Practical and Amateur Wireless, August 1st, 1936.

SOUND RECORDING FOR AMATEURS

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F.J. CAMM

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Vol. 8. No. 202. August 1st, 1936.

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6D.

AT ALL NEWSAGENTS AND BOOKSTALLS

SOME QUALITY CIRCUITS

SEE PAGE 511.

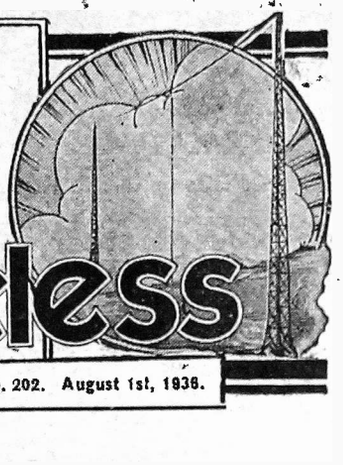


Practical and Amateur Wireless

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. 202. August 1st, 1936.



ROUND *the* WORLD *of* WIRELESS

Radio Life-saving

EXPERIMENTS carried out in Kent have shown that an ultra-short-wave transmitter and receiver will form a valuable link between the pit head and the workings at the bottom of the mine. A wavelength of 4.5 metres was used in the tests, and two-way communication (telephonic) was carried out, the depth of the pit which was used being 2,160ft. It was also found possible to carry out conversations between the shaft bottom and workers situated 2,000ft. away in a remote part of the workings. The apparatus used weighed only 15lb.

Western Transmitter

THE B.B.C. propose to build a new Regional transmitter at Start Point, in Devon, to supply the Western counties. This transmitter will take the place of those now in use at Plymouth and Bournemouth. The present Western Regional transmitter will probably then be retained solely for the Welsh programmes whilst the new station will serve a much greater area than is now covered by the two relay stations just mentioned.

Dublin Interval Signal

DUBLIN is still waiting for its interval signal. It was proposed to use the first nineteen notes of the tune "O'Donnell abu," but when the apparatus arrived it was found that the tune was rather ineffective and, therefore, it has been sent back for lengthening. It is now unlikely that the tune will be on the air for at least another month.

New Detector Systems

ALTHOUGH the present method of detection is a relic from the very earliest days, there are several schemes now incorporated which may be regarded as modern inventions or improvements. From France, however, news now comes of a totally new system of detection, which is claimed to combine all the advantages of present systems and which promises to become standard practice in future designs. An interesting book dealing with another system of detection has also been issued in this country, and gives some interesting details of experiments carried out by a Mr. D'Arcy Ford.

Ulster Radio Show

IN view of the fact that the R.M.A. proposes not to support provincial radio exhibitions the Ulster Radio Wholesalers' Association have called a meeting and have decided to co-operate with other local bodies to organise a radio exhibition. If the resolution is carried the exhibition would probably be held at the Plaza, Belfast, for ten days, commencing September 14th next.

Television In Russia

TELEVISION is progressing in the U.S.S.R. and the Soviet Radio Committee have decided to put up three television transmitters this year, in Moscow, Kiev, and Leningrad, whilst a mobile transmitter is also being built. It is also proposed to put up other transmitters to serve the districts of Khabarovsk, Novosibirsk, Tashkent, and so on. Television receivers are being designed and are to be put on the market, but no details are yet to hand concerning the wavelengths, picture definition, or other important data.

RADIOLYMPIA

AUGUST 26th

TO

SEPTEMBER 5th

OUR STAND No. 10

GROUND FLOOR

SAME STAND—SAME SPOT!

Believe It or Not

AMATEURS in this country are often intrigued by the names given to various American receivers, such as the "Go-Getter," and "Hotter Dog," etc., but a recent magazine from that country describes a Three-stage Tri-Tet Exciter with Regenerative Quadrupling Amplifier using Suppressor-grid Feedback!

Marconi-Ekco Company

THE Marconi Wireless Telegraph Company and Messrs. E. K. Cole, Ltd., are forming a jointly-owned company combining the manufacture and technical and research activities of the two companies for the production of measuring instruments, diathermy and electro-medical apparatus. The company is to be known as Marconi-Ekco Instruments, Ltd., with a nominal capital of £5,000.

Television at Olympia

AT the time of going to press we learn that the R.M.A. are considering the erection of ultra-short-wave aerials at Olympia to enable advantage to be taken of the television transmissions should they commence in time for the Exhibition.

Changes in the Band

CERTAIN contracts terminate this month, and the combination now employed by Henry Hall in his famous band will undergo some changes. Miss Vivienne Brooks is leaving, and the type of programme to be broadcast will undergo a revision. This, no doubt, promises to result in a general improvement in the dance programmes, as well as in the lighter types of broadcast.

Zeesen Short-wave Transmitter

A NEW transmitter is to be opened at Zeesen in order to enable the broadcast of the Olympic Games to be carried out in all possible languages. This new station is claimed to be the largest and best equipped in the world and is now nearing completion.

Bicycle Radio

A LIVERPOOL firm has produced a novel receiver for use on a cycle and the local Watch Committe has placed an order for eighty of these receivers for the use of the police force. Does the policeman wear headphones whilst riding? We cannot imagine a loudspeaker on the machine, and at the same time it would be rather risky riding through traffic whilst wearing headphones, but, no doubt, the makers have made suitable provision, and the apparatus must be very effective in view of the large initial order which has been placed for these machines.

THE PICK of the PROGRAMMES

Coldstream Guards Band

THE Band of His Majesty's Coldstream Guards has been broadcast several times in the Midlands, chiefly as outside broadcasts. On August 4th it will play from a Birmingham studio. The programme is to open with the first broadcast performance of a March, "Stratheden," composed by Lieut. J. Causley Windram, the regiment's Director of Music, who will conduct. The Coldstream Guards have had an enlisted band since about 1783. For a number of years prior to that date it had civilian bands. Notable events in the band's recent history have been a Canadian tour and the fact that it represented British Army bands at the funeral of Marshal Foch.

