage, with the result that the current passing through it is maintained constant within wide limits. The barretter indicated is the Philips type, 1928, which is rated to drop between 100 and 210 volts. This means that a mains voltage from 160 to 270 (60 plus 100 or 210) can be applied to the set without any alteration being required, and with the assurance that the valves will be properly run. Other barretters are available for different currents and to drop different voltages; there is one for every type and combination of valves normally required.

conditions which exist in a D.C. set they cannot be connected to points of wrong polarity due to the inclusion of the rectifier. But when using a metal rectifier it is desirable that the proper polarity should be determined before connecting up the set. This does not apply, of course, when using a valve-type rectifier. The values of components indicated apply to the valves indicated, and should not normally be varied, although the capacity of the reaction condenser naturally depends upon the particular tuning coil employed. The L.F. transformer can be of any good pattern because the anode current passed by the detector when used in this circuit is not more than about 1.5 mA. As to the smoothing choke, this should have an inductance of not less than 20 henries when carrying 50 mA. The 25-mfd. condenser used in the bias circuit of the pentode is important, for it is very helpful in eliminating any traces of mains hum which remain after rectification and smoothing.

Note the inclusion of fixed condensers in the aerial and earth leads; these are always important when the set is operated from D.C. mains, since they prevent the likelihood of short-circuits in the event of the positive mains lead being earthed.

Valve Rectification

A rather more advanced circuit arrangement is shown in Fig. 2, where three pentodes are used for H.F. amplification, detection and L.F. amplification. The first is a variable-mu valve, the second a screened-grid one, whilst the third is of the power type. The aerial coil is shown as having a transfer aerial tapping, and this is used in conjunction with a tuned H.F. transformer for inter-valve coupling, but alternative arrangements may be used with equal success in most instances.

All the valves are Cossors, the first two requiring heater voltages of 13, and the third a voltage of 40; all take .2 amp. Valve rectification is used, and the rectifier also is of Cossor manufacture. It is a type 40 S.U.A., with a maximum output of 210 volts at 75 mA, and has a heater rated at 40 volts, .2 amp. The voltage drop across the heaters of all four valves is 106, and the barretter indicated—a Philips type C.1—provides a voltage drop of 90 to 230 at .2 amp. Thus the set could be used with voltage supplies between 196 and 336. In practice the voltage will always lie between 200 and 250, so there is ample margin. The output valve is de-

(Continued overleaf)

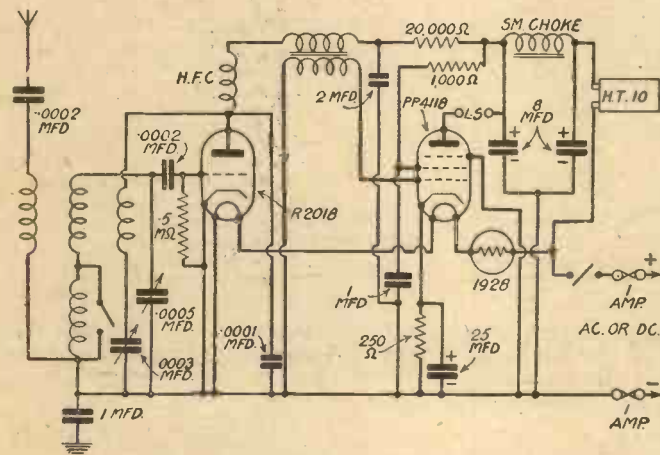


Fig. 1.—A simple detector-pentode circuit in which a metal rectifier is used.

Practical Points

receiver, but the difference is very slight when modern valves are used, and when an output of 2 watts or so is sufficient—as it generally is.

Uniform Make of Valves

There is a wide range of valves suitable for universal use, and these are now made by most of the manufacturers in nearly every type, but it is generally important that all of the receiving valves should be of the same make. This is because, whereas some manufacturers produce valves requiring a heater current of .2 amp., others take .18 only, and others require .3 amp. In addition, there are the Ostar-Ganz mains-voltage valves which take .024 amp. at the full mains voltage. Apart from the latter, however, the valve heaters require from 13 to 40 volts for heating, which means that the various heaters have to be connected in series. And it is obvious that if all of the valves do not require the same current complicated resistance-balancing circuits must be adopted.

Detector-pentode Circuit

Fig. 1 shows a very simple type of two-valve circuit comprising a triode detector, and power-pentode output valve, which is completely satisfactory for good reception of a few transmissions. In this case a Westinghouse metal-oxide rectifier, type H.T.10 is used, and this will easily supply the anode current necessary when connected in a half-wave circuit, as shown. The valve types indicated refer to the Tungstram range, the R.2,018 being a triode detector

Beyond the points mentioned there is very little in the circuit which calls for special mention. It is not proposed to give constructional details, because this article is intended for those who have sufficient experience of receiver design and construction to be able to work from a theoretical circuit. The following practical notes will, however, be of use. The two 8-mfd. smoothing condensers may be of any type since their working voltage will not exceed about 250; additionally, unlike the con-

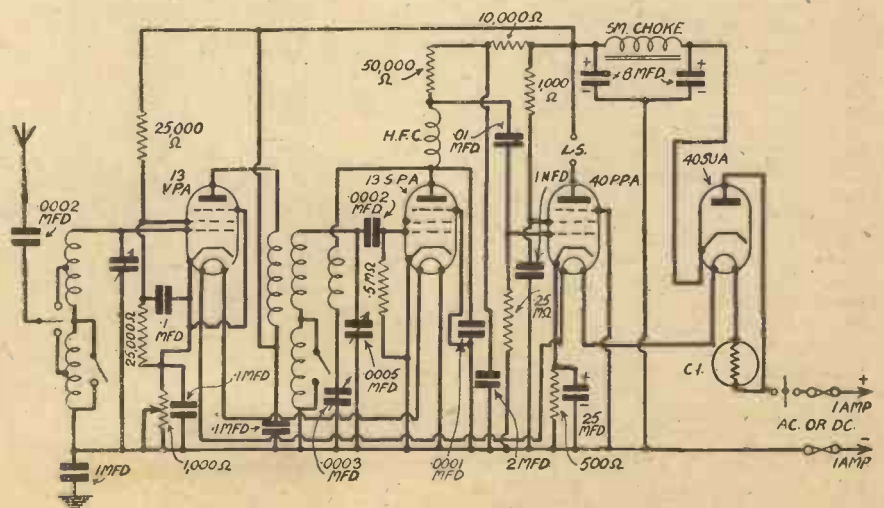


Fig. 2.—In this three-valve universal-mains circuit a half-wave valve rectifier is employed.

(Continued from previous page)

signed for a maximum anode voltage of 150, and this will be provided when the mains voltage is approximately 230, due to the voltage drop across the smoothing choke, rectifier, speaker transformer and bias resistance.

Variable-mu Control

Variable-mu control is provided by the 1,000-ohm variable resistance in the cathode lead of the first valve. The method of feeding the screening grid, by means of a fixed potentiometer, is not technically ideal, but it is simple and works extremely well in a straightforward circuit of this nature. The screen-grid valve used as leaky-grid detector proves extremely effective in a circuit of this nature, despite the fact that it is impossible to include a resistance equal to the optimum load in its anode circuit; it provides a high degree of amplification, combined with pleasingly smooth reaction control. In fact, reaction control is so smooth and uniform over the tuning range that it is often possible to set the reaction condenser to its most suitable setting and then to leave it alone entirely. This is of especial importance when the receiver is for "family" use, and when a reasonable number of distant stations are required.

Heater Connections

It is interesting to observe the sequence in which the valve heaters are connected. Starting from the positive mains connection (when using D.C. only, of course) the

lead goes to the rectifier, from there to the output pentode, thence to the variable-mu pentode, back to the detector and earth. It is not essential that this sequence should be followed, but there is less chance of mains hum when using it. The idea is to reduce the voltage difference between the cathodes and heaters of all valves as much as possible, and it may be seen that the cathode of the rectifier is the most positive portion of the heater "chain." The output-valve cathode is next, due to its being positively biased, the variable-mu

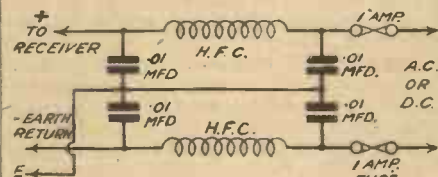


Fig. 3.—A complete filter circuit for inclusion in the mains leads. This prevents modulation hum and certain forms of instability.

pentode has a less-positively-biased cathode, and the detector cathode is at earth (full negative) potential.

Values of the principal components are indicated in Fig. 2, and it might be added that the smoothing choke is similar to that used in Fig. 1.

Modulation Hum

One of the difficulties which often occurs when using D.C. receivers, even when all

normal precautions have been taken against it, is due to modulation hum and different forms of instability. This can in almost every instance be overcome by including a filter circuit in the mains input circuit. Various types of filter have been described in these pages before, but the most effective is that shown diagrammatically in Fig. 3. It may be seen to consist of two power-type H.F. chokes and a pair of centre-tapped .01-mfd. condensers. The chokes are simply wired in series with the mains leads, each of the double condensers being connected between the two ends of the chokes. In addition, the two centre-tappings of the condensers are joined together and to earth. This earth connection should not be made to the earth or negative line of the set, but directly to the earth terminal. When a filter circuit of this kind is used in addition to the electrolytic condensers shown for smoothing and bias-resistance by-passing it is very unlikely that there will be any trace of hum, as long as the heater leads are kept as short and direct as possible. For this reason it is a good plan to arrange the holders for receiving and rectifying valves, and also the barretter, close together, or at least, as near as they can be placed whilst complying with other rules of layout, such as have been explained many times before.

Incidentally, for the benefit of those who have not used a barretter before, it might be mentioned that those specified are fitted with a four-pin base, the two "filament" pins only being used.

TELEVISION NOTES

Television and Sponsored Programmes

IT was anticipated that the Ullswater report would make more than a passing reference to television, for its importance in relation to broadcasting cannot be over-estimated. The main concern of the committee appeared to be in connection with finance and they recommended that the position should be very carefully reviewed in the autumn of 1936, as the estimate of £180,000 for the cost of the service up to December, 1936, has already been earmarked entirely, actual equipment costs and structural alterations to the Alexandra Palace accounting for the bulk of this sum of money. They suggest that a further proportion of the net receiving licence revenue should be used for television development purposes. In addition, however, they are of the opinion that, at least as far as the early programmes are concerned, "sponsored" items should not be excluded. If this proposal is accepted by the Government it will, no doubt, be necessary to exercise very careful supervision over the matter which is televised in order to avoid any undue emphasis on the items advertised in this way. Perhaps the simplest solution would be a bare announcement at the start and finish of the programme to the effect that the broadcast was due to the courtesy of Messrs. — Another encouraging item was the committee's suggestion that steps should very soon be taken to ensure that provincial television stations should be built as soon as possible after the service from the Alexandra Palace had been inaugurated, and special types of land line may shortly be laid for connecting the stations.

Television in Yorkshire

THE Yorkshire Television Association, with its headquarters at Leeds, is planning a very ambitious summer programme. Although small in numbers the



Two of the disc scanners for the forthcoming high-definition television transmissions.

members are very enthusiastic and keen and they have applied for a licence to work an experimental transmitting station to be erected at Gildersome, about five miles from Leeds. This site has been selected because of its advantageous height and proximity to the thickly populated city of Leeds. If the licence is granted the proposal is first of all to transmit sound programmes in order to become acclimatised to the new technique involved in the use of the very high frequencies. Work has already begun for the purpose of building a television scanner, and when this is complete and has been tested in "short-circuit" attempts will be made to transmit television signals by radio and receive these at selected points on suitable receiving sets. The association is to be congratulated on so ably combining theory with practice, and if hopes materialise Leeds will at least be able to display a tangible interest in television reception at an earlier date than would otherwise have been possible.

Schools and Televised Films

It is stated that schemes are on foot for the preparation of special films for schools which can be televised for educational purposes. The advantages of such an arrangement are immediately apparent, for where a talking film outfit is very expensive television receivers would be a much cheaper and more satisfactory proposition.

On Your Wavelength

Charles Dickens on the Radio

THIS Dickens business cloys me. Why all this pother about an author who has little claim to have his name echo down the centuries? I have always regarded Charles Dickens as the vainest man in the world of letters—I won't say literature because in my opinion he has never written anything except pot boilers. "Pickwick Papers," for example, was not his idea, but that of the wily publisher who called upon him with the scheme. The long, tergiversatory, confused, verbose, and circumnavigatory sentences, consisting of strings of words of which Dickens had but the faintest notion, and his readers none whatever, and which comprises the Dickens pot boiler, are not literature. There is not one of Dickens's books which has any semblance of a plot; they are all just rambling screeds, as if the author has had a job of work to do and has been anxious to get to the end of it. Nothing can be vainer than for an author to tour the country on concert platforms reading excerpts from his own books and at the end bowing to the audience and waiting for the expected applause, yet that is what Dickens did. Arriving home at the hotel in the evening he would promptly write to all his friends in vainglorious strain acquainting them of the great success of his evening. A lot of this Dickens business is pure plugging by small coteries of hero-worshipping cranks who are unable to distinguish between a good novel and a bad. I put this plugging in the same class as that which seeks to extol the absent virtues of Stevenson, Scott, and Robert Burrrrrrrns—the doggerel writer. I fail to see, therefore, why we should have to put up with Dickens



A relic of the past.

on the radio—Dickens, the man who merely wrote melodramatic rubbish, and was incapable of a "plot." Let us by all means hear of the works of William Shakespeare, Christopher Marlowe, and Carlyle, and leave pot-boiling authors to the obloquy they deserve.

Radio Uplift.

CRITICS of broadcasting are often producing evidence in support of their contention that radio is ruining the lives of the present generation. We hear from one group that the modern youth lacks incentive, and thinks only of enjoyment and dancing, vices which are fostered owing to the fact that dance music is continually churned out at all hours, and thus it is only necessary to sit back in an easy chair and be entertained. Another group holds

By Jhermion

that the continued broadcast of so-called low-brow entertainment is lowering our moral standard, and so on. But I have just noticed a very important fact which these critics have apparently overlooked, and which goes against these arguments. I claim that there is genuine uplift in the broadcast and that the effects are beneficial rather than detrimental to all. I will let you into my secret which supports my view. Have you heard, within recent years, a dog howling at music? Not so many years ago if anyone played an instrument in the street, for instance, a passing dog would sit back and kick up a most unearthly row, and I have even heard some animals do this to the humble barrel-organ. But nowadays you do not hear this, and the itinerant musician may stand at the street corner and even attempt Melody in F on a tin-whistle without our canine friends turning a hair. The reason? Well, I claim that the animal has been educated through the medium of the radio and now understands music. Or, perhaps, I have overlooked some other fact, and probably my enemies will say that the dog's ear has been completely ruined by the broadcast and now he can stand anything!

Quality Receivers Again

MY recent comments regarding quality receivers must be strongly revived once again, and I am forced to the conclusion, after looking through a few of the daily papers, that there should be some ruling regarding the types of receiver which are employed by the radio critics. Could not the B.B.C. make up a really good quality set to present to the critic, and make it a rule that no paper should print criticisms of the programmes unless they were heard through the medium of such a set? I am driven to ask this question owing to the remarks which have accompanied the recently-introduced Henry Hall combination. This was advertised for weeks in advance, and naturally everyone was looking forward to it. I had the pleasure of hearing the band at a final rehearsal, and formed my own conclusions. After their first broadcast the critics had all manner of comments. One critic complained that the band was "basey," another that there was a deficiency of the bass or rhythm instruments. One said the new vocalist was screechy, whilst another complained regarding the slurring of the spoken word. Yet surely these matters could not be regarded as personal taste, and they must be due to the reproduction which was obtained from the critics' sets. The balance of the band is actually very fine now, and there is no deficiency either in the bass or the treble, and if only some readers realised the extent to which the producer and the controller go in order to obtain a correctly-balanced reproduction, I am sure they would make greater efforts to improve their equipment in order to

reap the advantages of the programmes as now put out by the B.B.C.

Another Relation

ALAS! after complimenting myself on the education of poor Aunt Agatha, I find that I have now to start the education of another relative, this time, a great-aunt to whom I had the honour of presenting one of my early discards in the way of a wireless receiver. This was gratefully accepted and, as far as I was aware, had been giving yeoman service. However, a chance remark by another member of the family the other day sent me round post-haste to Great-Aunt Harriet, and I was surprised to see my previous creation was conspicuous by its absence, and standing in its stead was a product of a well-known commercial factory. I stood aghast. What had happened? Surely I could have been called in to effect a repair if something had gone wrong. Or perhaps some over-efficient salesman had called and worked the oracle on her, taking the old set in part exchange. But when the dear old lady was ushered in I nearly collapsed at the reason which was given to me for her parting with the old faithful. What do you think was her excuse? "The set was quite all right in its way, my boy, but I could not stand so much of this modern jazz stuff, so I had to get something more sedate." Ye gods and little fishes, now I have to start again and destroy further illusions.

Outside Broadcasts

THE great strides which are being made in the design of wireless equipment are leading to some novel apparatus which will give scope for some interesting events



The Radio Critic's set.

in the future. From the land of milk and water comes news of a micro-wave transmitter, built to such tiny dimensions that it may be completely enclosed inside a top-hat. Presumably the aerial takes the form of thin wires along the side of the hat, but the valves and other components are all so small and light that they may be totally enclosed without discomfort to the wearer inside the hat. I read that the motive supply, or rather the batteries, are worn in the tails with inconspicuous leads to the apparatus, whilst the microphone is capable of being concealed in the glove. I imagine that the announcer, when he sallies forth, will look like some dream from Savile Row, and presumably when he wishes to speak into the mike he will gently raise

(Continued overleaf)

(Continued from previous page)

his gloved hand to his mouth in a most demure manner and whisper the glad tidings (whatever they may be) for all and sundry to hear. I imagine that at a wedding celebration he could give a really good eye-witness account of the bride's blushes, and no doubt, the bridegroom's curses. I shall be on my guard when the income tax collector calls on me arrayed in "top hat, white tie, and tails."

Russian Again

CONFIRMATION of the rumours that Russia is making good progress in television development is apparent in the reports which keep filtering through from that country. In order to hasten the popularising of a television service the State has installed receivers in factories and communal halls to work in conjunction with the radio transmitters and scanners which have been erected in Moscow and other big cities. On the programme



She changed her set.

side excerpts from operas and plays have been featured as well as films, boxing matches, a circus, and illustrated talks on subjects of real public interest. Unfortunately, it is not possible to secure technical details concerning the equipment or types of scanners employed, but, no doubt, very thorough investigations have been undertaken in order to assess the relative merits of mechanical and electronic scanners. Perhaps, as in this and other countries, a combination of the various methods is used, for there is nothing so good as an experimental public service in order to ascertain which methods can survive the rigours of daily usage under the critical eyes of technicians and the general use of receiving equipment.