MAKE THESE DATES WITH YOUR RADIO

Follies" broadcasting from the Arcadian Pavilion, Morecambe, and a variety act from the Winter Gardens.

ROY FOX LISTENS-IN



Roy Fox, the famous band leader, has a Pye All-wave receiver demonstrated to him by Mr. A. G. Waterkamp, manager of the Plymouth branch of Messrs. Godfrey & Co., Ltd., who installed this model in his dressing-room at the Palace Theatre.

Dance and Serenade

JEAN SALDER and his Serenaders, who have had a number of broadcasts this year, are to give a programme on August 5th, entitled "From the Hills." This band is engaged at a Birmingham hotel.

Tony's Red Aces

PAYNE'S Majestic Ballroom is known to everyone who has visited Llandudno. It has accommodated many celebrated dance-band leaders. The present band connected with the Majestic Ballroom is Tony's Red Aces, who will broadcast on August 1st. This band made its début on the air from the Midland Regional in November, 1934, and since then it has broadcast over one hundred times.

Morecambe on the Air

ON August 6th Mark Sheridan's "1936 Frolics" will broadcast twice from the Palace Theatre, Morecambe, once in the afternoon in the main Regional programme, and again in the evening as part of a special "Morecambe Night's Entertainment" for Northern listeners only. The latter programme will include the "Arcadian

Four Years of Broadcasting

ON August 2nd, in the North Regional programme, the orchestra of the New Victoria Cinema, Bradford, under the direction of Sydney Phasey, completes four years of regular weekly broadcasts. Mr. Phasey's team will continue to broadcast this season. It is interesting to recall that the director made his début at the age of fourteen by playing violin solos at the Metropolitan Temple in New York.

SOLVE THIS!

PROBLEM No. 202.

Walton's superhet stopped functioning and although he suspected that the frequency-changing valve was not oscillating, he found that this valve showed continuity across its filament pins and passed anode current. What easy method could he have adopted to find whether the valve was oscillating? 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. 202 in the left-hand corner and must be posted to reach this office not later than the first post Tuesday, August 4th, 1936.

Solution to Problem No. 201.

320 ohms is the resistance specified by the manufacturers for the 41 M.P., but when two of these valves are used in push-pull, the value of the common bias resistance must be halved, as the current taken by the two valves is passed through it.

The following three readers successfully solved Problem No. 200, and books are accordingly being forwarded to them: M. B. Ember, 6, Clifton Bldgs., London, E.2; J. D. Morris, 17, Lynton Rd., Heaton Moor, Stockport; J. Harris, 635, Beanwood Rd. Beanwood, Birmingham.

Dance Band from Malvern

ON August 8th, in the Midland Regional programme, Billy Gammon and his Star Players, who are having their second summer at the Winter Gardens, Malvern, will be heard playing from the Festival Club there. This combination has had resident winter engagements at Cheltenham Spa since 1934.

Western Salon

THE second concert in the series "Western Salon" will be broadcast from the orchestral studio at Bristol before an audience on August 5th, when the artists will be the Bristol Chamber Music Players, who are Joan Allen (violin), Madeline Jacobi (viola), Olive Woodington (violoncello), and Winifred Davey (pianoforte), and they have taken the name of "Players" so that the combination can be augmented to a quintet or sextet if desired.

Variety from Hanley

STEFFANI'S Sixteen Singing Scholars are the principal item in the Midland Regional programme on August 4th, in a variety bill from the Theatre Royal, Hanley.

Evelyn Hardy and her Ladies' Band

THIS well-known all-ladies band will broadcast from the Manor Gardens, Exmouth, on August 3rd. The band broadcast last year from Crewkerne, and listeners have also heard it from Minehead.

An Ex-Cowboy's Experiences

IN the Midland Regional programme on August 4th, in the "Seeing Life" series of talks, B. K. Vallings is to relate his experiences as a cowboy and packer in Western Canada. Mr. Vallings, who is now in charge of the Shropshire campaign against the musk rat, has broadcast entertaining stories of rodeo in the West.

R.U.C. Band

THE Band of the Royal Ulster Constabulary, which is to broadcast on August 6th by permission of R. D. Harrison, O.B.E., Commissioner of Police, will be under the directorship of District Inspector George C. Ferguson. The band consists of thirty-six players recruited mainly from military bands, and representing twenty-eight separate battalions. The band may frequently be heard in the public parks in Belfast; it plays at many official functions and has broadcast on several occasions in the Northern Ireland programmes. The programme includes the "Ballet Egyptien," by Luigini, melodies from "Patience," and Allegro marziale (Nautical Moments), by Winter. There will be a baritone soloist, William J. Breakey, and Constable J. Orr and E. McKenna will play a duet for piccolo and clarinet.

Symphony Concert

H. FOSTER CLARK will conduct the B.B.C. Midland Orchestra in a Symphony Concert on August 7th. The works to be given are Symphony No. 29, in A, by Mozart, and "Job," a masque for dancing in nine scenes by Dr. Vaughan-Williams.

Building the "Magic Hand"

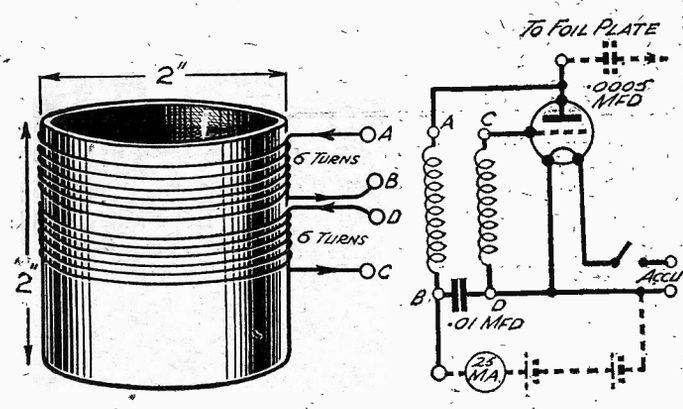
The Device Described in this Article Enables Distant Apparatus to be Controlled by "A Wave of the Hand." It is well within the Abilities of the Amateur Constructor.

By W. H. CAZALY

WHEN a valve is set in oscillation, its anode current changes. For instance, if a valve in a quiescent state passed 4 mA., putting it into violent oscillation by coupling tuned grid and anode coils may cause it to pass double or treble this current, say, 9 or 12 mA.

This current change is used in the device to be described. In the anode circuit of an oscillating valve is placed a relay that makes or breaks a following circuit according to whether 4 mA. or 10 mA. is passing through. This change of current is caused by affecting the valve's oscillation intensity by means of hand-capacity—well known as the bug-bear of ill-designed short-wave receivers.

It thus becomes possible to operate the relay, and hence any distant piece of apparatus connected with it, simply by approaching or withdrawing one's hand to or from a sensitive part of the oscillating valve unit. This sensitive part may be connected by a thin, unobtrusive wire to a concealed foil plate that provides the capacity effect, and the oscillating unit itself may be concealed, so that the whole business becomes very mystifying to anybody not "in the know." This is the principle upon which the apparatus works.



Figs. 1 and 2.—Details of the coil, and the circuit which is employed.

Constructing the Coils

The valve unit is made to oscillate at a high frequency, in the region of 40 metres wavelength. This is so that any hand-capacity effects become much more marked than they would be at a lower frequency: the susceptibility of short-wave receivers to hand-capacity is notorious but in this case useful.

The grid and anode coils consist of six turns each of 22-gauge enamelled wire on a 2in. diameter former, the turns being slightly spaced and the coils close alongside one another. Fig. 1 will make this clear. If one of those old 6-pin formers and its base holder are available, they will do excellently.

The other components needed are a non-inductive condenser of about .01 mfd., an on-off switch and a few terminals. They, and the coils and valve holder (4-pin) are mounted on a suitable baseboard and wired up as shown in Fig. 2.

This completes the oscillating unit. Preliminary adjustments are made by connecting a 25 mA. meter and H.T. battery in the anode circuit, as shown by the dotted lines, and switching on. About 100 volts H.T. will be needed. If the valve—it may be almost any 2 volt H.F. or detector type valve—is oscillating properly, some 10 or 12 milliamps of current will be passed. The coupling between the grid and anode coils should be adjusted, by carefully closing up or opening out the turns on one of the coils, until about this value of current is being passed. The adjustment could be done by adding preset condensers, of .0001 maximum capacity, one across each coil, and adjusting them by means of their screws, but the self-capacity of the coils is really sufficient, if care is taken over adjusting the turns spacing.

It will be noted, while making these adjustments, that as soon as either the grid of the anode of the valve is touched, or even if the hand is brought close to the coils, the anode current changes, since the intensity of oscillation is altered. This is exactly the effect we are aiming at. When left to itself, with nothing of a conducting nature within three feet of it, the unit should pass about 10 mA. When the grid or anode is touched, the current should drop to about 4 mA. Various anode voltages should be tried, between 120 and 80 volts, until the most sensitive arrangement is found. It is the *change* of current that matters: it is better to drop from 10 mA. to 4 mA., which is a change of 6 mA., than from 20 mA. to 17 mA., which is a change of only 3 mA., or from 6 mA. to 4 mA., which is a change of only 2 mA.

The Relay

The relay is made out of an electric bell, which may be second-hand, if it is a good one. Cheap and nasty bells will not do, because their make-and-break contacts are usually of inferior metal merely plated with a resistant metal which is quickly burnt off in use, or is removed when attempts are made to clean these points.

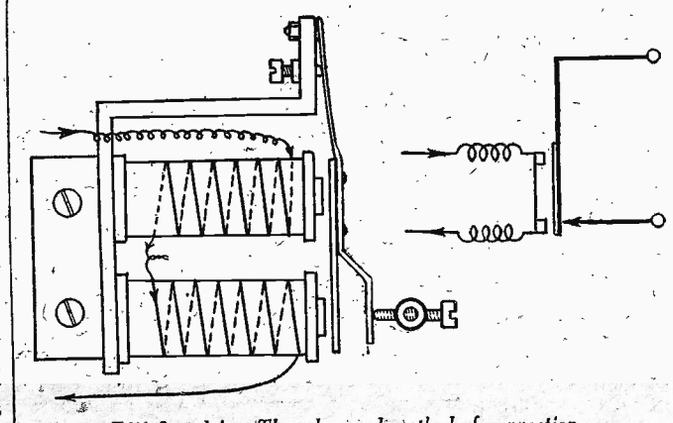
The clapper is cut off short at the armature and the gong removed, as if the bell were going to be used as a buzzer. Then the bobbins are removed, the wire taken off, and 40-gauge enamelled wire wound on in its place, completely filling the bobbins. This is easily done with a hand drill or one of the simple winding gadgets that have been described from time to time in this journal. Care must be taken when joining the wires of the two bobbins that the sense of the windings is correct, otherwise the magnetism of the pole pieces will be incorrect. The direction of the windings is shown in Fig. 3, and the connections in Fig. 4.