Signal Strength

ALTHOUGH at the moment not following any definite time schedule, it is known that television signals are radiated at different intervals by both the Marconi-E.M.I. Company from Hayes, and the Baird Company from the Crystal Palace. The power output from the aerials is not stated, but reports on strength show that these ultra-short-wave signals are being picked up over quite wide areas. This augurs well for the television service when it starts from the Alexandra Palace, and enthusiasts with any type of ultra-short-wave receiver should search for signals in order to ascertain how they will be received. The television picture signal note is quite easily recognised with its predominant high-frequency and low-frequency synchronising pulses.

Shop Assistants

IDREW attention some time ago to the colossal ignorance which is displayed by some assistants in shops which deal in radio and accessories. You will remember some of the instances I gave of the treatment which had been meted out to constructors and prospective purchasers, and I have just received a letter from a reader in Limehouse who gives another instance,



Notes from the Test Bench

Controlling Tone

THE treble response of a receiver can very easily be reduced by connecting a condenser of approximately .01 mfd. across the terminals of the speaker, or a lower capacity condenser across the secondary winding of the L.F. transformer. It is often found, however, that bass response preponderates, and it is found necessary to increase the treble. This is sometimes due to the speaker; speakers of the heavy duty type having large cones are sometimes deficient in the upper register, whereas the smaller type of speaker has a good treble response, but distorts on heavy bass notes. Two speakers of this type can be used together, provided that they have the correct ratio transformer attached, in order to obtain a better tonal balance. One terminal of the big speaker may be joined via a condenser of approximately .01 mfd. to one terminal of the small speaker and the other terminal of the latter can then be joined direct to the second terminal of the big speaker. The condenser will prevent the bass notes reaching the small speaker, but will not affect the response of the large one.

L.F. Volume Controls

IT is very desirable to incorporate L.F. and H.F. volume controls in the quality receiver in order that the degree of high-frequency and low-frequency amplification can be kept under control. When a power-grid or a diode detector is used distortion due to insufficient detector input is often experienced. When a power-grid detector is used the input signal should be sufficiently strong to cause the detector anode current to drop by approximately one-seventh; for example, if the steady anode consumption is 7 mA, a drop of 1 mA should be indicated when a signal is being received if best results are to be obtained. It will be found in practice that if the receiver is placed in the average-sized room and an efficient speaker is used, sufficient volume can be obtained by coupling this type of detector to a power output valve (e.g., 4 X.P. or PX25) by means of a resistance-capacity coupler.

Loss of Treble

IF two L.F. stages are used the setting of the L.F. volume control must be reduced to a very low level otherwise excessive volume, or if the volume is controlled in the H.F. stage insufficient detector input with consequent detector distortion, will be obtained. The L.F. potentiometer control is generally connected across the grid circuit with the grid of the valve connected to its moving arm. When the setting of the control is reduced to lower the volume to the required level there is a high resistance between the coupling condenser and the valve grid, and therefore loss of treble occurs unless a method of counterbalancing this loss is adopted. A simple method is to connect a condenser of between .0005 mfd. and .001 mfd. between the moving arm terminal and the grid terminal of the control.

not necessarily of ignorance, but apparently of an attempt to pass off an article in place of one which was ordered, and as for the reason, well, read for yourself what Mr. Hendry says:—

"I had occasion a few days ago to service, for a friend, a receiving set that had "blank" valves in it, so, wishing to replace two of the valves, and knowing where I could purchase this brand, I entered the shop (a branch of a well-known purveyor of wireless goods). I was greeted by an almost perfect specimen of both tonorial and sartorial art. 'What can I do for you, sir?' 'Well,' says I, 'I want two "blank" valves, BC9, an L.F., and a BC18, an H.F.' Two BC9 (L.F.) valves were produced, and when I remonstrated, very methodically (and, to me, very pathetically) the polished salesman explained that he could never understand a home constructor being so definite in demands, as really the two valves I required were actually identical; the reason why one was marked BC9 and the other BC18 was



Radio set in a hat.

(and here he drew on his sales book what was meant to represent a work bench in the valve factory) that a valve worker on one side of the bench marked the valves he made with his factory number—viz., '9,'—whilst the man on the other side of the bench did likewise, only his number happened to be '18.' So, really, sir, you can be assured by me that the two valves I'm offering you are just what you require."

"Needless to say, friend Thermion, there was no sale—not to this chicken. By the by, I forgot to state that the shop had actually sold out of valves 'marked by the workman No. 18.'

"Now what do you think of that? And to think that there must be plenty of clever home constructors unemployed at present who would love a job like my 'salesman.'"

I must admit that this is an exceedingly bad case of bluffing, but I am glad that Mr. Hendry was not put off, and that a sale was lost at that particular emporium.

A "Technical Miracle"

WITH their usual rather blasé descriptions of matters technical, the lay press have already alluded to the television telephone experiments of Germany at the Leipzig Fair as a "technical miracle." Without in any way belittling the experiments conducted in Germany on this type of work, it is far from the truth to refer to it as a miracle. It is simply the application of well-known television principles in a rather spectacular manner, and as far back as the Radio Exhibition of 1929 the Germans had television and telephony between two public booths, although, of course, the pictures were of the low-definition type.

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A PAGE OF PRACTICAL HINTS

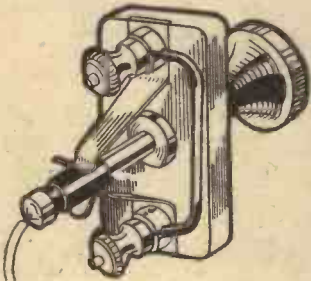
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Switch Improvement

MOST readers will have experienced at some time or other mysterious cracklings due to faulty switches. Here is an idea for minimising the trouble. Solder



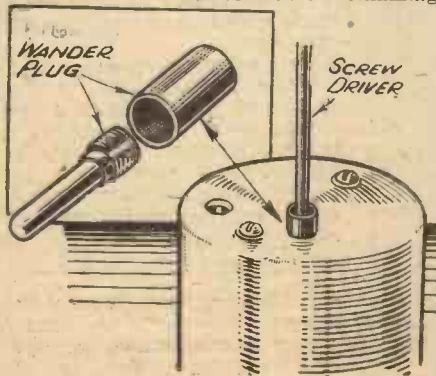
To set

A simple method of improving a faulty switch.

a piece of wire to both terminals, and make one connection to this. The other connection is made by soldering to the tip of the plunger a piece of wire, which is wound once or twice in the form of a spring to allow for the movement of the plunger. This wire can be taken to a terminal on the baseboard, but in most cases this is quite unnecessary and it can be soldered direct to the set wiring. In the case of wavechange switches the plunger should be earthed to prevent hand-capacity.—IVOR WOOD (Bradford).

A Trimming Hint

IN most intermediate-frequency transformers one of the trimmers is connected to the H.T. positive line, whilst the metal screen surrounding the transformer is earthed to prevent interference. Thus, when carrying out the adjustment of the trimmer should a metal screwdriver come into contact with both screen and trimming screw the H.T. supply is short-circuited. An insulated tool may be employed, but a simple solution is to remove the insulated sleeve from a wander plug or spade end, and drop this in the hole in the transformer screen. It will be found to make an almost perfect fit, and a small screwdriver may then be inserted in the insulated bush thus formed for trimming



A useful dodge when trimming I.F. transformers.

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purposes with perfect safety. To avoid unwanted stray capacities the screwdriver should be as thin as possible. The illustration makes the idea perfectly clear, and as the trimming is only to be carried out when the receiver is first installed the bush may be removed from one of the leads to the receiver and afterwards replaced, thus avoiding expense and the necessity for purchasing a component especially for the single use.—D. W. J. (Hendon).

A Short-wave Coil-switching Device

WITH the arrangement illustrated, one can change from one waveband to the next without coil changing, or a complicated switching arrangement, merely by pushing or pulling a knob on the panel. The coil mounts consist of two parts, A and B.

Part A is a piece of wood, or easily workable insulating material, measuring 5½ ins. by 2½ ins. by 3/16 ins. On it are fixed

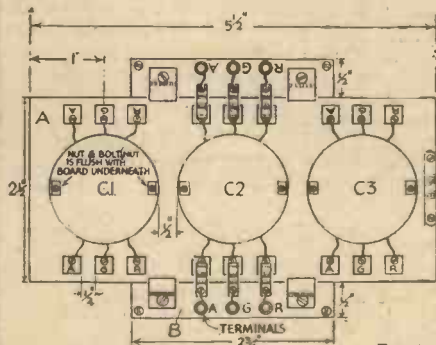


Fig. 1.

A simple wave-change switching arrangement.

three coils (1½ in. formers, placed centrally) and small metal contacts (copper or brass) are screwed down opposite each coil. There are six contacts to each coil, and these can be marked "A" for aerial, "G" for grid, and "R" for reaction so as to avoid confusion. The connections to the coils can be soldered or screwed down under the fixing nuts, and the nuts and bolts which fix the coils are placed inside, so as to avoid crowding the coils, and the nut is set flush with the underside of the board. Finally a spindle and knob

are fixed on one end of the board, as in Fig. 1.

Part B is a piece of plywood measuring 3½ ins. by 2½ ins. by 5/16 in. in which is cut a shallow groove, 2½ ins. wide, in which part A slides backwards and forwards. On part B are fixed four clips to hold part A firmly and to help in making good contacts. Six terminals are fitted, and to these are joined six contact strips.

When fixing on the baseboard, it is advisable to put four rubber buffers on the fixing screws so that any other wiring

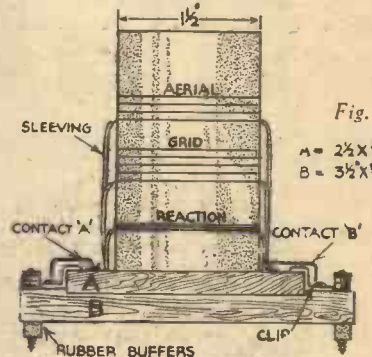


Fig. 2.

End view of wave-change switching arrangement, showing how the coils are mounted.

of the set can pass underneath. Either part A or B can be fixed and the other part made movable according to the constructor's own ideas. All contacts are made of stiff copper or brass, and should be screwed firmly into position so as to avoid shorting while changing from one band to the next. As they are wiping contacts they will keep clean, and once fixed will need but little attention.

Here are some suggestions for the coils:—

- Coil 1. 8.5 to 23 metres.
- Coil 2. 17.5 to 46 metres.
- Coil 3. 35 to 90 metres.

—R. F. MASKELL (Cambridge).

A Handy Cleat

THE idea illustrated in the accompanying sketches will be found very useful for fixings connected with aerial construction. As will be seen by Fig. 1, each "cleat" comprises a piece of sleeving over a twisted nail of a well-known make. Fig. 2 gives an example of one of the many uses to which this may be effectively put.—W. R. HOBBS (Ilford).



ONE METHOD OF APPLICATION

Fig. 1.

This handy cleat has many uses when fitting up aerials, and for similar purposes.

Fig. 2. ANCHORING THE LEAD IN

Chemistry in Radio-3

Interesting Particulars Concerning Piezo-electric Crystals are Given in this Article
By G. V. COLLE

WHEN speaking about crystals in the early days of broadcasting it was understood that reference was being made to the type used in crystal receiving sets.

A simple statement to the same effect made to-day would be fraught with ambiguity so extensive is the use of crystals in various classes of radio apparatus. Consequently, it is necessary to define them by describing their type, or application, or even by naming the particular pieces of apparatus in which they are employed.

There are roughly three classes, viz: (1) those used in receiving sets, (2) piezo-electric type for pick-ups, high-note "tweeter" loud-speakers, and microphones, and (3) quartz crystals for frequency stabilising in transmitters, oscillators, etc. Owing to the impossibility of dealing with

although their characteristics were not fully known or appreciated until further examined in the Curie laboratory. Readers will remember that Mme. Curie and her husband discovered radium after investigating the radio-active effect of pitchblende. It was inevitable perhaps that other researches into electrical-active substances should be conducted in their famous laboratory, and it is therefore not surprising to find the name "Curie cut" applying to a particular cleavage of Rochelle salt crystals.

In a soluble and refined form Rochelle salt is known as Seidlitz powder. More correctly its true name is Seignette salt, after its discoverer in 1672, who conducted his experiments at Rochelle. The chemical name is Sodium Potassium Tartrate and the formula— $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$.

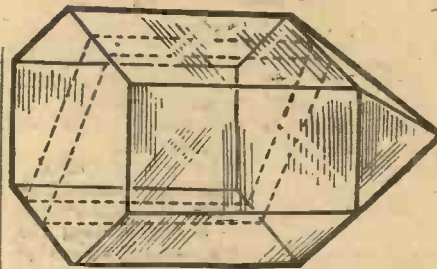
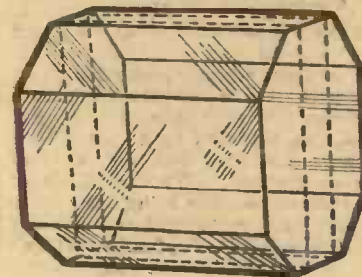


Fig. 2.—Natural salts exhibiting the piezo-electric effect. Above, Rochelle salt, and below, quartz.

shown by the Rothermel Corporation, of London, in first introducing radio apparatus incorporating Rochelle crystal elements to the English radio public. A number of other firms (B.T.H., etc.) are now manufacturing pick-ups, high-note "tweeter" loud-speakers, and microphones under the Brush patents. Meanwhile, the growing popularity of Rochelle crystal operated apparatus can be gauged from the ever-increasing list of patents filed by independent concerns.

Artificially-formed Crystals

An examination of the methods of growing large Rochelle salt crystals artificially is of interest, if only for the reason that it paves the way to an understanding of the practical applications. The description is due to R. W. Moore as given in the Journ. Am. Chem. Soc., 1919. No suggestion is made that the particular sequence of stages in the crystal formation is applied commercially, although it is feasible a similar but quicker scheme is used.

Small seed crystals about 5 m/m. long by 2 m/m. thick are used as a nuclei, and placed in a jar. A saturated solution of Rochelle salts is made up at some convenient temperature, usually 35 to 40 degrees Centigrade, heated to a temperature 7 to 8 degrees higher, and filtered through paper on a Büchner funnel maintained at 4 to 5 degrees above the saturation temperature. This salt solution is then poured upon the seed nuclei, the jar is at once covered with a glass plate and placed in a large waterbath maintained with the aid of a very sensitive thermostat at a temperature half a degree higher than the saturation point.

The temperature is then allowed to drop to saturation point and then subsequently at the rate of only one-tenth of a degree per day until the seed crystals have grown into larger and perfectly clear and well-formed crystals. This stage occupies about one day, but after this the rate of temperature fall can be increased to a fifth of a degree, and when the crystals have attained an inch in length the rate may be still further increased up to half a degree per day. This can go on until the ordinary room temperature is reached, when the crystals, now of considerable size, should be removed and dried with a soft cloth.

Owing to the fact that for most radio
(Continued overleaf)



Fig. 1.—A commercial loud-speaker incorporating a piezo crystal tweeter or high-note reproducer.

crystal structures in all three classes in the space of a single article, it is proposed to discuss each one separately. The writer has therefore selected (2), the piezo-electric type, as warranting first consideration.

An examination of up-to-date catalogues shows the necessity for a clear explanation as to the operation of piezo-quartz and piezo-electric Rochelle salt crystals. Both substances produce electric voltages on opposing surfaces when subjected to mechanical stresses. The fact that they are employed for totally different purposes, as shown above, leads one to assume their physical characteristics do not allow a free exchange in application. Fundamentally, it should be possible to employ Rochelle salt crystals for frequency control, but in actual fact the mechanical stability, such as it is, mitigates this application. Crude quartz and Tourmaline, the latter a substance having similar properties, and imported from Brazil, are ground to fine optical limits to act as master resonators at predetermined frequencies. Beyond the statement that when encased in glazed ceramic, or similar holders, and made substantially proof against atmospheric disturbances, they maintain a high degree of constancy, there is no further point in discussing their features here.

Rochelle Salt Crystals

The piezo-electric effects of Rochelle salts were first investigated by Pasteur,

Except for the past two years, most of the present-day researches have been conducted in America, principally in the laboratories of the Brush Development Co. Many mechanical and thermal obstacles had to be overcome before the crystals could be applied commercially, but the numerous world-wide patents filed by the Brush Co. bear testimony to the successful results achieved.

Tribute must be paid to the enterprise

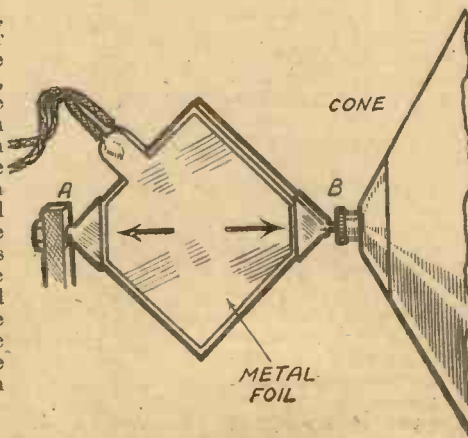


Fig. 3.—Diagram illustrating the principle of the crystal loud-speaker.

(Continued from previous page)

purposes the crystals need rarely be larger than, say, half an inch in diameter, being ground to this shape subsequently, it follows that such fine temperature control and prolonged growth are unnecessary. By the aid of polarised light, the crystal formation is examined and the angle of grinding determined. Two methods of cutting are employed, one being the "Curie cut" as previously mentioned, and the other the "30 degrees cut." The finished crystals are brittle and subject to temperature variations, the latter affecting the piezo-electric properties.

Early Rochelle crystals, when mounted for pick-ups and loud-speakers, and made substantially airtight, acted quite well. On loud or sustained notes, however, the mechanical strain was such that a lag occurred between the pressure and voltage not unlike hysteresis in magnetism, and this often caused the piezo-electric effect to fail. It was for these reasons Rochelle crystals remained a laboratory curiosity until the Brush Development Co. evolved means for overcoming these physical limitations.

Mounting the Crystals

The essence of their research work was to combat the brittleness by cementing thin plates of the crystals together with their "grains" (or lines of strain) in opposite directions, similar to plywood. Independence from temperature changes or, more accurately, moisture absorption, was achieved simply by waterproofing the crystals. Nevertheless, in most piezo-electric pick-ups, it has also been found necessary to encase the crystal units in bakelite cases,

which are moulded in place on similar lines to small flat mica condensers. No real difficulty has been experienced in obviating resonance effects, because by suitably proportioning the crystals, their natural frequency has been raised above the higher limits of audibility.

The Quartz Generator

The question which inevitably arises

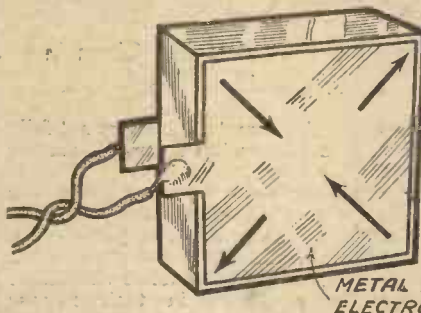


Fig. 4.—The crystal section is clamped between metal foil and expands and contracts, as shown by the arrows, under the influence of an electric current.

whenever Rochelle crystals and quartz and tourmaline are mentioned is, if all these substances possess piezo-electric properties, why cannot the latter and harder materials be used exclusively. Superficially, quartz has everything to recommend it, but in actual fact it is not so sensitive as Rochelle salts, the latter also being relatively less expensive to produce.

So far as the writer is aware, there is no available data showing the response curve

of a pick-up fitted with a quartz generator. It must not be assumed that this substance would provide an equivalent, if lower, voltage output curve over the range of frequencies covered by a pick-up as compared to that provided by a Rochelle crystal generator. In the normal way, of course, quartz is ground to operate at a fixed fundamental frequency, and is not subjected to mechanical stresses other than its holder. It possesses, when employed as an oscillator, inductance, capacity, and resistance, and thereby includes all the features of a tuned circuit. Rochelle salt elements, on the other hand, with reference to pick-ups are called upon to generate a range of A.C. frequencies having a direct ratio to the applied mechanical stresses, that is, from the needle and armature.

The Rochelle crystal generator, in both pick-up and tweeter loud-speaker, acts purely as a condenser, and for the particular size of crystals employed possesses a constant capacity of about .0011 mfd. When connected as a pick-up in the grid circuit of the first L.F. valve, it must be shunted by a fixed or variable resistance of about .5 meg. to provide a D.C. resistance path for grid bias.

Stray H.F. fields, and back coupling, due to the proximity of output leads, can be overcome by the use of twin screened conductors, but their capacity to the earthed outer metal screening must be low, otherwise the pick-up output is reduced equally at all frequencies. This is somewhat different from the usual electro-magnetic pick-up, where high-capacity screened leads would cause attenuation of those frequencies in the upper register.

A REMOTE CONTROL WAVE-CHANGE SWITCH

AFTER fitting an extension loud-speaker in my bedroom, I soon discovered the great inconvenience of not being able to change the programme from National to Regional when required. I therefore made the device, shown in the accompanying sketches, to overcome this difficulty.

The necessary parts required comprise two bell bobbins from an old electric bell, one small bar magnet about 3in. long, one small current reversing switch, one 4½ volt flash lamp battery, one .0003 pre-set condenser, and one valve pin and valve socket. At one end of the base mount the valve socket in the position shown with a length of wire pinched underneath it for connecting purposes.

Contact Pieces

Run a small nut on to the valve pin as far as it will go, twist one turn of a 1½in. length of bare copper wire to form a contact piece, and then screw the valve pin into a narrow piece of thin wood, pinching the wire between the latter and the nut. The bar magnet is then mounted on the wood strip either with Chatterton's compound or a turn or two of adhesive tape. The valve pin should be an easy fit in the socket so that the magnet will swivel with the slightest touch. It is quite immaterial which pole of the magnet is opposite the bobbins.

The bobbins are mounted on a wood block to bring them on a level with the bar magnet, as illustrated. By reversing the current through the bobbins the poles will be north and south alternately, and the end of the bar magnet will be drawn to the

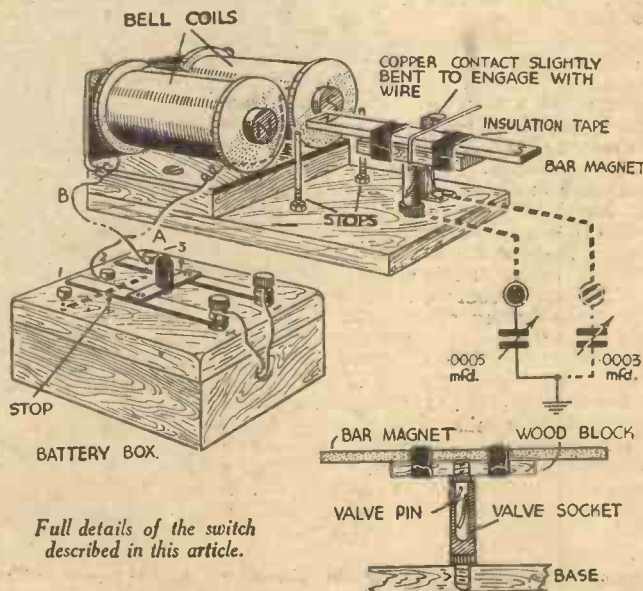
stops, the position changing with each reversal of current. A thin contact strip, made of copper foil, is mounted on the base with a connecting wire fixed under the screw. When the magnet is attracted so that the contact wire touches this contact spring, the circuit is closed, which puts the .0003 pre-set condenser in parallel with the .0005 tuning condenser of the set, thus bringing in the Regional programme.

Switching Device

The switching arrangement which is used in the distant room comprises a small box containing a flash lamp battery, in which is mounted the reversing switch. The connections to the contact studs are clearly shown in the sketch. One important point is that the switch arms must pass over the studs and not rest on them, as only momentary contact is required to reverse the current. The whole action is quite simple. The base on which the bobbins and bar magnet, and also the .0003 pre-set condenser are mounted, is fixed anywhere near the

set. The flash lamp battery with reversing switch is fixed on the wall in the distant room.

To use the device, tune the receiver to the National in the ordinary way with the contact wire circuit in the open position. Now move the reversing switch in the opposite direction, which will cause the bar magnet to swing over and close the circuit, putting the .0003 condenser in parallel with the .0005. Now tune this .0003 pre-set condenser till the Regional station comes in at its loudest point. The reaction should be regulated so that it suits either National or Regional more or less equally well.—L. B. (Eltham).



Full details of the switch described in this article.

TESTS OF COMMERCIAL
RECEIVERS
ON OUR
AERIAL

REVIEWS OF LATEST RECEIVERS

The Cossor Table Radiogram (Model 737)

C OSSOR first introduced a table radiogramophone at Olympia last year, where it caused a good deal of interest and favourable comments. Its introduction showed that such a type of radio-gramophone was in very considerable demand both by modern flat dwellers and by others from considerations of personal preference.

Model 737 is a new Cossor Table Radiogram, as illustrated on this page, where the restrained but handsome appearance may be judged. As will be observed, the controls are three in number—tuning, the usual four-position switch, and the combined gramophone and volume control. A tone control is also fitted.

Pentagrid Frequency Changer

The chassis is arranged for A.C. mains working and makes use of five Cossor mains valves. The first, Cossor 41MPG, is a pentagrid frequency changer and performs the usual function of frequency changing for superheterodyne working. It enjoys a particularly well-designed coil arrangement, both in the aerial pre-selector section and in the anode and oscillator grid sections.

The next stage, a Cossor MVS/PEN, is an intermediate-frequency amplifier where very great care and ingenuity have been used in the design of the associated coils, resulting in a remarkable degree of sensitivity and selectivity, while retaining sufficiently flat-topped tuning characteristics to avoid side band cutting. Both the pentode in this stage and the pentagrid in its predecessor are actuated by the automatic volume control system which naturally gives better anti-fading characteristics than would be the case if either valve were controlled separately.

Detector Amplifier

The second detector uses the Cossor DDT, which is a double diode triode, and can, therefore, be described as a detector amplifier. As is usual, one diode controls the delayed

note. The remarkably well-balanced reproduction of gramophone records indicates in no uncertain manner what careful precautions have been taken to correct both the frequency variations that are inherent in the design of sensitive pick-ups, and also the falling off in the bass register which is inherent with the ordinary gramophone record. The gramophone motor is of the silent induction type, equipped with 12in. turntable, speed regulator, and automatic stop.

On test, the selectivity on both wave-bands was found to be of a very high order even for a superhet, while at the same time there was the same pleasing absence of whistles, a praiseworthy feature that has been very noticeable in Cossor Superhets for several years.

Sensitivity and Tone

The sensitivity of the instrument is all that can be desired on both wave-bands, and the large number of stations available are tuned in smoothly and disappear quickly, due to the square-topped characteristic of the coils employed. The Cossor Model 737 has a pleasingly silent background, and even though it is a superhet the background is negligible on all stations having any pretensions to decent strength, while the receiver is so sensitive that



This illustration shows the handsome appearance of the new Cossor Tablegram (Model 737) with the three control knobs and calibrated tuning scale.

A.V.C. system, while its partner acts as second detector, the output being duly amplified by the triode portion of the valve which is resistance coupled to the output valve, the Cossor MP/PEN. The MP/PEN is capable of an output of some 2½ watts and works in conjunction with an energised moving-coil loud-speaker that does real justice to the volume available; in fact, the volume available for the loud-speaker is greater than that usually associated with an output of this order.

The Cossor 442BU, a double-wave rectifier, is employed in the power pack which, in common with usual Cossor practice, is particularly heavily designed to give hum-free reproduction.

Pick-up Arrangements
The pick-up arrangements are worthy of

its range is limited by background considerations rather than limitations in sensitivity.

In spite of the high opinion we hold of the sensitivity and selectivity of this receiver, it must be admitted that its most outstanding feature is tone, which is really excellent and covers a wide frequency range.

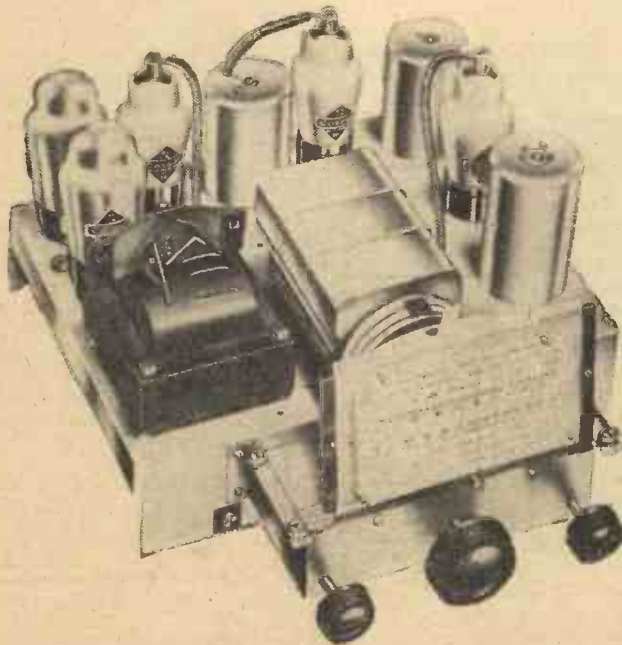
The general construction of this radiogram is very robust, as is the well-finished walnut cabinet with bakelite combined grille and escutcheon, backed by dull gold raffia, the cabinet being approximately 19in. high, 15in. wide and 14½in. deep.

The price of 15 guineas is unquestionably moderate, and it is available for A.C. Mains only, 200/250 volts (adjustable), 50-60 cycles.

It may be obtained on hire purchase terms, the deposit being 30s. and twelve monthly payments of 26s. 6d., or, if preferred, 30s. deposit and eighteen monthly payments of 18s. 6d.

SPECIFICATION:

Cossor Model 737. 5-valve A.C. Mains Superhet Table Radiogram with delayed automatic volume control. Combined radio and gramophone volume control, variable tone control, 4-way wave-change, gramophone and off switch. Large illuminated scale calibrated in wavelengths and with station names. Silent induction motor with 12in. turntable. Polished walnut cabinet with bakelite escutcheon and knobs.



The chassis of the new Cossor Tablegram, showing the compact layout of the components.

THE STRAIGHT SET versus THE SUPERHET NEW ANGLES ON AN OLD PROBLEM

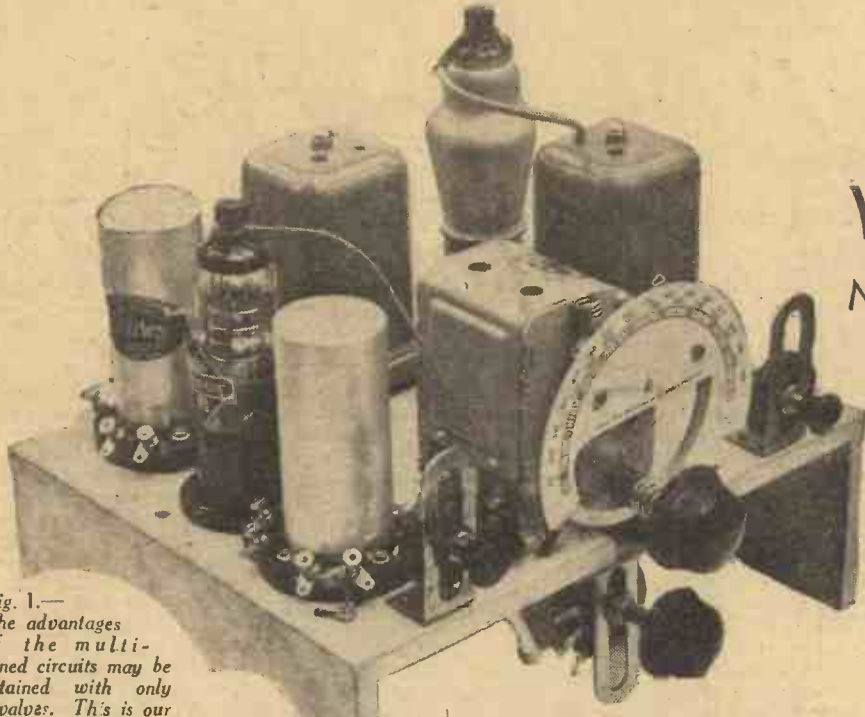


Fig. 1.—
The advantages
of the multi-
tuned circuits may be
obtained with only
2-valves. This is our
2-valve superhet.

FROM time to time every listener finds himself having to face the fact that he requires a new set, and is at once confronted with the question, "What type of set shall I select?"

Battery or mains supply, standard range or all-wave, table, console or radiogram model, all these points readily solve themselves on the matter of general requirements, local conditions and price. The question therefore inevitably resolves itself into a choice of a circuit—in other words, the old problem of superhet or straight set.

It is generally agreed that the principal points on which a set must be judged are (not necessarily in order of importance): sensitivity, selectivity, reproduction, simplicity of operation, reliability, economy and price. Let us see how the straight set and the superhet compare with respect to each of these.

Sensitivity

First, as to sensitivity. Taking the usual standard for comparison, namely, the signal strength in microvolts required to give an output of 50 milliwatts at 30 per cent. modulation, modern types of receiver may be arranged in ascending order of their average sensitivity as given below, omitting such almost obsolete types as the simple detector and L.F. arrangement:—

Least Sensitive.—

Straight set with one H.F. stage. Superhet of the frequency-changer-I.F.-detector-output type. Straight set with two H.F. stages. Superhet with two I.F. stages or with one I.F. and two low-frequency valves.

Most Sensitive.—

Superhet having one radio-frequency stage preceding the frequency changer.

This order may vary slightly according to the efficiency of individual makes, and also by modification of design, but the list as given is based upon experience with a large number of sets of both commercial and home construction. It should be mentioned in connection with this list, however, that whereas the average superhet is of fairly constant sensitivity throughout its tuning range, the majority of straight sets are more sensitive towards the bottom end of the medium-wave tuning range than at the top, so that in the case of the simple superhet, and the set with two H.F. stages, placed second and third in the above table, there is little to choose between the two in the middle of the medium-wave band, while the straight set is definitely superior below, say, Milan and less satisfactory on the higher wavelengths.

Further Considerations

What does the difference in sensitivity between different types of set imply in terms of performance? Obviously it means that the more sensitive sets will receive a larger number of stations at useful strength, and on this score the superhets seem to have the advantage. But this must be qualified by several other factors. First, high sensitivity applies to extraneous noises as well as bona-fide signals, so that if the listener is unfortunate enough to reside in a district where severe outside interference is experienced, a very sensitive set is of little value to him, and he might just as well use a simple, less sensitive set, for he will then receive just as many useful stations as with a more expensive outfit.



Fig. 2.—A very efficient set employing the full superhet feature with only 4 valves.

Secondly, the highly sensitive set amplifies internal incidental noises as well as signals, and this means that at least the two most sensitive types on the list are prone to a certain degree of that very unpleasant noise known as "valve hiss," while the most sensitive set is practically impossible to

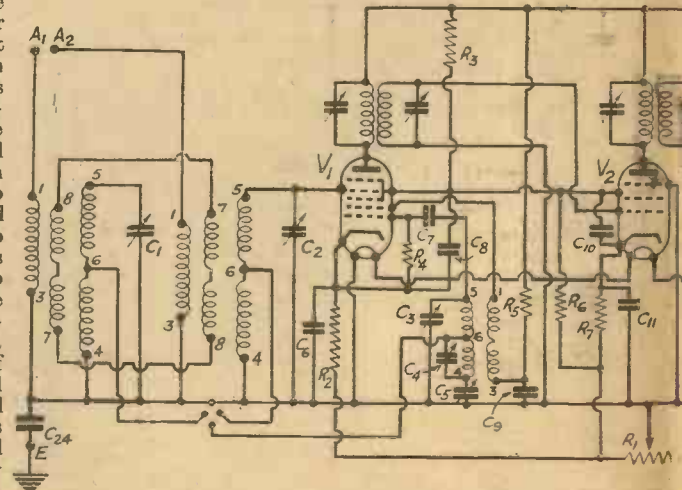


Fig. 4.—This circuit, of the Universal Superhet 4, is

STRAIGHT SET VS SUPERHET

TOPIC. By H. BEAT HEAVYCHURCH



design to give a reasonably silent background. It will thus be seen that on the question of sensitivity alone the superhet has, in

general, a better performance, valve for valve, so far as station getting is concerned but, to the lover of reproduction free from objectionable noise, its range is offset by a not-too-silent background.

Even this statement must, however, be modified by pointing out that all superhets, and most straight sets except the very simplest forms, can be fitted with a quiet A.V.C. feature which, when switched in, prevents the set from re-

sponding to any but the strongest signals, thus giving only the most important stations against an extremely silent background, since all mush is eliminated.

Selectivity

Now consider the matter of selectivity, or the ability to receive signals free from interference by programmes on neighbouring wavelengths. The selectivity of a set is determined mainly by the number of tuned circuits, and the accuracy with which they are aligned. Now a straight set with one H.F. stage seldom has more than three, and often only two, tuned circuits, whereas no superhet has less than four resonant circuits, including those of the intermediate transformers, and many have as many as nine or more. There is no difficulty, therefore, in obtaining perfect adjacent channel selectivity in a superhet of quite simple type over practically the whole waverange with the exception of the local stations where from one to three channels may be missed, according to the type of set, and the nearness of the local transmitter.

Such a degree of selectivity cannot be expected from any straight set, although some of the latest straight receivers, having two H.F. stages and four highly efficient tuned circuits, have a performance very little inferior in this respect to that of a superhet with an equal number of valves. Two further aspects of this part of the question require consideration. The first is that it is very little use pushing selectivity to the limit in order to receive a few

extra stations of doubtful programme value; and the second is that adjacent channel separation means that no audio frequencies above 4,500 cycles will be received, so that no receiver pretending to this degree of selectivity can give anything like high fidelity reproduction, although by judicious tone correction a very pleasing quality may result.