Adjustments

When the oscillating unit and the relay have been constructed, they should be mounted together on a baseboard and linked up in accordance with the diagram in Fig. 5. The insulating condenser, non-inductive and of .0005 mfd. capacity, is mounted close to the valve anode and connected to it, and from the other side of this condenser a 12ft. length of 36 gauge enamelled wire is taken; the end of this wire is soldered to a plate of tin or copper foil. This plate is 3in. square. It can be placed anywhere out of the way, as long as it and the wire do not lie close to metal objects such as tools, pipes or iron work.

Now the oscillator is switched on. There should be about 10 mA passing through the relay magnetising coils; it may be necessary to plug in at 120 volts in the H.T. battery instead of at 100 volts in order to overcome the resistance of the relay coils. This should be enough to pull the armature to the pole pieces,

(*Continued overleaf*)



Figs. 3 and 4.—The relay and method of connection.

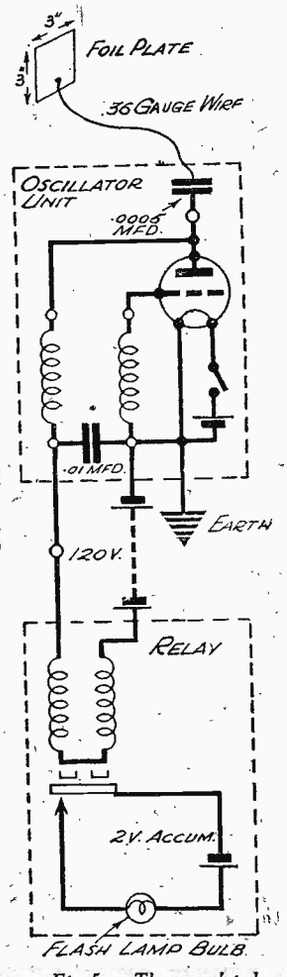


Fig. 5.—The completed apparatus.

BUILDING THE "MAGIC HAND"

(*Continued from previous page*)

thus breaking the circuit that lights the flash-lamp bulb. As soon as the foil square is touched, the armature should be released from the pole pieces, flying back and closing the flash-lamp bulb circuit so that it lights up. If this action does not take place properly, first try different tappings on the H.T. battery, and then carefully adjust the armature spring and the screw contact point against which it presses. It is sometimes a help to stick very thin paper—cigarette paper—over the ends of the pole pieces, so that the armature is only held very lightly with the 10 mA. passing, and quickly released when the current falls. This also prevents any residual magnetism in the poles or armature causing it to stick. These adjustments are carried out until it is sufficient only to bring the hand within half an inch of the foil square to make the armature fly back and close the light circuit.

It may be found that even when the action seems to be quite in order the flash-lamp bulb does not light up properly. This is due to poor contacts in the relay. They should be very gently cleaned with methylated spirit on a piece of card to remove grease and then *very* lightly rubbed with the finest of emery cloth.

Using the Relay

Having succeeded satisfactorily in switching on and off a flash-lamp bulb, many other amusing and mystifying effects can be produced with ingenious devices operated by the relay. The author had one of these hand-capacity relays working for weeks in a shop window, using an eliminator instead of a H.T. battery for economy sake.

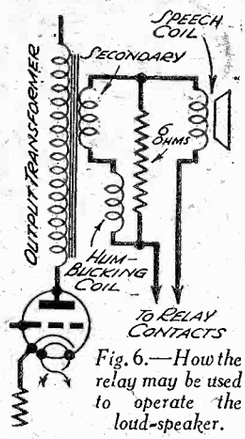


Fig. 6.—How the relay may be used to operate the loud-speaker.

The oscillator and relay were concealed behind show receivers and showcards and the wire and foil plate were taken behind side curtains to a cardboard "hand" stuck on the inside of the plate glass window. This "hand" consisted of two pieces of card stuck together with the foil between them. Passers-by were invited, by a notice above the "hand," to place their own hands over this "hand," outside the glass—and to listen. When they did this, a powerful mains receiver standing in the doorway abruptly emitted whatever programme it was tuned to. When the startled people removed their hands, it stopped, and mystification was complete.

This effect was obtained by making the relay close the speech-coil circuit in the mains receiver's loud-speaker, connections being made as shown in Fig. 6. The receiver was switched on all the time, so that it was unnecessary to wait for the valves to warm up, and the 6-ohm resistance was placed across the output transformer to provide a load to avoid damage to the receiver.

It should be noted that where the foil is to be mounted behind a shop window, and perhaps to be obscured by cardboard or other cut-outs between it and the glass, the capacity between the foil and the body of the operator will be considerably reduced, and therefore the initial adjustments should be carried out by providing a similar capacity change, rather than by actually touching the grid or anode. Such tests will avoid the possibility of failure when the apparatus is finally installed under the above conditions.

Strings of "fairy" lights, moving signs, working models driven by electric motors, gramophones, hooters, all sorts of apparatus of an amusing or useful kind can thus be operated simply by passing a hand across the foil square.