Reproduction

This brings us to the third factor, namely, reproduction, which falls into several divisions. The first of these concerns the low-frequency portion of the set to the extent that a generously designed output stage and a good

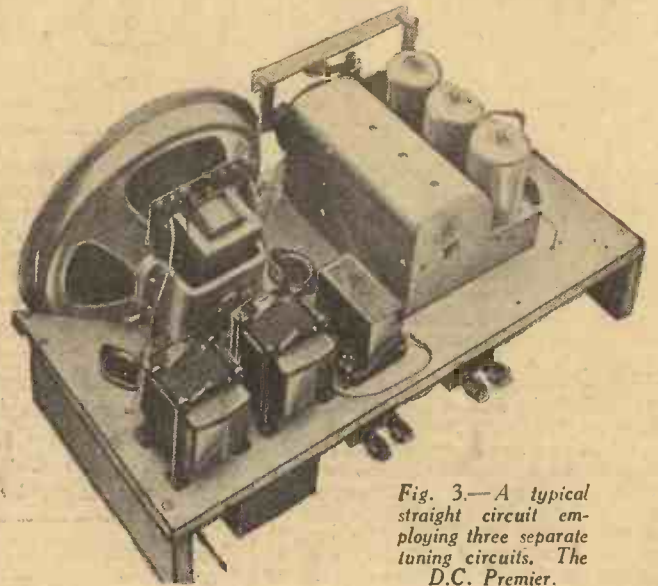


Fig. 3.—A typical straight circuit employing three separate tuning circuits. The D.C. Premier.

speaker are essential and an important factor in good reproduction. It does not, however, affect the choice between straight and superhet reception, and must, therefore, be disregarded here. Next is the matter of audio-frequency range, and this is limited by the inherent selectivity of the set. On this score, therefore, points must be accorded to the straight set, as must also be the case on the matter of background noise.

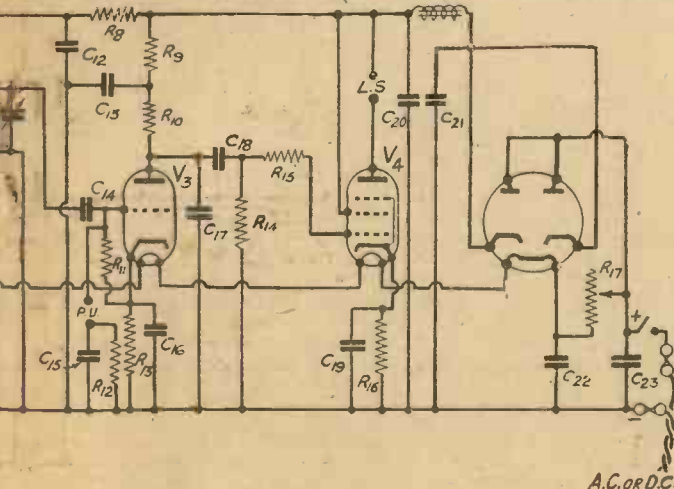
Simplicity of operation comes next. The average superhet is usually quite as easy to operate as the average straight set, and it is all a matter of individual design. Reaction or selectivity control in simple straight sets requires some skill to operate satisfactorily and has no counterpart in the superhet. A superhet, however, if fitted with A.V.C., requires careful tuning in view of the tendency of the A.V.C. circuit to boost signals when the set is slightly detuned, and to introduce distortion at the same time. On the other hand, many of the more elaborate superhets are fitted with so many tone controls, variable muting controls, variable bandwidth fidelity controls and so on, that considerable practice is required to memorise them all, and to obtain the best results.

Reliability is an important point, and here the straight set must be allowed to score by reason of the comparative simplicity of the circuit.

Final Features

The last point for discussion is price, and this is, perhaps, the least satisfactory criterion. Examination of price lists shows that, in general, straight sets are cheaper than superhets of comparable performance. But everything depends upon what the individual considers as good performance—stations or quality or a combination of both.

In endeavouring to sum up, one is inclined to put matters in this way. If you are living in a district giving noisy reception by reason of man-made static, you can only enjoy the more powerful stations, so that a straight set will give you as wide a useful range as a superhet, and you will obtain the additional benefit of much better reproduction. If, however, you live under the shadow of the local station, it may be necessary to have a superhet.



shows the number of tuned circuits which are employed.

MORE RADIO MISNOMERS

If any reader will take the trouble to collect half a dozen pamphlets dealing with this season's radio products he will find no difficulty in picking out misnomers and unhappy technical phraseology on every page, and it is just because there is a danger that such looseness may become a permanent feature of radio terminology, and because this in turn may lead to wholesale misconceptions on the part of those whose scientific knowledge is limited, that the following notes and warnings have been prepared.

"Radio"

The first criticism concerns the use of the word "radio." Now "radio" is an excellent adjective to apply to apparatus associated with communication carried out by means of radiated energy, and such terms as "radio receiver," "radio telephony" and so forth are beyond reproach. But "radio" is and can be nothing more than an adjective and should therefore never be used as a noun. How frequently, however, do we see a receiver described as a "table radio." It is almost as bad as calling a flying machine a "flying," or a football a "foot," both of which, of course, are absurd.

Having dealt with the receiver itself, we come to the various components and accessories, the first of all being the "aerial." Long usage has sanctioned, in this country, the use of the adjective "aerial" as shorthand for "aerial wire," that is, a wire extended in the air. But the American (and also French) term "antenna" is far more logical. Besides, it is not every "aerial" which is stretched in the air. A frame aerial, for instance, is not an aerial at all. Many prefer to call it simply a "frame," or the American name "loop," is quite as good. Then large numbers of receivers are fitted with a "mains aerial"—another terrible misnomer. While admitting that off-hand a really good alternative cannot be suggested, the expression "mains signal collector" is the best that comes to mind.

To be strictly correct we should follow the word "earth" by the qualifying term "plate," "tube," "wire," or "connection," but it seems that the single word "earth" has dug itself in too firmly and must be accepted for all time.

Valves

Many will not quarrel with the term "valve," although quite a good case can be made out for the use of the term "tube," as employed by our American cousins. There is, however, a great deal of loose terminology in connection with these essential components. For example, objection can be levelled most strongly against the descriptions "single-phase" and "double-phase" as applied to half-wave and full-wave rectifiers. In technical parlance single-phase and two-phase, etc., should be reserved for alternating currents, a single-phase current being the ordinary form familiar in lighting circuits, and a two-phase current one consisting of two single-phase currents which are out of step with each other.

Another annoying expression is in connection with double-diodes, double-diode triodes, and similar combined valves. Many will persist in saying that such and such a wire is connected to one of the diodes, when they mean that it is connected

to one of the diode anodes. It should be remembered that each of the diode elements consists of a small anode and the common cathode.

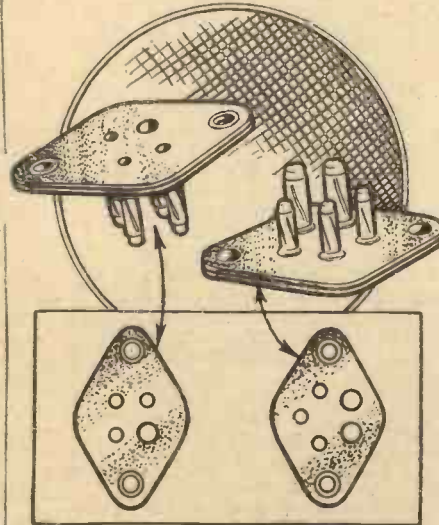
A consistent engineer would never describe a valve as being a "high-slope" valve. What is meant is that the valve curve has a high slope, that is, the valve has a high value of mutual conductance. The sensible term, and one which is easily understandable to even the lay mind, is "high sensitivity."

The Use of Incorrect Terms and Expressions Should Always Be Avoided Where Possible. This Article Points Out Some of the Inaccuracies. By "CRITIC"

Causes

At this stage it might be as well to consider the causes for the various types of misnomers and loose technical terms. There are really four main reasons. The first is pure carelessness—the kind of thing which results in a screen-grid valve being called simply a "screened grid." The same slackness causes a neon tube to be termed a "neon." But you would never call a petrol engine a "petrol," or a fountain pen a "fountain"—at least not unless it behaved itself very badly!

Another set of misnomers results from a form of contraction of quite legitimate phrases, these being contracted in such a way as to be somewhat objectionable in the eyes of those with a sound knowledge



Radio tube sockets, which are more commonly referred to as value-holders.

of both radio engineering and etymology. Take, for example, the term "superhet." It has been in use for so long that we shall never lose it, and to-day it is just a label for a certain type of receiver. Written in full, "supersonic heterodyne," it describes fairly accurately a technical principle in receiving circuits, and is compounded of four roots or basic words, some Greek and some Latin. Actually, the prefix "super" and the root of which the "het" is a contraction, mean respectively "above" and "outside," and the combination of the two in "superhet" conveys no sensible

meaning. But when it is explained that "supersonic" means "above sound" and "heterodyne" means an outside force, it does not take long to understand that together they form a good name for a receiver operating on the principle of combining a new (i.e. "outside") oscillation with the original signal frequency oscillation in order to produce a third oscillation having a new frequency which is above sound frequency, and can be amplified more efficiently than the original signal frequency.

Volume Control

It is to be feared that many of the most impressive technical terms have been produced with the desire, at least in part, to create an air of mystery or tuning importance. In the same way, quite correct terms are sometimes loosely applied and, possibly innocently, create quite false impressions. Our old friend A.V.C. or automatic volume control is a case in point. Actually, of course, A.V.C. does not control volume—except indirectly; what it does control is the gain or amplification in the high-frequency stages of the receiver, and "automatic gain control" would be a far better name. The resultant effects of the various modifications of A.V.C. are fairly well known. We have "delayed A.V.C.," which is applied only to signals above a certain strength, and "quiet A.V.C.," which combines a system of suppressing noises between stations. But objection can be taken to the term "Full Automatic Volume Control" being applied to the simplest and, incidentally, the least effective form of A.V.C. Again, the term "Amplified A.V.C." is very misleading. What is it that is amplified? Certainly not the "automaticness" of the control, to coin an expressive if unwieldy word. Nor the volume, for in every case the net result of A.V.C. is to render the volume of sound less than it would be if the receiver was not equipped with A.V.C. Nor is the control amplified, strictly speaking, for amplified A.V.C. does nothing more in its basic action than simple A.V.C. The thing which is amplified in "amplified A.V.C." is the controlling force, making it sufficient to control effectively the variable-mu valves in the receiver. Since, therefore, amplified A.V.C. merely does efficiently what simple A.V.C. can only do moderately well, it seems an unusually grandiose term to apply to a device which simply does what it sets out to do in a perfectly satisfactory but not a strikingly spectacular manner.

Other Expressions

There is another class of radio misnomer which contains glaring examples of what may be termed pure inaptitude in naming objects and processes. A valveholder certainly does hold a valve, but it is really more of a socket than a holder, and certainly



MORE RADIO MISNOMERS

(Continued from opposite page)

"valve socket" is to be preferred. Why do we call that black moulded part of a valve which contains the valve pins, the "cap"? Surely it is much more logical to call it the "base." Besides, if you call it the cap, what are you going to call the terminal at the top of the valve which forms the anode (or sometimes the grid) connection? I do not like the term "cap" even for this, and would rather see it christened by general consent the "top connection." *Not* "terminal," please, for a terminal clearly means a finishing point, whereas most, if not all, terminals are used to provide a means whereby a circuit is continued through a further piece of apparatus.


Many sets to-day are fitted with what are known as "visual tuning indicators"—devices which, by means of a meter, a lamp, or a neon tube, indicate when the optimum point of tuning has been reached. But surely this is not a tuning indicator! The visual tuning indicator is the tuning dial, for it certainly indicates roughly to what station or to what wavelength the set has been tuned, and the indication is certainly visual. What the so-called "tuning indicator" indicates is the exact point of resonance—so why not call it a visual resonance indicator?

Finally, do not call an electrolytic condenser an "electrolytic." You do not call a paper condenser a "paper," nor a mica condenser a "mica." And don't call a micro-farad a "mic" or a "mike" (the former stands for "microhenry" and the latter is the recognised contraction for a microphone), nor a milliamperere a "mil," for that is a small unit of length used in precision engineering.

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20 for 11½d.**

'BETTER BUY CAPSTAN.
they're blended better
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**THE "QUEEN MARY'S"
FIRST VOYAGE**

THE B.B.C. Variety Director, wishing to celebrate the *Queen Mary's* maiden voyage with a musical work, has commissioned George Posford to write a symphonic rhapsody in the modern idiom. This special work, entitled "Transatlantic Rhapsody," will be played in London by Geraldo and his Orchestra in the programme "Romance and Rhythm," during the time of the voyage. This will be an important occasion for Mr. Posford and should help to place the seal on his success with "Good-night, Vienna," and "Invitation to the Waltz." It is possible that "Transatlantic Rhapsody" will be featured by the ship's orchestra during the voyage. The "Rhapsody" is descriptive, first portraying the departure and the colossal activity at the docks and then forming a kaleidoscope of cheering crowds, bands playing, and sirens of tugs as the giant liner leaves the quay. The second theme is the open sea—a romantic theme on the grand scale, depicting the achievement which the *Queen Mary* represents in British shipbuilding. Theme three seeks to represent the conflict between two great forces, the ship's mighty engines and the sea. Next comes a descriptive picture of life aboard, with its dance bands, swimming pool, cabarets, etc. The finale provides a glimpse of the mighty liner as she ploughs her way through the seas on a moonlit night, her decks brilliantly illuminated and her passengers thrilled with the excitement of her maiden voyage.

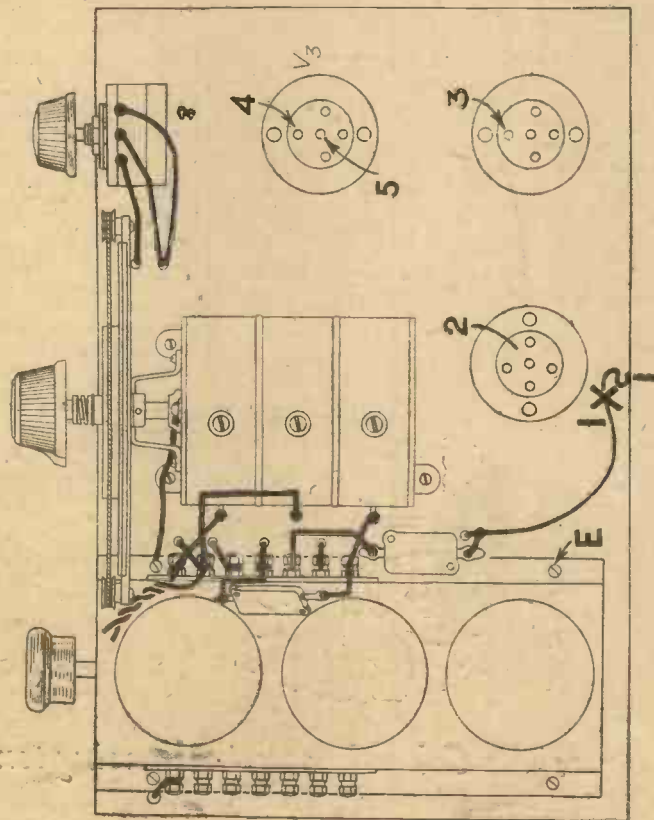


- as the Colonels say in Kensington

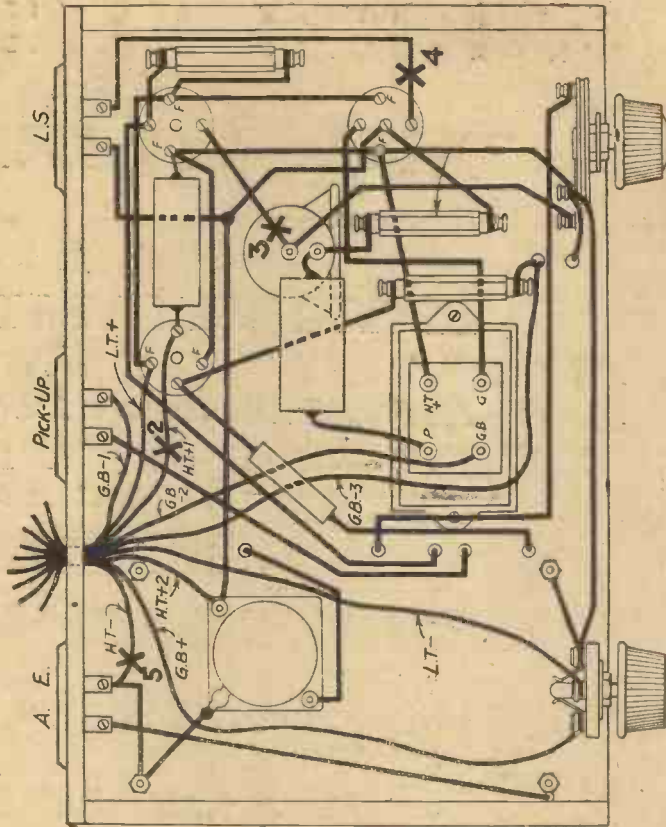
Practical and Amateur Wireless SERVICE DATA SHEET NO. 20

FOR TUTOR THREE

F. J. CAMM'S



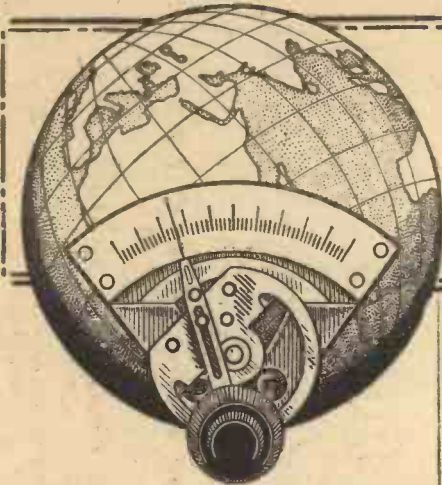
Top of Chassis View



Underside of Chassis

Approximate Voltage Readings **Approximate Current Readings** **Approximate Resistances Readings**

Voltmeter — to E.	Milliammeter connected at	L.F. Transformer.
+ to 1 = 120 volts.	× 1 = 2½ mA.	Ohmmeter connected across G & GB
+ to 2 = 60 volts.	× 2 = ½ mA.	= 3000 ohms.
+ to 3 = 60 volts.	× 3 = 1½ mA.	Ohmmeter connected across P & HT
+ to 4 = 118 volts.	× 4 = 3½ mA.	= 1000 ohms.
+ to 5 = 120 volts.	× 5 = 9 mA.	Chokes.
		Ohmmeter connected across Screened Choke
		= 500 ohms.
		Ohmmeter connected across Disc Choke
		= 200 ohms.



SHORT WAVE SECTION

SUMMERTIME IMPROVEMENTS

The Longer Hours of Daylight will Affect Short-wave Reception and Some Improvements which may be made to the Short-wave Equipment to Counteract the Effects Are Here Given. By W. J. DELANEY

MANY listeners made their first acquaintance with short-wave reception during the past few months, and therefore they will be unfamiliar with the conditions which obtain when the long hours of daylight are experienced. It may already have been found that certain stations which were previously well received early in the evening cannot now be heard or are now only obtained at very weak strength. Conversely, signals which previously could not be heard until perhaps the early hours of the morning

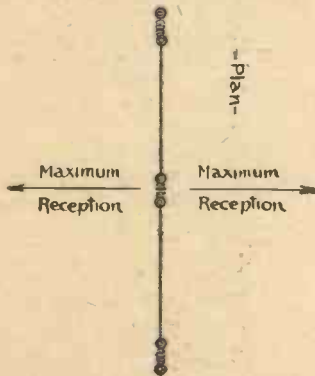


Fig. 1.—Diagram showing the "T" aerial and reception strength.

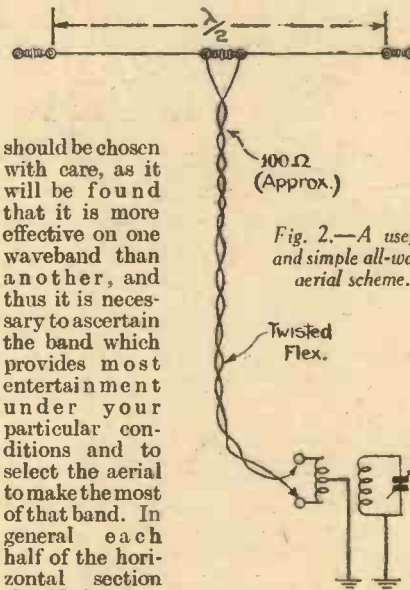
may now be tuned in about 10 o'clock in the evening, and thus the conditions are considerably changed from those which have been experienced for the past few months. The vagaries of the short-wave signals under conditions of sunshine, wet weather, daylight, and darkness may have been experienced, but in any case, the user of a short-wave set should take the opportunity now of improving the equipment so that advantage may be taken of the longer hours of daylight. There are several directions in which improvement may be effected, but as the majority of short-wave experimenters also wish to listen to the broadcast signals and utilise a common aerial, a form of all-wave aerial is desirable.

An All-wave System

There are already several all-wave equipments now on the market for those who do not wish to make up their own. These are all provided with a special matching transformer which has to be connected to the aerial and earth terminals of the receiver, and the general form taken is a "T" aerial, with twin down-leads (Figs. 1 & 2). The latter are generally referred to as the transmission line, and the two wires may be brought to the receiver in two or three

different ways. The simplest is to employ ordinary twisted leads after the manner of ordinary lighting flex, whilst a more effective scheme is to use the special insulators which hold the wires in a crossed position at regular intervals.

The horizontal portion of the aerial



should be chosen with care, as it will be found that it is more effective on one waveband than another, and thus it is necessary to ascertain the band which provides most entertainment under your particular conditions and to select the aerial to make the most of that band. In general each half of the horizontal section should be one-quarter of the wavelength desired, and thus an intermediate setting must be selected.

Fig. 2.—A useful and simple all-wave aerial scheme.

Matching Transformer

For good all-round results on the short

and broadcast bands, it will no doubt be found that by making each horizontal wire between 20 and 25ft. in length an effective compromise is obtained, but if better short-wave reception is desired, the length may be decreased. The ends of the transmission line may be connected direct to the matching transformer, or may be joined through variable resistances or condensers, and this subject has already been well covered in these pages.

An old medium-wave broadcast coil may be used for the secondary of the transformer, or a similar coil may be wound for the purpose, and to couple this to the short-wave set two or three turns may be overwound on it and joined to the aerial and earth terminals. Improvements may be effected by interposing an electro-static screen between primary and secondary, and by modifying the number of turns in the coupling coil, its position, and the number of turns on the secondary. Experiment will show the most effective scheme for individual conditions.

Reaction Circuits

Where the short-wave set consists of the simple detector and L.F. stages an improvement in the reaction arrangements will be found of great service when endeavouring to push the receiver to its limits as regards range. No doubt every short-wave listener has found the value of the reaction circuit, and whilst a good slow-motion drive to this part of the circuit will do much towards obtaining that maximum setting just before oscillation sets in, a much better arrangement is found in the employment of a separate reactor valve. This is joined in parallel with the existing detector valve and

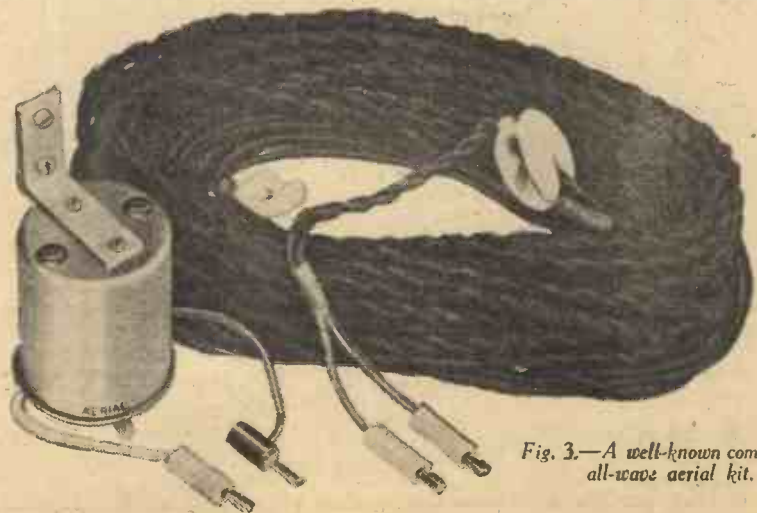


Fig. 3.—A well-known commercial all-wave aerial kit.

the anode is employed purely for reaction purposes. The scheme is indicated in Fig. 4. Practically any valve may be employed for this purpose, and the H.T. will not be found critical. Again, however, experiments regarding the most suitable value of the grid condenser and leak will be amply repaid by improved performance.

The average superhet receiver will not be found of great value when it is desired to receive short-wave amateurs who are transmitting telegraphy signals, but the difficulty may be overcome by including a reaction scheme which will permit the intermediate-frequency stage or second detector to oscillate and thus make audible the C.W. signals employed by the amateurs.

In America a separate stage is favoured for this purpose and it is connected to an existing receiver by means of an adaptor plug. A simpler scheme is to include a potentiometer in the screening-grid circuit of an S.G. valve, so that the valve may be caused to oscillate at will, but certain experimenters do not favour this scheme although it has the merit of simplicity.

In certain cases it may be found that the intermediate frequency which is employed in the superhet and other circuit arrangements, does not permit of good

short-wave results, and in such a case it may be found worth while to fit the short-wave tuner only to the grid circuit of the second detector valve, arranging the wave-change switch so that when short waves are required the aerial is transferred to the

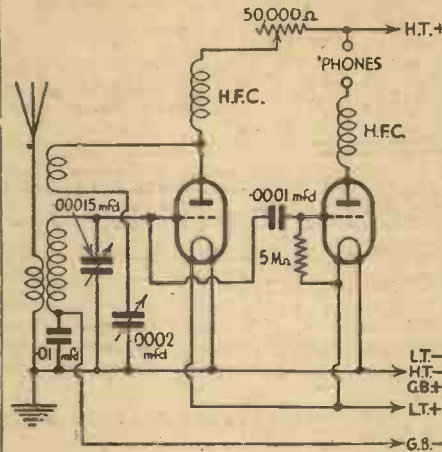


Fig. 4.—A typical reaction circuit using a separate valve.

second detector and thus a straight arrangement is used for short-wave reception. The reaction arrangement may then take the standard form, including a reaction coil and condenser in the anode circuit. To economise in battery consumption it is also desirable in this case to switch out the filaments of the frequency changer and any other valves which will not be used in the straight circuit arrangement. In a mains receiver the heaters should be left in circuit and the anode coupling component disconnected.

Earth Connection

Finally, as the longer hours of daylight are also accompanied by drier weather, it is imperative to guard against a dry earth connection which will materially affect long distance results. Therefore, the existing earth should be replaced by one of the proprietary chemical earths, or some arrangement should be made to ensure the retention of moisture round the earth plate. If the latter cannot be arranged for, it may be found desirable to dispense with the usual earth and to erect a counterpoise, but the best method of doing this will depend upon the type of aerial which is employed.

German Transmitters

GERMANY appears to be testing three more short-wave transmitters to be added eventually to her network. They are DJT, Zeesen, 40 kilowatts, 19.53 metres (15,360 kc/s), which so far is being tried out for the broadcasts to Africa; DZH, Zeesen, 40 kilowatts, 20.75 metres (14,460 kc/s), which has been heard working simultaneously with DJJ (29.87 metres), and DJM, Zeesen, 49.35 metres (6,079 kc/s), which on some nights takes the DJC (49.83 metres) programme from G.M.T. 20.00-22.00. I am also informed that tests are to be carried out with DJU, 11.56 metres (25,950 kc/s), and DJV, 11.33 metres (26,480 kc/s), in the near future.

Of the North American stations received during the past two weeks, excluding such old-timers as W2XAF and W2XAD, Schenectady (New York), and so on, the best has been VE9DN, Drummondville (Quebec), on 49.96 metres (6,005 kc/s). It relays programmes from Montreal, but is only to be captured on Sunday mornings between G.M.T. 05.30-08.00; no other schedule is advertised. At that time you will pick up messages broadcast to settlers, trappers, and other inhabitants of the Far North outposts of Canada.

Television Wavelength Decision

It is now stated that the television signals will be radiated on a wavelength of 6.67 metres, corresponding to a frequency of 45 megacycles, while the accompanying sound will occupy the 7.23-metre channel (41.5 megacycles). This corresponds to a frequency separation of 3.5 megacycles which will be ample for the initial service. The band width in the case of one company is just over two megacycles for vision, and since the sound is not likely to exceed 20 kilocycles there will be no overlap. If it becomes necessary to increase the degree of line definition to any material extent, however, these wavelengths may have to be reviewed and a bigger separation provided.

The "Queen Mary"

It may interest DX enthusiasts to know that the letters allotted to the Cunard White Star Liner, "Queen Mary," are GBTT, and that her transmissions on short

Leaves from a Short-wave Log

waves will be made on channels comprised in the following bands: 16.85 metres (17,800 kc/s)—18.27 metres (16,420 kc/s); 22.5 metres (13,335 kc/s)—24.3 metres (12,345 kc/s); 33.93 metres (8,842 kc/s)—36.58 metres (8,203 kc/s), and 67.87 metres (4,420 kc/s)—73.17 metres (4,100 kc/s).

Addis Ababa

Through ETB, the 2-kilowatt transmitter at Akaki, Addis Ababa, the Abyssinians are giving every Sunday at G.M.T. 21.30 a twenty-minute broadcast in the English language. The channel used is 25.00 metres (11,960 kc/s).

This week, as may be expected at this period of the year, when the summer schedules are being compiled, we find a number of alterations both in wavelengths and timings. Firstly, W3XAU, which relays the C.B.S. Philadelphia station WCAU on 49.5 metres (6,060 kc/s) and on 31.28 metres (9,590 kc/s), in order to avoid interference with the Dutch transmitter PHI on the latter channel, works on weekdays from G.M.T. 17.00-01.00 and on Sundays from G.M.T. 17.00-00.00. On 49.5 metres W3XAU is on the air daily from G.M.T. 01.00-04.00. The transmission from PHI, Huizen, therefore, destined to the United States on Sundays (G.M.T. 00.00-01.00), is now clearly received.

PRAS, Pernambuco (49.71 metres, 6,035 kc/s), which so far has been using only 1 kilowatt, is to blossom out shortly as a 5-kilowatt. It operates daily from G.M.T. 14.00-16.00, and from 21.00-01.30, the latter broadcast being particularly well heard. As an interval signal the studio has now adopted six metal gongs, which, struck at intervals, provide four short melodies. The call is: *Radio Club de Pernambuco, A Voz do Norte.*

Another South American, of which reception reports are being regularly received, is LRU, Buenos Aires, relaying LRI, *Radio el Mundo*, on 19.62 metres (15,290 kc/s);

you may now pick it up as early as G.M.T. 20.00.

Colombian Stations

HJ1ABD, Cartagena (Colombia), has moved to the 31-metre band, and is now found on 31.25 metres (9,600 kc/s). It can be recognised by its call: *Radio-diffusora Cartagena*, or by its three

chimes, which possess the peculiarity that they finish on a high note. In view of the preponderance of North Americans among its listeners, the studio closes down with the playing of: Stars and Stripes For Ever.

Another Colombian which figures regularly in my log is HJ4ABA, Medellin, on 25.42 metres (11,800 kc/s), *Ecos de la Montana*, which transmits daily from G.M.T. 16.30-18.00, and again from G.M.T. 23.30-03.30. Interval signal: gong. You should tune in just above W2XE, Wayne (New Jersey), on 25.36 metres (11,830 kc/s)—or on the exact frequency of 12RO, Rome, if you have not already logged this station.

HJ3ABF, Bogota (Colombia), which has now selected a new channel, namely, 48.58 metres (6,175 kc/s) and regularly calls: *La Voz de Colombia*, is once more to the fore, as it is at present one of the best signals picked up from either Colombia or Venezuela. The best time to listen to its broadcasts is from G.M.T. 02.00-04.00. The signal is easily identified; it consists of a series of six notes, somewhat reminiscent of those used by the N.B.C. studios, but in different sequence. They are:—C, G, C, E, G, E. Announcements are made by both a man and woman.

Port au Prince (Haiti)

Finally, you may make a note of a new arrival, HH3W, Port au Prince (Haiti), a 1-kilowatt operating on 31.27 metres (9,595 kc/s) daily from G.M.T. 00.00-01.30. It is on the same channel as the League of Nations HBL, Prangins, transmitter, uses chimes between items and gives out all its announcements, including call, in English, French, and Spanish. If you log a broadcast a report will be welcomed by: Sr. C. Ricardo Widmaier Jr., P.O. Box A/117, Port au Prince, Haiti,

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

THE OXFORD SHORT-WAVE RADIO CLUB

THE annual general meeting of this Club took place on Tuesday, March 31st, at 7.30 p.m., when the officers for the ensuing year were elected. Mr. H. J. Long (G5LO) was unanimously re-elected President, and Mr. M. F. Long (G2CL) was elected Vice-President. In his report the secretary summed up the past year's activity and deplored the lack of experiments with 5-metre apparatus, which was unfortunately limited to only two occasions, both of which were successful. We are now well equipped with receivers for 5-metre work and one member is applying for the 5-metre addition to his transmitting licence during the month. It is hoped that there may be many experiments made this year, and any reader whether transmitting or receiving, or both, who is willing to co-operate on any occasion is asked to communicate with the secretary, Mr. E. G. Arthurs (2BHP), at 13, Walton Well Road, Oxford, who will forward particulars of the tests as they are arranged. The club meetings will take place monthly at 7.30 p.m. on the last Tuesday in each month until September, when they will be continued at fortnightly intervals until the end of March, 1937. Anyone wishing to attend a meeting should notify the secretary not less than seven days beforehand, and the necessary particulars will be forwarded.

WELLINGBOROUGH AND DISTRICT RADIO AND TELEVISION SOCIETY

A MEETING of the above society was held at the Midland Hotel, Wellingborough, on Monday, April 6th, at 7.45 p.m., and was addressed by Mr. J. C. Lee (G6JL), of Luton, on "Television for the Beginner." Over forty enthusiasts turned up and a very enjoyable evening was spent. After the lecture, questions were asked, and followed by a general discussion around Television matters. The next meeting of the Society will be on Monday, April 27th, at the Victoria Hotel, Rushden, when Mr. H. K. Bourne (G2KB), of Rugby, will give a lecture and demonstration of 50mc transmitting and receiving apparatus. All PRACTICAL WIRELESS readers in the district are heartily invited to attend. Admission is free. Particulars of how to join the Society and dates of meetings can be obtained from L. F. Parker (G5LP), 127, Jubilee Crescent, Wellingborough.

CATALOGUES RECEIVED

BRUSH SOUND CELL MICROPHONES

THESE well-known microphones, built on the piezo-electric principle, are designed to meet every microphone requirement. A folder, issued by the Brush Development Company, gives particulars of a useful range of these high-class instruments. The latest additions to the range include a lapel microphone, and a spherical microphone, the former being the smallest and lightest microphone on the market. It is intended for use of after-dinner speakers, lecturers, etc., and weighs less than one ounce. The spherical microphone is intended for broadcasting station use, and for public address, commercial inter-station, police, and amateur transmission work. It is provided with locking-type plug and socket connector for either suspension or stand mounting. Brush sound-cell microphones are of robust construction, and are not affected by severe changes in atmospheric conditions. No button current or polarizing voltage is necessary, and no elaborate stand mountings are necessary. Individual data sheets concerning each microphone listed are available on request.

THE REFLECTOR

THIS is a neat house organ issued by the Benjamin Electric Company, and relates to many interesting facts regarding the electrical industry, and the individual items which are manufactured by the Benjamin company. Some interesting illustrations are given of the installations which have been put up by the Benjamin company for various firms, and these cover lights, reflectors, P.A. equipment, etc. The journal will be supplied upon request to the company, and copies have already been circulated to various members of the Trade.

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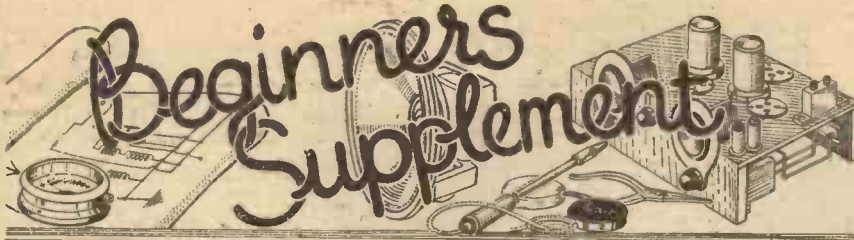
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CONSTRUCTOR PITFALLS

A Discussion of Simple Points Often Overlooked by the Home Constructor.
By IDRIS EVANS

ALTHOUGH the construction of a receiver is a comparatively easy job, provided that a full-size blueprint is available, we find that there are several important points in connection with the work which are often overlooked by beginners. These are mostly simple points which are guarded against as a matter of course by the experienced constructor but which, if not carefully attended to, can spoil the beginner's first effort at set making.

Chassis

The metallised wooden chassis is very popular nowadays owing to the ease with which it can be worked. When one of these is used, however, care should be taken to see that it is of reliable make and is effectively metallised on the upper surface; in this connection it is emphasised that aluminium paint should not be used for metallising an ordinary wooden baseboard as this type of paint cannot be relied upon to provide good metallic contact. It is also necessary to use a clean chassis, as the metallised

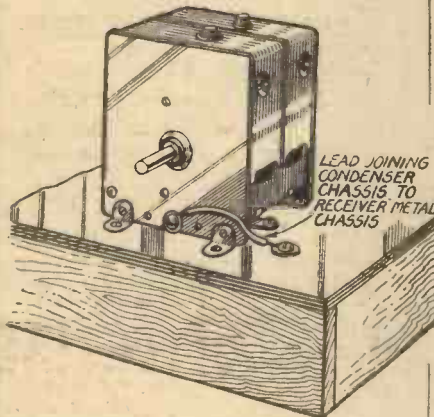


Fig. 1.—Condenser chassis joined to metallised surface of receiver chassis.

covering loses its effectiveness if covered with a layer of dirt, and therefore constructors should work on a clean table or bench and the hands should be kept reasonably clean. If there is any doubt concerning the effectiveness of the metallising, the points shown connected to the chassis on the blueprint should be joined together by means of ordinary connecting wire.