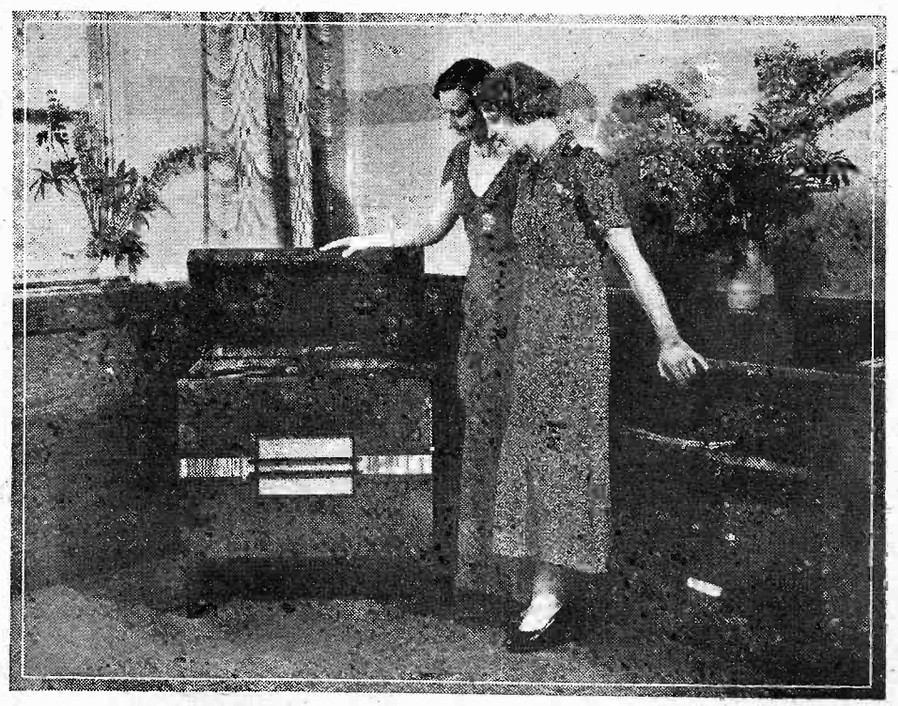
THE NEW FERRANTI "ARCADIA" RADIOGRAM

A New de-Luxe Superhet Radiogram Designed to Cover All Wavelengths and some Details of the New Magnascopic Dial

THE new season's Ferranti receivers possess some novel features, and the accompanying illustration shows the Arcadia radiogram which employs a superhet circuit covering the short waves in addition to the normal broadcast waves, and is fitted with a variable selectivity device. The superhet is of the 8-stage type and covers the short waveband from 19 to 51 metres, and the variable selectivity circuit which is fitted is of a patented type in which a self-resetting device is included, and this makes it impossible to retune the receiver except in its most selective state. As most amateurs are probably aware, the selectivity of a superhet may be varied by several methods, one of which is to modify the coupling between the primary and secondary windings of the intermediate-frequency transformers. If the coupling is increased so as to give maximum selectivity there would be a danger of forgetting that the adjustment had been made, and upon searching for a weak station it would be found impossible to pick it up until the coupling was increased. This renders it difficult to use such a receiver unless the user is fully aware all the time of the various changes which are made. The Ferranti device overcomes this defect and provides the listener with a fool-proof adjustment which may always provide maximum results, no matter in what direction they are required.

The Magnascopic Dial

A further new feature which is introduced in the new receivers, and which is intended to simplify tuning on the short waves, is in the form of a small additional dial situated above the main tuning dial. The effect of this new scale is to increase the length of the normal tuning dial to over 6ft., and this is carried out by an interesting system of mirrors and lenses. Attached to the main condenser spindle is a transparent semi-circular scale of about the same size as the old-type tuning scale, and this is engraved with the wavelengths which are shown on the normal tuning dial and which range from 19 to 51 metres. The usual sub-divisions are, of course, included. The normal dial-illuminating lamp is so placed that its rays are concentrated by a lens on to the additional scale, and they pass through this and through a further lens on to a mirror inclined at 45° to the horizontal. This mirror is, of course, immediately in front of the tuning condenser and it directs the reflection of the dial in an upward direction, where it strikes another mirror arranged at a similar angle which directs the reflection in a forward direction so that it strikes an opal screen immediately behind the additional aperture. Upon this the settings of the dial are then seen in a greatly magnified form, and thus one of the great bugbears of short-wave tuning is removed. This device is now fitted to all of the Ferranti superhets.



The 26-guinea Arcadia All-Wave A.C. Variable Selectivity High-Fidelity Radiogram.

Experiments in Unified Control

Various Components Which Form an Essential Part of the Modern Radio Receiver may be Linked Together to Reduce the Number of Controls. Some Suggestions are Given Here

By W. J. DELANEY

THE ganged condenser is now familiar to every listener, and it is common knowledge that the separate sections of this component are employed for tuning two or more separate coils. The actual process of tuning these separate circuits is a rather complicated one, especially when a superheterodyne receiver is considered, and the degree of variation at different parts of the tuning dial has to follow a complicated law. That the difficulty is not insurmountable is obvious from the fact that every modern superhet employs a ganged tuner, and in some receivers there are no fewer than four separate coils so controlled, each circuit varying throughout the scale. For the benefit of those readers who do not know how this process is carried out, it may be briefly stated that the end plate in each ordinary section of the condenser is split into a number of separate sections and these separate sections are individually adjusted by the manufacturers to provide the required difference at various wavelengths, whilst the condenser which tunes the oscillator section has the plates of a different shape, or the condenser for this particular purpose is used in conjunction with other condensers (fixed) to provide the required capacity variation.

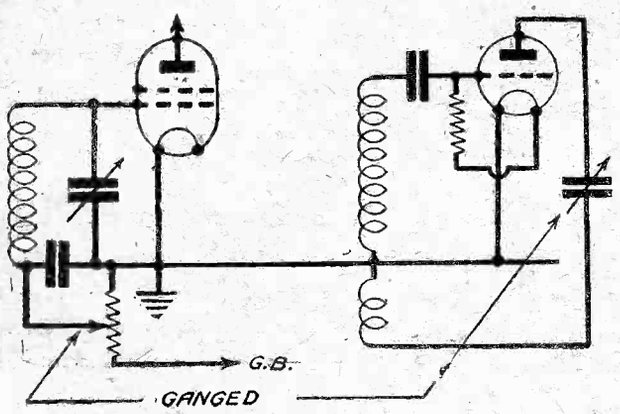


Fig. 1—A circuit which has been tested and proved—The combination of an H.F. volume control and a reaction condenser.