If a receiver of the simple type having only one tuning condenser and tuning coil is being made it is unnecessary to use a metal chassis, but if two coils are used a metal covering for the baseboard is desirable, and if the coils are not of the screened type they should be separated by a vertical screen of aluminium or copper. As with the metal-

lised wood chassis, cleanliness is again of great importance, as an aluminium sheet covered with dirt or grease is a very unreliable conductor.

Coil and Condenser Chassis

Most modern coils and gang condensers are of the screened type with the earth

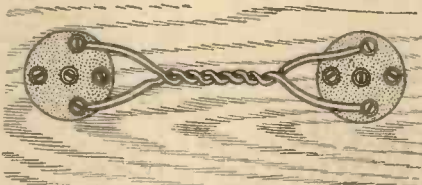


Fig. 2.—Showing A.C. valve heater leads twisted.

connection joined to the screening can. When components of this type are used, great care should therefore be taken to ensure good contact between the coil or condenser chassis and the receiver chassis. If the coil cans are painted the paint should be scraped off underneath before they are screwed to the chassis. In the case of gang condensers the chassis are sometimes supported on legs, but these legs cannot always be relied upon to provide good contact between the condenser and receiver chassis. Constructors are therefore advised to connect a wire between the condenser chassis and the metal or metallised chassis of the set, as shown in Fig. 1.

The fixed vane tags or terminals of the gang condenser must be kept clear of the set chassis, however, and in cases where two sets of fixed vane tags are provided for ease of wiring the unused tags should be bent up so as to avoid the possibility of a short-circuit occurring between them and the chassis. The same warning applies in connection with valve-holder and terminal strip sockets; care should be taken to keep these clear of the metallised covering of the chassis.

Joints

All constructors are not agreed concerning the best type of joint to use; some prefer pressure joints, whereas others favour soldered joints. Unless the beginner is an experienced solderer, however, pressure joints should be used where possible. If terminals are not provided it is better to twist the wires tightly together than to apply solder incorrectly; a soldered connection is preferable to the pressure type only if effectively done. The wires to be soldered should be perfectly clean before the solder is applied, and the tip of the soldering iron should be well tinned and at the right temperature—just sufficiently hot to make the solder run.

Wiring

Care should be taken to keep the wiring short, avoiding straggling wires and loops, especially in the H.F. stages, and wires associated with tuned circuit components (gang condensers and coils) should be kept clear of each other. If long leads cannot be avoided in the H.F. stages it is advisable in some cases to enclose the leads in screening covers. The cap lead of the S.G. or H.F. pentode valve is often screened in this way, as shown in Fig. 3. This type of screen covering is generally made of braided wire which can easily be soldered. Great care should be taken not to apply too much heat when soldering, however, as the insulation covering the wire may become damaged and a short-circuit will occur. In some cases we have found that constructors have connected the lead instead of the screening cover to the metallised chassis;

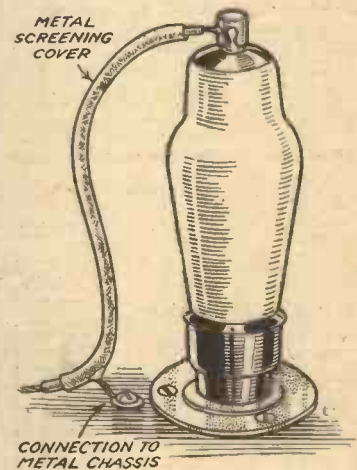


Fig. 3.—Screened S.G. anode lead showing screening cover joined to chassis.

it is emphasised that the lead passing through the metal covering must not be in contact with the latter, and only the covering should be connected to the chassis.

In mains receivers of the A.C. type the valve heaters are fed from raw A.C. and therefore it is customary to twist the heater leads together, as shown in Fig. 2. By this means the fields around the two leads are balanced out and interaction is avoided. If this precaution is not taken excessive hum is likely to occur. In receivers of the universal type the best procedure to prevent hum from this source is to pass the heater leads through a screening cover and then connect this cover to the metal chassis.

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IMPRESSIONS ON THE WAX

By
T. O'nearm

The Late Dame Clara Butt

PERHAPS the most interesting records issued by the Columbia Company for this month are some special re-recordings of Dame Clara Butt's most popular records. The first two of these, which sell at 4s. each, are "Abide with me," by Liddle, coupled with "Husheen," on Columbia DX729, and Elgar's "Land of Hope and Glory" together with Stephen Foster's "Old Folks at Home," on Columbia DX730.

A "Paraphrase of Strauss Waltzes" is Albert Sandler's latest contribution this month on Columbia DB1636. By "paraphrase" is meant a free translation of some of Strauss's most famous dances. Sandler is assisted by his 'cellist and pianist.

"Voice of the Stars"

SHIRLEY TEMPLE, in an extract from her newest film, "The Littlest Rebel," appears in a new record called "Voice of the Stars." Actually, this record, under a special green label, is being issued on behalf of the Cinematograph Trade Benevolent Fund, but it can be obtained in the usual way from gramophone dealers. It costs 1s. 6d., and includes the voices of stars like Maurice Chevalier, Jeanette Macdonald, Charles Laughton, Clark Gable, Richard Tauber, Robert Donat, and a score of others.

A New Light Orchestra

NOW and again one comes across a light orchestra that is refreshingly different. Into this category falls the new Orchestre Louise, rendering "Come to the Ball" (from "The Quaker Girl") and "Moya, Lovely Moya." This is a Columbia disc—Columbia FB1330, with Gerry Fitzgerald vocalising.

Bow Bells Remade

SOME years ago the Columbia Company made a recording of the Bow Bells, and for a long time the B.B.C. have used the record as their interval signal. Nobody knew that the bells in this record were cracked, until Messrs. Gillett and Johnston, the bell founders, pointed out that the recorded bells were false in their overtones, and that as eight of the peal had been entirely re-cast (since the recording), there was no need for the out-of-tune signal to be continued. So Columbia have re-recorded the chimes of St. Mary-le-Bow, Cheapside, on Columbia DB1637.

Henceforth, this record will be used by the B.B.C. to replace the cracked signal.

"My Piano and Me"

SINCE Turner Layton has been on his own he has adopted a stage description appropriately entitled "My Piano and Me." It appears in the new Columbia list—Columbia FB1332—in the form of a medley which includes "One Alone" ("Desert Song"), "To a Wild Rose," and "One Fine Day" ("Madam Butterfly"). It is a vocal record. Other new records by him are "Moon Over Miami" and "He's an Angel," on Columbia FB1333, and "Up the Wooden Hill to Bedfordshire" coupled with "If I Should Lose You" on Columbia FB1334.

NORMAN LONG furnishes a couple of good laughs in his latest record—Columbia FB1349. "For the Glory of Old England" is terribly "Empah"



E. Fowler, of the H.M.V. Recording Studios, who has invented a novel Football Pools Record having twenty-four different tracks. It really consists of twenty-four records in one, and is issued by H.M.V. in their April list on BD333, price 1s. 6d.

and all that, while in "Serahngin" he gives one of his Cockney studies.

"Sunbonnet Blue"

A NEW number which the publishers are confident will be a terrific hit is "A Sunbonnet Blue." It has a good melody and catchy words, and the fact that Les Allen has recorded it, should give the song its first impetus. On the other side is a "Star Gazing Medley," consisting of "O Star of Eve" (Tannhäuser), "I Saw Stars," "Stars Fell on Alabama," and "You are My Lucky Star." The Bachel'rs provide splendid support. The number of the record is Columbia FB1347.

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RADIO VALVES

LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.



All letters must be accompanied by the name and address of the sender (not necessarily for publication).

McMichael Dimic Three

SIR,—I shall be greatly obliged if any reader can loan me a pictorial layout of a McMichael Dimic Three, with screen-grid, detector, and pentode, either A.C. or battery.—J. ROBINSON (79, Blackberry Lane, Halesowen, B'ham).

The Cameo Midget in S. Africa

SIR,—Since taking your paper, I have become very interested in wireless, especially in short-wave work. I built a set to your Cameo midget circuit, using standard components of the same values. The set is a great improvement on my previous commercial one, which was out of date. Johannesburg, 30 miles away with 15 kW, on 465 metres, gives really good reception, but Durban, 10 kW, 300 miles away, on 430 metres (really Maritzburg which relays Durban) I can only get reception on an indoor aerial, as on my outdoor aerial Johannesburg cannot be tuned out.

I used an Eddystone 4-pin coil (250-500 m.), as it was the best I could get, tuned by a Polar No. 2 .0005 mfd. condenser. I also built your one-valve S.W. adapter, published in the September 14th, 1935, issue, and used in conjunction with the three-valve set, with fairly good loud-speaker results on Daventry, Zeesen, France, and Schenectady (W2XAF), besides others which were not quite so strong. I altered the number of turns on the coil to three, eight and six to pick up ZTJ Johannesburg and CR7AA (Lourenço Marques) on 48.88 metres, both giving good reception.

I intend building your Prefect 3, but it is difficult to obtain the correct parts, as the radio firms here do not carry a wide selection of components. For example, when I wanted to fit a band spread condenser to the S.W. adapter, the best I could do was to get an Eddystone micro-condenser 25 mmfd. capacity, and remove some of the plates. The result, however, was quite satisfactory.—D. HANNIGAN (Glenray, Transvaal, S. Africa).

Back Numbers Wanted

SIR,—I shall be greatly obliged if any reader could loan me a copy of *Wireless Magazine*, No. 350, containing details of the Lucerne Four, I will gladly remit all postal charges.—DAVID WEEDEN (30, Sussex Street, Poplar, E.14).

SIR,—I shall be glad if any reader would loan me a copy of *Amateur Wireless* dated October 27th, 1934 (No. 646).—NORMAN SCAMMELL (Somerset).

SIR,—I shall be extremely obliged if any reader will either sell or loan to me a copy of the "Atom" Light-weight Portable Three-valver blueprint which was given free with PRACTICAL WIRELESS dated June 2nd, 1934. Any postage costs will willingly be paid.—DAVID J. MORRIS (The Garth, Middleton-one-Row, Nr. Darlington).

SIR,—I shall be very much obliged if any reader can supply me with a copy of *Amateur Wireless* (No. 616) dated

March 31st, 1934, and also *Amateur Wireless* (No. 532) dated August 20th, 1932.—A. STAPLETON, 33, Wilfred Street, Derby).

Of Interest to Cornish Readers

SIR,—In these days of cheap "ready-made" receiving sets, the home constructor is not receiving much encouragement. I have always preached the doctrine of "rolling your own." For my own listening I have no room for the "ready made."

Several of my customers (and we have a large number) have either built their own receivers or allowed me to do it for them. Incidentally I build and aerial test free of charge when the components have been purchased from us. Need I say that this has not spoilt our good-will!

Quite recently I came across PRACTICAL AND AMATEUR WIRELESS, and was struck with the excellent way in which you cater for the home constructor. Here in this extreme corner of England (by the way is Cornwall in England?) we have to build sets with high stage gain owing to the distance from the transmitters. Personally, I have found four stages with either Q.P.P. or Class B output really necessary.

At the moment I am using two triodes in "push-push," and the full volume is altogether too powerful for a small room. About sixty programmes are available, all perfectly clear of each other (Deutschlandsender can be received perfectly clear of Droitwich, despite the terrific voice of that station). Finally, should any builder in Cornwall of a PRACTICAL AND AMATEUR WIRELESS set get into trouble, I shall be only too pleased to assist him free of charge, except for any out-of-pocket expenses. Also, provided we supply the kit of parts, I will assemble and test the set at no additional expense.—A. G. CREBER, Shooting Grounds, Torcot, Liskeard, Cornwall.

I.S.W. Broadcast

SIR,—Short-wave readers of PRACTICAL AND AMATEUR WIRELESS may be interested to know that a special DX programme dedicated to the International S.W. Broadcast Club has been arranged from the Radio Station EAQ, Madrid, Spain, to take place on April 31st at 24.00 G.M.T. to 00.30 G.M.T. The wavelength to be used is 30.43 metres, or 9,860 kc/s.—JOHN TAYLOR (Marple, Cheshire).

An S.W. Log from Goodmayes

SIR,—Not having seen a short-wave log from this district before, I am enclosing a list of stations I have received since January last:—

DJC, DJN, DJA, DJD, DJB, Zeesen; 2RO, Rome (25 and 31 metres); EAQ, Madrid; TPA3, Radio-Colonial; HVJ, Vatican City; OXY, Skamleback; SPW, Warsaw; OEA2, Vienna; LKJ1, Jelöy; HAS3, Budapest; W8XX, Pittsburgh (19 and 25 metres); W3XAL, Bound Brook (16 and 49 metres); W2XAF, W2XAD, Schenectady; PRF5, Rio de Janeiro; VK2ME, Sydney; JVP, Tokio.

My receiver is an o-v-1 with a long

outside aerial and a fairly good earth. I am thirteen years old and have been reading PRACTICAL AND AMATEUR WIRELESS for about six months.

Of the more distant stations I have received, JVP, Tokio, comes over about the loudest, except, of course, for W2XAF. I have just received my first QSL card—from VK2ME—which I received two weeks ago. I have not yet got any American amateurs, but have logged dozens of Continental ones.—P. V. JACOBS (Goodmayes).

The Prefect Short-wave Three

SIR,—I have been a reader of your very interesting journal PRACTICAL AND AMATEUR WIRELESS since January, 1933, and have built many receivers from it. I have been very interested in short-wave work for the last six years and have received many amateur stations, giving reports and collecting QSL cards on 1.7 mc., 3.5 mc., 7 mc., 14 mc. and 56 mc. bands. I have designed and built two- and three-valve receivers, and have found that a leaky grid detector using a triode valve, which in turn is transformer-coupled to a small power output valve with a minimum number of controls, smooth reaction and complete stability, is the best for amateur work. With a two-valver using a leaky grid detector I have logged and received several QSL's from foreign amateurs.

I have recently given the Prefect short-wave receiver a trial. I made it up from spare parts from the circuit described in your issues of February 8th and 15th, 1936, and I am very pleased with the results. I enclose my log, which may interest you. The Prefect S.W. Receiver on 40 metres spreads the amateur stations out O.K. Also the receiver is free from hand-capacity and is very stable on all bands.—B. C. BLAKE (Highams Park).

[We were very interested in your log, which, however, was too lengthy for publication.—ED.]

CUT THIS OUT EACH WEEK.

Do you know

—THAT Q.P.P. double valves are obtainable in various patterns to each type, so that various signal-handling capacities may be used to advantage.

—THAT it is often advisable to earth the centre dividing plate in a ganged condenser unit with a separate earth connection.

—THAT in some cases of hum troubles it may prove necessary to enclose H.F. components in a lead or steel screen to prevent L.F. interaction.

—THAT ordinary wire netting may be employed for H.F. screening.

—THAT many scientific laboratories are screened in the above manner to prevent interference from electrical machinery.

—THAT when ascertaining the rating of condensers and resistances, peak or instantaneous values should be borne in mind.

—THAT in some D.C. mains receivers it often proves worth while to place the smoothing choke in the H.T. negative lead.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Facts and Figures

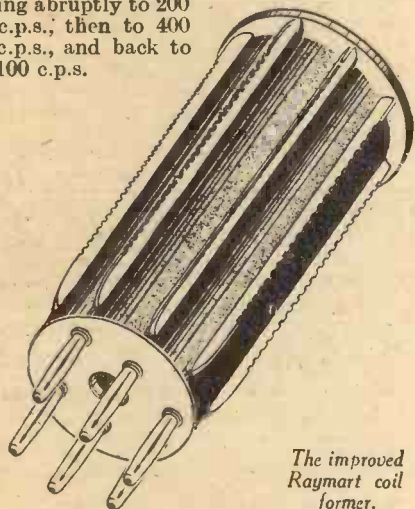
COMPONENTS TESTED IN OUR NEW LABORATORY

H.M.V. Sound-demonstration Record

ALTHOUGH primarily produced for demonstration purposes in conjunction with a pick-up and an oscillograph, there are also some useful applications of the new demonstration record which has been produced by H.M.V. This is a 12in. double-side disc, and one side is divided into four sections, or bands, whilst the second side is divided into six bands. The recording on these bands is as follows:—

SIDE 1

Band No. 1.—Illustrates the relation between wavelength and frequency (pitch). Band starts with a frequency of 100 cycles per second, changing abruptly to 200 c.p.s.; then to 400 c.p.s., and back to 100 c.p.s.



The improved Raymart coil former.

Band No. 2.—Illustration of amplitude (volume). A constant frequency of 200 c.p.s. is recorded which gradually increases in volume and then decreases to the original level.

Band No. 3.—Illustrates the phenomenon of interference of two waves of slightly different frequencies with the consequent production of beats. This band commences with a constant frequency note of 200 c.p.s., followed by one of 210 c.p.s. These two frequencies are then combined, producing beats of 10 c.p.s. per second, which are evidenced by periodic amplitude variations.

Band No. 4.—A 400 c.p.s. constant-frequency note is modulated by a sliding range of frequencies from 10 cycles upwards. Beats of a steadily reducing frequency will be observed towards the end of this band.

SIDE 2

Band No. 1.—Illustrates the production and nature of harmonics. Band starts with a short strip of 100 c.p.s., followed by a similar strip of 150 c.p.s. The two frequencies are then recorded together, showing the production of harmonics 2 : 3.

Band No. 2.—This is of the same general nature as Band No. 1, but in this case the band starts with a short strip of 100 c.p.s., followed by a short strip of 200 c.p.s. These two frequencies are then recorded together, showing the production of harmonics 1 : 2.

Band No. 3.—This consists of a gliding tone of constant amplitude starting at

300 c.p.s., rising to 1,000 c.p.s., and falling again to 300 c.p.s.

Band No. 4.—To illustrate the quality of musical sounds. This band consists of a steady note and rapidly ascending scale played on a mustel organ.

Band No. 5.—Same as Band No. 4, but played on a grand piano.

Band No. 6.—Illustrates the character of simple speech sounds. Short vowel intonations on middle C (256 c.p.s.) are given as follows:—

“a” as in part;

“e” as in we;

“i” as in tie;

“o” as in go;

followed by the word “emma.”

A stroboscopic speed indicator is provided with this record for use with 50 cycle A.C. electric light mains. Not only will its use enable the record speed to be controlled and the frequency of the various notes accurately obtained, but parts of the record can also be used as standards for comparison purposes. The uses to which the record can be put are, therefore, considerably increased. The price is 6s.