Reaction Circuits

The normal tuned-grid circuits are not the only ones to which this device may be applied, although, owing to the difference in coils and circuits, it is not possible to purchase ready-made dual controls. When a standard broadcast receiver is examined, however, it will be found that there are several separate controls which may easily be removed if only some simple way of linking them with another control can be found. I am leaving out, for the purpose of this article, such items as ganged switches for radio and gram. change-over, and ganged on/off switches and volume controls, as these are now well known. The following details will, however, form the basis for experimental work by the keen amateur who is anxious to develop a receiver of a type which cannot be purchased, and it will be seen later that some very interesting tests may be carried out in an endeavour to remove one or more controls.

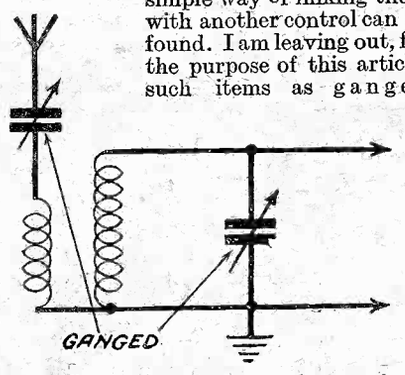


Fig. 2.—The aerial condenser may be ganged with the tuning condenser.

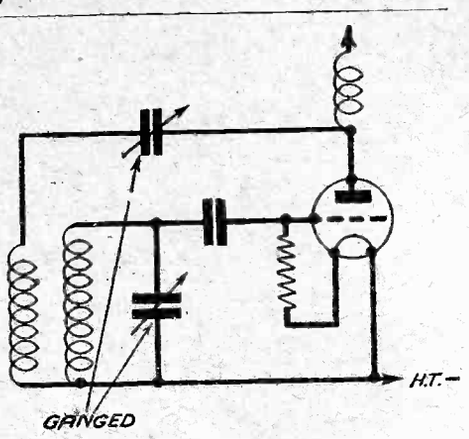


Fig. 4.—A reaction condenser ganged with the tuning condenser.

Dealing first with the reaction circuit as used in the normal grid-leak detector stage, it will be found in practically every receiver that as the wavelength to which the grid circuit is tuned is increased, so must more reaction be employed. That is to say, if the circuit is tuned to 200 metres and the reaction control advanced until the receiver is just off the oscillation point, upon tuning the circuit to 300 metres it will be found that the reaction control may be advanced a few degrees further before oscillation takes place. Thus, when searching for a station with the set in the position of maximum sensitivity, it is normally necessary to adjust both tuning and reaction controls together throughout the entire wave range.

Dual Resistances

A normal reaction condenser may be linked with a tuning condenser so as to provide this position of maximum sensitivity as a constant factor from minimum to maximum wavelength, but there are other more interesting methods of carrying out the same effect, as it will probably be found that with the correct capacity of reaction condenser the required coupling cannot easily be obtained.

Two-section resistances (or volume controls) are already on the market and are obtainable in various values. By adopting

(Continued overleaf)

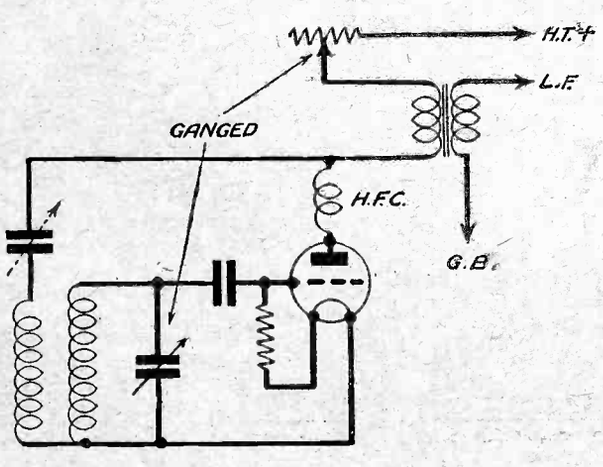


Fig. 3 (left). —In this circuit the reaction is pre-set by means of the condenser, and the H.T. feed is varied in conjunction with the tuning condenser.

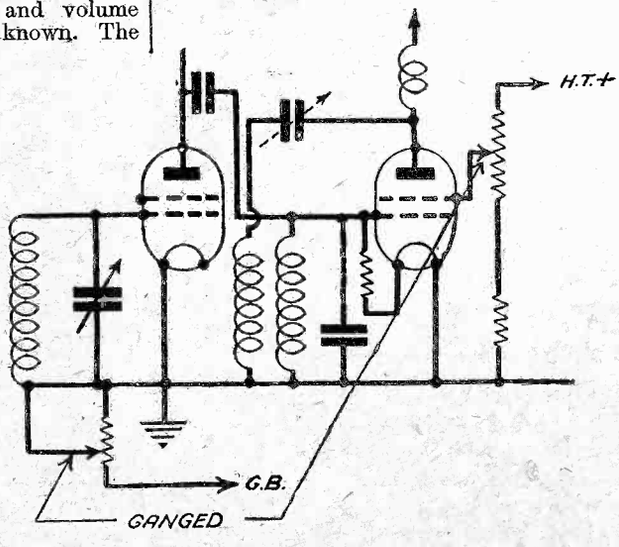


Fig. 5 (right). Resistance controlled reaction and H.F. volume control—a modification of Fig. 1.

EXPERIMENTS IN UNIFIED CONTROL

(*Continued from previous page*)

a resistance to control reaction a dual-purpose unit may be employed in a circuit of the type shown in Fig. 5, the remaining section of this unit being then employed for the variable-mu grid-bias control in the H.F. stage. Other methods of using the resistance for the control of reaction are shown in Figs. 3 and 6, and in these the resistance may be ganged with the tuning condenser, provided that suitable components are chosen.

A Novel Arrangement

In Fig. 6 a novel arrangement is shown in which the control of reaction is carried out by means of a resistance and this is ganged with the tuning control, the degree of reaction being governed by the H.T., the size of the reaction condenser and its relation to the grid winding. The fixed condenser is inserted to prevent a short-circuit of the H.T. battery. The combination of the normal reaction condenser with a resistance to vary the H.F. grid bias has already been dealt with, and a dual unit for this purpose was employed in our Three Star Nicore, although, unfortunately, the dual component is no longer on the market.

The Aerial Input

The degree of damping which is exercised by the aerial-earth system varies according to the wavelength to which the circuit is tuned, and it will be found that by including a variable condenser in the aerial circuit, maximum results may be obtained at every wavelength if the condenser is suitably adjusted. Thus this condenser may be ganged with the tuning condenser, although in this case it will be found that as the capacity of the tuning condenser is increased the capacity of the aerial condenser must be decreased, and thus the two components must be linked together with care.

In all of the schemes just outlined, experimental work is called for and no exact values can be given, as they will vary for each individual circuit. Furthermore, in some cases it may not be found possible to obtain suitable components which may readily be converted for use in the dual arrangement, chiefly owing to the fact that components with double-ended spindles are not now generally manufactured. Certain short-wave tuning condensers are obtainable with spindles at each end and may be employed for reaction purposes, and Messrs. Varley manufacture variable resistances with a lengthened spindle for ganging purposes. In other types of volume control it will generally be found that by removing the end cover the spindle may be found accessible, and in most cases provision will have been made by the manufacturers for the attachment of a switch, and this will enable the experimenter to carry out one or other of the above schemes. Coupling units are available from several firms, and in general are designed for two ¼in. spindles and thus are not readily adaptable to every case. A little thought will, however, enable some device to be constructed to enable the ideas which have been given to be enlarged upon or tried out and will undoubtedly provide some hours of interesting experimental work.

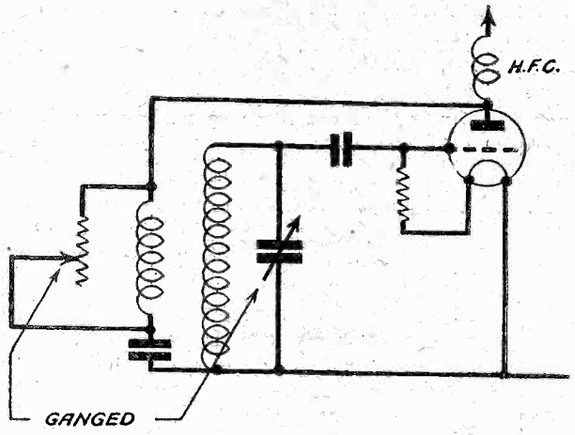


Fig. 6.—Another form of resistance-controlled reaction which may be operated with the tuning condenser.

FROM THE LISTENING POST

CONDITIONS, unfortunately, during the past fortnight have not shown much improvement over the previous period, and atmospherics due to the numerous storms which have been raging over the continent of Europe have not made DX listening too pleasant. However, when fair spells have prevailed following the disturbances, the ether has been kinder on certain wavebands, and usually in the earlier hours of the night it has been possible to tune in distant transmissions without experiencing too disturbing a background.

On these occasions channels between 16 and 30 metres have been, by far, the best, and it is on this somewhat restricted band that most stations have been logged before midnight. In the early hours of the morning it is fairly safe to turn to wavelengths above 40 metres, and on some days interesting captures were made.

Sydney (N.S.W.)

For the months of July and August slight alterations have been made in the time-table of VK2ME, Sydney (N.S.W.), and you would do well to make a note of them. Broadcasts now take place between B.S.T. 06.00-08.00; 10.30-14.30; and from 17.30-19.30 every Sunday. In my case it is the first of these only which is well heard, although occasionally the last transmission has provided signals loud enough to permit identification, but of no programme value.

From Paris comes the news that a powerful short-wave station has been erected at Homs, which is situated to the north-west of Beyrouth in the French Levant, and that we may shortly hear tests of speech and music. So far, excluding the Beyrouth-Khaldé commercial stations, I have not been able to trace any transmitter in official lists destined to the broadcast of radio programmes from this region.

Zeesen

Listeners who have opportunities of turning to their short-wave receivers in the morning hours will find that two of the most powerful transmissions on the ether are those provided by the Zeesen stations DJQ (19.63 m.-15,280 kc/s) and DJB, (19.74 m.-15,200 kc/s). They may be heard at excellent loud-speaker strength from the moment they come on the air at B.S.T. 09.55 until they close down at B.S.T. 14.00. During these broadcasts which are mainly intended for Southern Asia, some excellent concerts are given. A relay of the same programme is also carried out by DJN on 31.45 m. (9,540 kc/s). Later, from B.S.T. 14.05 until 17.00, DJE on 16.89 m. (11,760 kc/s) joins in with DJA on 31.38 m. (95.60 kc/s), and a kind of "Letter Box" with verbal replies to correspondents through the mike, to listeners in the Far East, is one of the regular features of the programme. The German announcer must be congratulated on his remarkable knowledge of the English language.

RECORD MAKING.



Artur Schnabel and the B.B.C. Symphony Orchestra, conducted by Adrian Boult, are here seen making records in the His Master's Voice Studios.