New Raymart Coil Formers

THE popular short-wave coils and coil formers obtainable from the Raymart Company have now been redesigned, and an entirely new material is being employed in the moulding of these formers. This new material is known as “RD4” and has a very high insulation factor and an extremely low-loss characteristic. The formers are approximately 1½ ins. in diameter and the eight ribs which are moulded on the outside may be obtained in plain form or with a continuous spiral groove cut to facilitate the winding of spaced coils. The base may be obtained in four separate types, fitted with 4 or 6 pins, and in the



A neat electric engraver.

latter case the pins may be chosen so that the coil may be inserted into a standard 6-pin coil holder or into a 7-pin valve base. In addition, a model is available with a 7-pin base. The overall length of the former has been increased by ½ in. and type CF.4 (4-pin plain) costs 1s. 6d., whilst type CT.6 (6-pin threaded), costs 1s. 11d. The pins which are fitted are of the resilient hollow type, and connection to the winding is carried out by passing the ends of the wire down through the top of the coil former

and into the pin, bringing it out at the end of the pin, soldering there and cutting off the surplus. This results in a neat finish and avoids difficulties due to the drilling of the material. The illustration on this page shows the type CT.6 coil and is roughly two-thirds full size.

A Runbaken Engraver

A SIMPLE electric engraver which may be used for marking various wireless accessories, or engraving an aluminium or other metal panel for a short-wave receiver, is shown on the left. The operating mechanism is a universal mains motor, suitable for use direct on any type of mains, A.C. or D.C. If desired, a slightly less powerful model may be obtained for use where the electric light supply mains are not available and in this case a 6-volt battery must be used. The motor operates the engraving point, causing this to vibrate extremely rapidly after the manner of the familiar road drill, and the impulses which vary from thirty to forty per second will mark practically any type of metal. By using the device as a pen or pencil it may be used to mark metal with printed characters, or names may be written in script, as the flow is perfectly smooth. For mains use the price is £5 5s. with a Power-plus model at £7 10s. The battery model costs £3 10s.

New B.T.S. Coils

BRITISH Television Supplies have now revised their 4-pin short-wave coils and the new models are known as Type E. There are four Models, No. 1 covering from 12 to 26 metres, No. 2 covering from 22 to 47 metres, No. 3 covering from 41 to 94 metres, and No. 4 covering from 76 to 170 metres. The price of all models is 3s. 6d., and it should be noted that the method of winding, and the connections to the pins now brings these coils into line with other 4-pin short-wave coils on the market, so that they may be interchanged with such coils in any receiver without difficulty.

“Glorious Adventure At Home”

IN our issue dated March 14th we mentioned the Philco publication bearing the above title, but owing to a printer's error the price was wrongly given as 2s. It should be noted that the price is only 2d.



The new Pye “Empire” all-wave console shown above employs a separate power pack chassis to simplify servicing operations, an extremely large loudspeaker and a sloping baffle to improve reproduction.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

Queries and Enquiries

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querists.

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

High Anode Current

"My mains set has developed a fault which I cannot trace, except so far as the following point is concerned. My meter is one of the usual high-resistance types, and accordingly I do not rely upon it too much. But strength has fallen off lately, and in making a test I find that the voltage on the valves is very low. Even allowing for the meter, it seems that the 10 to 20 volts which is shown is not in order. I included the meter in the H.T. negative lead and it shows a tremendous current, knocking the needle right over to the end of my scale. Do you think you can suggest the fault from these brief remarks, or could you examine the set for me?"—C. I. (Liverpool).

WE regret that we cannot examine the receiver for you, but from your brief comments we suggest that there is a heavy leak between H.T. positive and negative. Examine all decoupling condensers (which may have broken down) and also the mains smoothing condensers. If these are of the electrolytic type there is a possibility that they have been overloaded due to the surge when switching on and off, and they may be leaking unduly. We presume you have checked over the wiring for shorts between H.T. positive wiring and the chassis or earth leads, and have also checked the automatic bias components and wiring.

Valve Replacement

"I am sending a sketch of my present three-valve battery set, which I should like to bring up to date. I am fitting modern coils in place of those shown, and should like to improve the valve combination as cheaply as possible. You will see that the H.T. supply is on the small side, but this is because I have to keep all the apparatus in a small cupboard, and I cannot get in a super battery. What can you suggest in this particular case?"—B. P. A. (S.W.4).

THE fitting of modern coils would certainly be an improvement in an old set of the type shown, but so far as the valves are concerned it would be preferable to replace all of these. If, however,

expense is a consideration, then the output valve alone should be replaced, and in this connection you could use the new Mullard valve type P.M.22.D. which was reviewed by us recently. This will enable you to keep the anode current low as the total load of this valve is only 5 mA, or 3.8 mA if you use a lower H.T. voltage. You would also need a 5-pin valve-holder to accommodate this valve and a flexible lead should be attached to the centre terminal for plugging into the H.T. battery at the voltage recommended by the makers, i.e., either 110 or 120 volts.

The Simplest Short-waver

"In your issue of March 21st you gave a pictorial diagram of a simple single-valve receiver. Would you kindly let me know the values of the tuning and reaction condensers, and the diameter of the coil former?"—W. H. F. (Canterbury).

THE tuning condenser in this particular receiver is of standard value, namely, .0005 mfd., but it will be seen that to enable tuning to be carried out easily on the short waves a fixed condenser having a value of .0003 mfd. is connected in series with it. In place of these two components a standard .00015 mfd. variable condenser may be employed. The reaction condenser has a value of .0003 mfd. and the coil is wound upon a former having a diameter of 2in. Full details were given in our issue dated September 14th, 1935.

Battery H.F. Pentodes

"I am building a set in which the H.F. valve which is specified, and in the diagram the valve which is shown, is of the four-pin type. I have bought the valve and have only just noticed that it has seven pins. Is it possible to use this valve and if so how do I connect the various pins on it? Is it worth while changing the valve, or will the seven-pin type be more efficient?"—T. R. A. (Basingstoke).

THE electrode arrangement of the four- or seven-pin H.F. valve is identical, and it will be found that there is only one additional connection to be made in the seven-pin valve. This is to the suppressor grid which, in the four-pin type, is internally connected to the filament. Thus, in the seven-pin valve you must connect this pin direct to earth. If the valve is of the metallised type you will also find that the metal coating is joined to a separate pin instead of to the filament pin, and thus this must also be connected to earth. The references to the pins viewing the valve from the base, and reading in a clockwise direction from the single pin which stands on its own (which is joined to the metallising), are the grid, next the suppressor grid, the next two are the filaments and the next is not connected to anything. The remaining pin is the screening grid, whilst the cap on top of the valve is the usual anode terminal.

Simple All-wave Receiver

"I am anxious to build up a set for use with batteries for all-wave reception. Could you give me an idea of the simplest and most efficient arrangement for the purpose? I do not want a superhet, but I would like to have an arrangement which may be relied upon under poor conditions, and, therefore, am not keen to use the simple detector-L.F. arrangement if any other scheme is possible."—S. B. E. (Leeds).

YOU could employ a stage of H.F. amplification if you wish for greater reliability than the ordinary detector scheme, and to obtain a high degree of efficiency the detector stage of the receiver could be of the H.F. pentode type. Thus, an H.F. pentode with aperiodic aerial tuning would be used in the first stage, followed by an H.F. pentode acting as grid-leak rectifier, with an all-wave tuning unit in the grid circuit, and a single L.F. stage with a pentode output valve following. In place of the tuner separate plug-in coils could be employed, but there are several all-wave units now on the market which could conveniently be used. A circuit of this type, with constructional details, was given on January 19th, 1935.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

J. W. H. (Glasgow). Ordinary coils could be used, but it would be preferable to employ properly-designed I.F.T.'s. We would not advise the arrangement of 18-1-36 in this particular case. In view of the peculiar I.F. you are using some special arrangement may be desirable.

M. F. (E.12). We cannot loan a blueprint, but the Perfect 3 Short-wave blueprint may be obtained from this office, price 1s.

G. W. G. (Glasgow). We cannot suggest any particular direction in which improvement could be effected in the receiver in question, but, of course, iron-cored coils could be fitted, although some difficulty may be experienced regarding connections, lay-out, etc.

F. D. (Bradford). Any modern dual-range coil could be used in the circuit in question, and we cannot give constructional data for such a component in this section of the paper. Your difficulty may be due to the method of handling the set, and slow and very careful tuning must be adopted. On some wavelengths you will only hear sparse transmissions, and, therefore, the coil may, perhaps, be changed to enable you to hear broadcast signals, or amateur transmitters employing telephony.

D. C. W. (St. Annes-on-Sea). The choke in question could be employed, but when on the lower wavelengths a special ultra-short-wave choke would be desirable, or the component which we specified.

J. H. (Grayford). The values are quite in order, but an improvement in the lower frequencies might be obtained if the value of the second coupling condenser were increased. Try values up to 2 mfd. Some of your troubles may be due to the value of the second anode resistance which, owing to its high value, is reducing the H.T. applied to the valve and consequently overloading is taking place in that stage.

K. R. (Mull). We have not published any details of an adapter of the type mentioned by you.

C. E. S. (Linton-in-Craven). The term superhet is an abbreviation for superonic-heterodyne, the term heterodyne being self-explanatory, and the term superonic meaning above audibility. Band-pass is a term used to indicate that a circuit is tuned to pass a narrow band, and it generally has a steep-sided characteristic which means that a signal is only heard a few degrees on either side of the exact resonance point, and it falls off rapidly after that point. These terms have all been described in various issues, and diagrams have been given to show the differences between a band-pass tuner and an ordinary tuner. We have not described a set of the type mentioned, but suggest that you build the £4 Superhet and a short-wave converter to employ with it for short-wave reception.

R. F. N. (Nr. Pershore). We suggest blueprint A.W.387, price 1s. Unfortunately, the issue in which the constructional data was given is now out of print.

M. B. (Osterley). It would be impracticable to supply the filaments from the mains section owing to hum difficulties. The mains type of indirectly-heated valve must be employed.

The coupon on page 165 must be attached to every query.

Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS

STRAIGHT SETS. Battery Operated.

	Date of Issue	No. of Blueprint
One-valve: Blueprints, 1s. each.		
All-Wave Unipen (pentode) ..	—	PW31A
Two-valve: Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen) ..	11.8.34	PW36D
Three-valve: Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (trans.)) ..	—	PW10
Sixty-Shilling Three (D, 2 LF (R.C. & trans.)) ..	2.12.33	PW34A
Leader Three (SG, D, Pow.) ..	—	PW35
Summit Three (HF Pen, D, Pen)	18.8.34	PW37
All-Pentode Three (HF Pen, D (pen), Pen) ..	22.9.34	PW39
Hall-Mark Three (SG, D, Pow.) ..	—	PW41
Hall-Mark Cadet (D, LF, Pen (R.C.)) ..	10.3.35	PW43
F. J. Camm's Silver Souvenir (HF Pen, D (pen), Pen) All-wave Three) ..	13.4.35	PW49
Genet Midget (D, 2 LF (trans.)) ..	June '35	PM2
Cameo Midget Three (D, 2 LF (trans.)) ..	8.6.35	PW51
1936-Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) ..	17.8.35	PW53
Battery All-wave Three (D, 2 LF (R.C.)) ..	31.8.35	PW55
The Monitor (HF Pen, D, Pen) ..	8.2.36	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	7.12.35	PW64
Four-valve: Blueprints, 1s. each.		
Fury Four (2 SG, D, Pen) ..	—	PW11
Beta, Universal Four (SG, D, LF, Cl. B) ..	15.4.33	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B) ..	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull) ..	—	PW46
F. J. Camm's Superformer (SG, SG, D, Pen.) ..	12.10.35	PW57
Mains Operated.		
Two-Valve: Blueprints, 1s. each.		
A.C. Twin (D (pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Power) ..	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow.) ..	—	PW19
Three-valve: Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, D.D.T., Pen) ..	10.6.33	PW23
D.C. Ace (SG, D, Pen) ..	15.7.33	PW25
A.C. Three (SG, D, Pen) ..	10.9.33	PW29
A.C. Leader (HF Pen, D, Power)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.8.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen) ..	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) ..	11.5.35	PW50
"All-wave" A.C. Three (D, 2LF (R.C.)) ..	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) ..	31.8.35	PW56
Four-valve: Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen) ..	—	W34D
A.C. Hall-Mark (HF Pen, D, Push-Pull) ..	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull) ..	9.2.35	PW47
SUPERHETS.		
Battery Sets: Blueprints, 1s. each.		
£5 Superhet (Three valve) ..	—	PW40
F. J. Camm's 2-valve superhet (two valve) ..	13.7.35	PW52
F. J. Camm's £4 Superhet 4 ..	16.11.35	PW58
Mains Sets: Blueprints, 1s. each.		
A.C. £5 Superhet (three valve) ..	—	PW43
D.C. £5 Superhet (three valve) ..	1.12.34	PW42
Universal £5 Superhet (three valve) ..	—	PW44
F. J. Camm's A.C. £4 Superhet 4 ..	7.12.35	PW59
F. J. Camm's Universal £4 Superhet 4 ..	11.1.36	PW60
SHORT-WAVE SETS		
Two-valve: Blueprints, 1s. each.		
Midget Short-wave Two (D, Pen)	15.9.34	PW38A
Three-valve: Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Power) ..	23.9.33	PW30A
The Prefect 3 (D, 2 LF, RC and Trans.) ..	8.2.36	PW63
PORTABLES.		
Four-valve: Blueprints 1s. each.		
Featherweight Portable Four (SG, D, LF, Cl. B) ..	—	PW12

These blueprints are full size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—
 "Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7½d., and "Wireless Magazine" at 1/3d., post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send (preferably) a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

MISCELLANEOUS.

S.W. Converter-Adapter (1 valve) 23.2.35 PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.
 Four-station Crystal Set .. — AW427
 1934 Crystal Set .. — AW444
 150-millicrystal Set .. — AW450

STRAIGHT SETS. Battery Operated.

One-valve: Blueprints, 1s. each.
 B.B.C. Special One-valver .. — AW387
 Twenty-station Loud-speaker One-valver (Class D) .. — AW449

Two-valve: Blueprints, 1s. each.
 Melody Ranger Two (D, Trans) .. — AW388
 Full-volume Two (SG, Det, Pen) .. — AW392
 Iron-core Two (D, Trans) .. — AW395
 Iron-core Two (D, Q.P.P.) .. 12.8.33 AW396
 B.B.C. National Two with Lucerne Coil (D, Trans) .. — AW377A
 Big-power Melody Two with Lucerne Coil (SG, Trans) .. — AW388A
 Lucerne Minor (D, Pen) .. — AW426

Three-valve: Blueprints, 1s. each.

Class-B Three (D, Trans, Class B) 22.4.33 AW386
 New Britain's Favourite Three (D, Trans, Class B) 15.7.33 AW394
 Home-Built Coil Three (SG, D, Trans) .. — AW404
 Fan and Family Three (D, Trans, Class B) .. 25.11.33 AW410
 £5 6s. S.G.3 (SG, D, Trans) .. 2.12.33 AW412
 1934 Ether Searcher: Baseboard Model (SG, D, Pen) .. 20.1.34 AW417
 1934 Ether Searcher: Chassis Model (SG, D, Pen) .. — AW419
 Lucerne Ranger (SG, D, Trans) .. — AW422
 Corsor Melody Maker with Lucerne Coils .. — AW423
 P.W.H. Mascot with Lucerne Coils (D, RC, Trans) .. — AW387A
 Mullard Master Three with Lucerne Coils .. — AW424
 £5 6s. Three: De Luxe Version (SG, D, Trans) .. 10.5.34 AW435
 Lucerne Straight Three (D, RC, Trans) .. — AW437
 All Britain Three (HF Pen, D, Pen) .. — AW448
 "Wireless League" Three (HF Pen, D, Pen) .. 3.11.34 AW451
 Transportable Three (SG, D, Pen) .. — WM271
 £6 6s. Radiogram (D, RC, Trans) .. — WM318
 Simple tune Three (SG, D, Pen.) .. June '33 WM327
 Economy-pentode Three (SG, D, Pen) .. Oct. '33 WM337
 "W.M." 1934 Standard Three (SG, D, Pen) .. — WM351
 £3 3s. Three (SG, D, Trans) .. Mar. '34 WM354
 Iron-core Band-pass Three (SG, D, QP21) .. June '34 WM362
 1935 £6 6s. Battery Three (SG, D, Pen) .. — WM371
 Graduating to a Low-frequency Stage (D, 2LF) .. — WM378
 P.T.P. Three (Pen, D, Pen) .. June '35 WM389
 Certainty Three (SG, D, Pen) .. Sept. '35 WM393
 Minutube Three (SG, D, Trans) .. Oct. '35 WM396
 All-wave Winning Three (SG, D, Pen) .. Dec. '35 WM400

Four-valve: Blueprints, 1s. 6d. each.

65/- Four (SG, D, RC, Trans) .. — AW370
 "A.W." Ideal four (2SG, D, Pen) .. 16.9.33 AW402
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 Crusaders' A.V.C. 4 (2HF, D, QP21) .. 18.8.34 AW445
 (Pentode and Class-B Outputs for above: blueprints 6d. each) .. 25.8.34 AW445A
 Self-contained Four (SG, D, LF, Class B) .. Aug. '33 WM331
 Lucerne Straight Four (SG, D, LF, Trans) .. — WM350
 £5 6s. Battery Four (HF, D, 2LF) .. Feb. '35 WM381
 The H.K. Four .. Mar. '35 WM384

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PILOT AUTHOR HITS are only obtainable direct from Peto-Scott. We can supply any Kit featured in this journal during the past three years. Miscellaneous Components, Kits, Finished Receivers or Accessories for Cash or C.O.D. or on our own system of Easy Payments.

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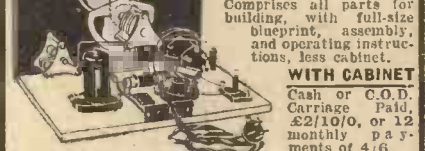
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SEND FOR FULL DETAILS and FREE BLUEPRINT COVERS 13-80 METRES KIT "A" £1:19:6

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Universal mains, A.C. or D.C., with moving-coil speaker. 1936 model:

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TEL.: HOLBORN 4631.

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ALL THESE VALVES CARRY A 90-DAY GUARANTEE AND FREE REPLACEMENTS, PROVIDED THAT THE FILAMENT OR HEATER IS INTACT AND THE GLASS IS NOT BROKEN WHEN RETURNED TO US. 5/6.

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17/6 500-0-500 volts, 150 m.a., 2-0-2 volts, 2.5 amps., 2-0-2 volts, 6 amps., 2-0-2 volts, 2 amps., 2-0-2 volts, 2 amps. Shrouded.

8/11 H.T.S. TRANSFORMERS. 250 volts, 60 m.a., 2-0-2 volts, 4 amps.

17/6 DITTO. With H.T.S Metal Rectifier.

ALL THE ABOVE TRANSFORMERS ARE OF FIRST CLASS MANUFACTURE, BRAND NEW AND CARRY MAKERS' GUARANTEE.

2/6 8 mfd. and 4 mfd. DRY ELECTROLYTIC CONDENSERS. By well-known manufacturer. 450 volt working, 500 volt Peak. Brand new.

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2/- G.E.C. 110 kc/s INTERMEDIATE FREQUENCY COILS. Complete with two trimmers.

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63, HIGH HOLBORN, W.C.1.

TEL.: HOLBORN 4631.

BIRMINGHAM RADIMART SHORT-WAVE SPECIALISTS

Proprietor, G5NI. Manager, G2AK. Staffed by experienced transmitting amateurs. Obviously we can serve you better.

CAUTION: Beware of coilforms, etc., moulded in cheap bakelite. Our coils and formers are guaranteed efficient.

4-PIN interchangeable short-wave coils; set 3. Cover 15-100 metres, latest ribbed former, 7/9. **1 1/2** PIN. ribbed short-wave coil forms; valveholder type, loloss, 4-pin, 1/6. 6-pin, 1/9. Threaded for winding, 2d. extra.

UTILITY 8/6 microdisc dials, fitted famous micro-high reduction, only perfect short-wave dial, 3/11.

SHORT-WAVE H.F. chokes, 9d. *Wireless World* states: "Very efficient—100 to below 10 metres."

UTILITY microvariables 15, 40 mmfd., 1/-; 100 mmfd., 1/3; 465 kc/s litz wound I.F.'s, 5/6.

RADIOPHONE super ceramic insulated short-wave condensers, .00016, 3/6; series cap, 3/9.

CONTINENTAL A.C. valves, 4/6, VMPT, HPT, VM5G, ACSG, ACH, ACHL, PT4. Most American types, A.C. Pen., 5/6.

2 V. types, H.F. detector, L.F., 2/3; LP2, P2, 2/9; Supper, 3/3; YMPT, HPT, 5/6; Class B, 4/6; S.G., VM5G., 5/-.

BARGAIN parcel value 30/-, containing binocular HFC, 4 750 v. test condensers, 6 resistances, 4 valveholders, .0003, .0005 variable, electrolytic condenser, etc., 6/-.

SPECIAL. Set Lissen 3-gang superhet coils, two Lissen I.F.'s, 3-gang superhet condenser; value 63/- for 10/-.

CABINETS. Climax horizontal set and speaker cabinets, 2/11. Vertical, 3/9. Part postage 6d. extra. Ekco chromium set stands, 12/6.

TELESEN 7/6 Ace transformers made for leading company, boxed, 1/11.

BALL-BEARING air-spaced condensers; World's finest manufacturers 4-gang, 3-gang superhet, 1/11.

NON-INDUCTIVE condensers by leading makers, T.C.C., Dubilier, etc., 0.5, 0.25, 0.1, 0.02, 0.005, 3d.

ASTOUNDING offer electrolytic condensers, 4+4 mfd. (separate) 500 v., working, 1/6. 8+8 mfd., 3/6; 8+16 mfd., 3/11.

GENUINE 15/6 Frost potentiometers, wire-wound, tapered, 10,000 ganged to 50,000 ohms, 1/6.

LISSEN 2-gang coils, 12-2,000 metres, switched and screened, nothing else required to convert 8G3 to all-wave, 12/6.

LISSEN 3-gang band-pass superhet coils, 4/6; 3-gang bandpass Tuned grid, 6/11. All with circuits.

AMPLION, 3/6; screened H.F. choke, 1/11; Iron-cored binocular, screened, 2/3. Climax binocular, 1/3. Telsen, 1/11.

UTILITY 2-gang .0005 Uniknob with large disc drive, 3/11. Ditto, single, with disc, 2/3.

LISSEN 30hy., 40 ma., chokes, 2/-; 20hy., 100 ma., 2/11. Lissen eliminator chokes, 1/3.

GRANIC tapered potentiometers 1-meg., 1-meg., with 3-point switch, 2/-. Centralab, 4-meg., 1/6.

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GREENED iron-cored selective dual-range coils, with reaction; circuit diagrams, 2/11.

NON-INDUCTIVE tubulars, 1,500 v. 0.01, 0.02, 0.04, 0.05, 0.1, 6d. 0.2, 0.25, 8d.; 0.5, 9d.

LISSEN 6-way battery leads, with plugs, 6d. Belling-Lee safety mains plug and socket, 6d.

TRANSFORMERS B.T.H. speaker; suit all moving coils, 2/11. Manufacturers push-pull, 1/11.

USES, Telsen 1-amp., 1-amp., 3-amp., 2d. Telsen 100 ma., 2d.

TELESEN latest differentials, .003, 1/3; .00015, 1/-. Radiogrand transformers, 2/9.

SPECIAL. Four assorted Telsen grid-leads, 5d.; twelve various wire-ended resistances, 2/6.

MILLIAMMETERS; flush 2 1/2 in., 5/9; 2 1/2 in., 6/9; all ranges above 25 m.a., visual tuning, 6/9.

T.C.C. etc., bias electrolytics, 50 mfd., 50 v., 1/9; 25 mfd., 25 v., 1/3; 15 mfd., 100 v., 1/-; 6 mfd., 50 v., 6d.

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Orders over 6/- post free. Enquirers must enclose stamp.

Catalogues: general catalogue gives hundreds of bargains; short-wave illustrated catalogue also gives diagram of efficient transmitter and receiver; each 1 1/2d. Pair 3d., post free.

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The largest array of quality radio goods at bargain prices ever. 3d. stamps to-day secures our new bargain sale catalogue, easily the most comprehensive published. Prices throughout the lowest in the country.

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We continue our amazing introductory offer of free valves. To introduce yet further afield our extraordinarily popular range of new 1936 low-priced home construction kits. In themselves absolutely the finest kit values obtainable—but with valves as well at no extra charge. Think twice. You cannot afford to miss such a double bargain. Every kit complete with brand new valves by well-known manufacturer. Every kit includes ready drilled metal chassis and panels, all components of the highest quality, sundries and full diagrams.

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"LITTLE SCOUT" Short-wave Band-Spread III, 25/-, High efficiency 3-valve circuit covering 13-22, 20-55 metres in 2-bands, with full band-spreading. All-wave model (13-2,000 metres), 31/6. Continental Super Three (180-2,000 metres), 15/6.

Short-wave Adapter Band-Spread Kit (13-22, 20-55 metres), 10/6. Superhet S-Wave Converter Kit, 18/6. (Postage on kits, 1/-.)

200 COMPLETE RADIOS AT 25/-!

Powerful 2-valve receivers in attractive bakelite cabinets including loud-speaker. All brand new in original packing by famous manufacturer, with 2 new boxed Mullard valves. Absolutely unrepeatable value. 200 only. Order to-day, cash or C.O.D. (carriage 1/-).

6v. SUPERHET KITS FOR 20/-!

Complete kit for building a magnificent 6v. battery band-pass superheterodyne. Limited offer only, comprising matched set Lissen superhet coils, I.F.'s, 3-gang condenser, illuminated calibrated drive, and all components and sundries, with full diagrams. £5 value for 20/-, by return, cash or C.O.D. (post 1/-).

BARGAINS SAVING YOU 75%

Short-wave Components. Ormond slow motion .0015, .0002; .00025; .00035 mfd., 1/9. Band-spread condensers .000005 mfd., 1/6. .00015 to .0003 reaction. 6d.; 2-band S.W. coil, 13-55 m., 1/10. Switch for same, 5d.

S.W. Plug-in Coils. Eddystone pattern. 4-pin sizes. 13-26, 22-47, 41-94, 76-140 m., 1/10 each; 6-pin ditto, 2/3; 150-325, 250-500, 400-800, 1,000-2,000 4-pin, 2/3; 6-pin, 2/6. Volume controls, 10,000, 20,000, 25,000 ohms, 1 meg., 1/-; 1/4. Ormond disc drives, 1/5. Dual Range Coils (with diagrams) 1in. former, 1/5.

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Every type of valve at new flat rates. All guaranteed regular production 100 per cent. valves, not "seconds" as advertised elsewhere.

5/9 each. British A.C. (4v.). All types from octode to triode.

5/9 each. British A.C./D.C. (13v., 2 amp.). All types. Octodes. Pentodes. Rectifiers.

5/- each. American Triad valves. All types. 2/2 each. British 2v. battery types. Pentodes, 4/11.

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20-22, HIGH STREET, CLAPHAM, S.W.4.
165 & 165A, FLEET STREET, E.C.4.

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(Next Door to Anderson's Hotel)

All goods guaranteed perfect. Set Manufacturers' Surplus. Carriage paid over 5/-; under 5/- postage 6d. extra. I.F.S. and Abroad carriage extra. Orders under 5/- cannot be sent C.O.D. NEW 1936 LIST READY SHORTLY. All Post orders to Clapham.

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PREMIER Super Public Address Amplifier, incorporating the new 6B5 Valve (see "Wireless World," July 15), 10-watt model. All AC, enormous gain, phase inversion, £7 7s. with valves; 20-watt model, £10 10s. Suitable Speakers in stock.

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ACHL, ACL, SC. V. Mu. 1, 3 and 4 watt directly heated Output Pens. H.F. Pen. V. Mu H.F. Pen. 250 volt 60 m.a. Full-wave Rectifiers. All 4/6 each. 20 volt 18 amp. AC/DC types. Screen Grid. V. Mu. H. HL. Power. Pen. All 4/6 each.
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All the following super quality American types.
Hytron Brand, 5/6 each: 1A6, 1C6, 2A5, 2A6, 2A7, 2B7, 6A4, 6A7, 6B7, 6C6, 6F7, 12A5, 19, 24A, 26, 27, 30, 31, 32, 33, 34, 35/51, 36, 37, 38, 39/44, 41, 42, 43, 45, 46, 47, 49, 6D6, 53, 55, 56, 57, 58, 59, 75, 76, 77, 78, 79, 85, 89, 6A6, 83, 5Z3, 25Z5, 12Z3, 1V.

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B.T.H. Truesped Induction type. AC only: 100-250 volts, 30/- DC ditto 42/6. Collaro Gramophone Unit, consisting of AC Motor, 100-250 volts, high quality Pick-up and volume control, 45/-. Collaro Motor only, 30/-. Collaro Universal Gramophone Motor, 100-250 volts, AC-DC, with high quality Pick-up and volume control, 67/6. Collaro Universal Motor only, 49/6. Edison Bell Double Spring Motors, including Turntable and all fittings, 15/-.
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Cosmocord Pick-ups, with arm and volume control, wonderful value, 10/6 each. Cosmocord Pick-up only, fits any gramophone tone arm, 4/6.

SPECIAL OFFER!!! COMPLETE KIT FOR 1 VALVE SHORTWAVE RECEIVER OR ADAPTOR, WITH COILS, CHASSIS AND CIRCUIT. 12/6

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Premier Short Wave Tuning condensers (S.L.F.), complete Ceramic Insulation. Silver Sprayed Brass Vanes. Noiseless Pigtail 0.00016, 0.0001, 2/9 each. Double-spaced, 0.00005, 0.000015, 0.000025, 3/- each. Premier all-brass Short Wave condensers, 0.00015 with integral slow motion, 3/9. British Radiophones, all brass. 2-gang short wave condensers, 0.00015, each section, 5/6 each. Ormond, 0.00025, O.K. for Short Waves, marvellous value, 1/6 each. With slow motion, 2/- each. Ormond, 0.00025, slow motion condensers, all brass, super value, 2/6. Ormond, 0.00025 with special Logging Dial, ideal for band setting, 2/- each. Short Wave Reaction Condensers, all brass, integral Slow Motion, 0.00015, 2/9 each.

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Premier Low Loss, 4- and 6-pin ribbed formers, 1½" diameter, finest quality, 1/- each.

Please note that only the very highest grade Plastic material is used in the manufacture of Premier Short Wave Coils and Formers.

Premier Short Wave Valve Holders, Steatite Insulation, 4-, 5- and 7-pin chassis type, 6d. each. Baseboard, 8d. each. Reliable Morse Keys with Code engraved on Bakelite base, 2/-.
Reliable Short Wave Coils, 4-pin type, 14-150 metres with circuit, 4/- set of 3. Stand-off insulators, 1" 2½d., 1½" 3d., 2" 4½d., 4" 9d.

COILS

Lissen 3-gang Band Pass Screened Coils, complete with switching and blueprint, 6/11. Lissen All-wave 2-gang Screened Coils for Screened Grid Tuned H.F. stage; and Detector, 12 to 2,000 metres. Complete circuit diagram supplied, 12/6. Selective Iron Cored Coils with circuit, 2/11 each. Varley Band Pass Aerial Coils, B.P.7, 2/9.

Special Offer. Set of three Lissen Band Pass Screened Coils with Switching, Utility 3-gang Condenser and Illuminated Disc Drive, 4-valve Chassis and Valve holders and blueprint, 14/6 the lot.

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Coscor 8" Permanent Magnet Speakers, 13/6. Reliable Permanent Magnet Speakers, 10/6. Moving Coil Speakers, all fitted output transformers. Magnavox 254, 7" diameter, 16/6. Magnavox 252, 9" diameter, 22/6. Blue Spot 29 PM 8" diameter, 15/-; without transformer, 12/6. Energised Moving Coil Speakers, all fitted output transformers (unsuitable for battery sets).
Kolster Brandes, 7" diameter, 15/0 or 2,500 ohm fields, 7/9. W.B. 8" diameter, 2,500 ohm field, 9/11. Magnavox DC 154, 7" diameter, 2,500 ohm field, 4 watt, 12/6. Magnavox DC 152 Magna, 9" diameter, 2,500 ohm field, 6 watts, 37/6. B.T.H., 8" diameter, 1,500 or 7,500 ohm fields, 8/6. AC Energised Units for any of the above Speakers, 10/-.
Magnavox, 9" 152, 2,500 ohm, 17/6. Magnavox Magna D.C. 154, 2,500 ohm field, 5 watt, 25/-.
All types P.A. Speakers in stock.

TRANSFORMERS

Premier Mains Transformers have tapped Primaries, and C.T., L.T.'s Engraved Panels, with N.P. Terminals. All windings paper interleaved. Combined H.T.8 and H.T.9, 4v. 1-2a, and 4v. 3-4a., 10/-. Westinghouse Rectifier, 8/6 extra. H.T.10 with 4v. 1-2a. and 4v. 3-4a., 10/-. Westinghouse Rectifier, 9/6 extra. 250+250v. 60 m.a. with 4v. 1-2a., 4v. 2-3a., 4v. 3-4a., 10/-. 300+300v. 60 m.a. with 4v. 1-2a., 4v. 2-3a., 4v. 3-4a., 10/-. 350+350v. 150 m.a., with 4v. 1-2a., 4v. 2-3a., 4v. 3-4a., 12/6. Auto Transformers, tapped, 100v., 110v., 200v., 220v., 240v. Step up or down, 100 watts, 10/-; 50 watts, 7/-. Manufacturer's type Transformers, 350+350v. 120 m.a. with 4v. 1-2a., 4v. 2-3a., 4v. 3-4a., 10/6. 500+500v. 150 m.a. with 4v. 2-3a., 4v. 2-3a., 4v. 2-3a., 4v. 3-4a., 19/6. 500+500v. 200 m.a. with 4v. 2-3a., 4v. 2-3a., 4v. 3-5a. and 5v. 3a. for American Rectifier, 25/-.
Valve Rectifier, 6/6 extra. 1,000+1,000v. 250 m.a. with 4v. 3a., 4v. 3a., 39/6.
Telsen RG4 Super L.F. Transformers (List 12/6), 2/9. High-grade Push-Pull Input Transformers, 4/6 each. High-grade Interval Transformers, 3/6 each. "Voltra" Inter-valve Transformers, 1/9 each. Ferranti A.F.3 Transformers, 8/11. Moving Coil Multi Ratio Output Transformers, 2/6 each. 1-1 or 2-1 Output Transformers, 2/6 each. Microphone Transformers, 50-1 and 100-1, 2/6 each. Telsen, "Class B" Driver Transformers, 2/9. Coscor "Class B" Driver and Output Transformers, 2/6 either type. Standard Telephones, "Class B" Driver Transformer, 1/6.

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BANKRUPT BARGAINS. List free. Brand new sets. Complete and ready to use. Alba Model 21, 3v, H.F. pentode, detector and pentode, M.C. speaker, listed £6/19/6, for 67/6. Coscor S.G. pentode, 3v. D.C., with M.C., 85/-. Amplion 12 gn. A.C. superhets, £7/10/0. Amplion A.C. 21gn. Radiograms, £13/10. Burgoyne Fury, 4v. A.C./D.C., £4/17/6. Fury 4v. A.C./D.C. Radiogram, £9/17/6. Very generous allowances for your old set against. Pilot and Ferguson all-wave sets. Mullard 6v. A.C./D.C. Mu35 superhets and MB3 battery sets, large stock valves, components. Write for quotation. Butlin, 6, Stanford Avenue, Brighton.

"RADIOLAND" OFFERS manufacturers' surplus stock. Brand new D.R. coils, incorporating special reaction for both wave bands, bargain price, 1/6. Also other components too numerous to mention here. Stamp brings free lists.—"Radioland," 10, London Road, Elworth, Sandbach, Cheshire.

G.P.O. SURPLUS CONDENSERS. 2 mfd. 800v. working, 2/3; 4 mfd. ditto, 3/9; 2 mfd. 1,000v. working, 3/3; 4 mfd. ditto, 4/9. Postage 4d. or C.O.D.—De-Ware, 364, Fulham Road, S.W.10.

THE following unused set manufacturers' Surplus; all goods guaranteed perfect; immediate delivery.
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SOUTHERN RADIO Branches at 271-275, High Rd., S Willesden Green, N.W.10; 40, Lisie St., W.C.2. All mail orders to 323, Euston Rd., London, N.W.1.

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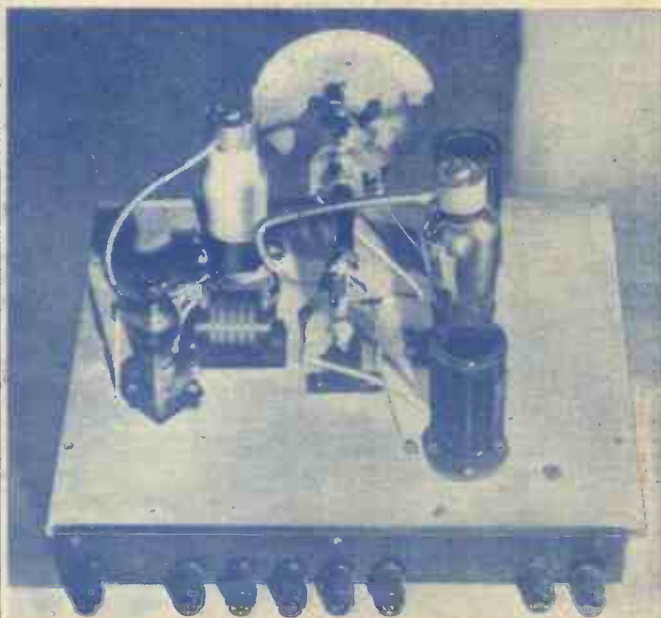
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