On Your Wavelength

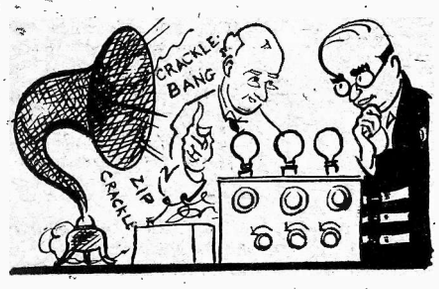
By Thermion

Bad News for Crooners

I EXTRACT the following from the dignified columns of the *Children's Newspaper* :—

"These miserable crooners, and all the people who make the air hideous with crude and barbarous noises, are in danger; there is a Daniel coming to judgment at Broadcasting House.

"He is Dr. R. S. Thatcher, Harrow's Director of Music, who has resigned his distinguished post there to become



Dust on the aerial.

Deputy Director of Music to the B.B.C.

"Many fine musicians are already in the service of broadcasting, but they pitilessly deliver us for long spells each day and evening to performances which, if attempted in the streets a few years ago, might have brought the perpetrators to the police court as public nuisances. For the modern style is exactly that of the begging street-singer, gobbling, scooping, out of tune, incapable of phrasing or of voice production.

"If any school child sang as these crooners do, howling, moaning, whining, mispronouncing words, affecting a horrible twang, offending every canon observed by teachers of music, the child would be forbidden to sing at all; *yet the lowest depths of vocal degradation find sanctuary in the B.B.C. studios.*

"But our spirits rise. Dr. Thatcher has as profound a loathing of these atrocities as we have, and has expressed himself in such terms as should suggest to B.B.C. crooners, 'All hope abandon, ye who enter here.'"

We shall see exactly to what effect Dr. Thatcher operates. I have said all I want to say about crooners and I would not dream of repeating that I think they are crazy, half-witted, tintinnabulating, ululatory sob-voiced nitwits, and like a flock of third-rate sheep. Nor shall I repeat what I think of those who employ them. Watch any smug-faced crooner smiling as he delivers his tosh—probably laughing up his sleeve at the public who can applaud such drivel.

American Sets

I HAVE received a further letter on this subject from J. W. L., of Llandudno :—

"What I have heard and read about 'American Sets' is that their performance and selectivity is amazing. Just to show, here is a cutting about the selectivity of a well-known American receiver: '. . . here in Chicago it can separate two of the world's most powerful broadcasting stations, namely, WGN Chicago, 50,000 watts, and WLW Cincinnati, 500,000 watts, and bring in WOR Newark, 50,000 watts, with no interference from WGN or WLW. No other receiver in the world offers a higher degree of selectivity. . . .'

"Now the questions I have been asked are :—

"'Why don't we in England make sets with 24 to 36 valves?'

"'Why don't we have amazing selectivity?'

"'Why don't we in our sets have an output of 35 to 50 watts?'

"Well, my answer is, British radio engineers can do this, but the listener in this country does not want to pay big prices for his entertainment, and not mentioning the amount of electricity such sets will consume.

"Perhaps, dear Thermion, you could plonk a few words in your article sometime about these 'American Sets,' and perhaps more will 'Buy British,' or should I say, '*Construct British*' 'P. and A.' Sets."

This reader hits the nail on the head. The American public differs from the English. Our race was old before theirs was born, and their tastes are where ours were 500 years ago. They like aborigine music; they like to exalt Harlem; their tastes are simple and easily satisfied; what suits America does not suit England. Fortunately, there are a few intelligent Englishmen left who know what's what.

Black Magic

WAY back in the dim dark ages of 1922 a friend of mine, who was considered quite a Marconi in his district, persisted that the crackles and spits which we now call atmospherics were due to tiny particles of dust bombarding the aerial. His friends sat round, mouths aghast, eyes agog, nostrils distended, ears quivering, and goggled at him. Sounds ridiculous, farcical, laughable, side-splitting, ludicrous theory, don't you think? Or don't you? It will be interesting to know what this same expert says about atmospherics to-day. We shall be laughing in ten years' time at much of what is considered sound practice to-day. The theory of the ether has never satisfied me, although it happens to fit in. I am not at all sure about the skip effect and fading. I can't contradict because I have not a better theory. I don't like to believe that the earth is round, although everything indicates that it is. Still, we like to look back on these queer notions as part of the good old days.



Crystals on velvet.

The Good Old Days

AND talking of good old days, do you remember the colossal prices we were asked to pay for components? Cardboard tubes with 16 S.W.G. wound on, 17s. 6d., earphones £2 2s. a pair, crystals anything up to 5s. 6d. Can you recall the smashing advertisement for these latter? Crystals in boxes, crystals so valuable that they reposed on velvet; crystals in caskets, crystals on velvet cushions. Special

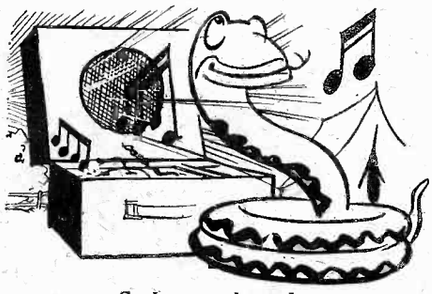
cat whiskers made of gold wire at 3s. 9d. per inch. What a pedigree they all had. Experience and expense are almost synonymous terms, and once you have gained experience you find it difficult to give away.

Great Snakes

ONE of the technical boys on this paper is a camping fiend, and took out the Midge Portable with him the other week-end. He rigged up the tent, turned on the radio, spread the cloth, and proceeded to kill the fatted calf, only to discover that he had not any milk (that wouldn't worry me, I prefer a corkscrew). On returning from the farm he found an adder sitting comfortably but inquisitively by the radio listening to some silky-voiced crooner. Snakes, as everyone knows, can be charmed with music, so this seems to be a compliment to the Midge only. Needless to say, great dubiety exists amongst the staff as to whether their colleague had really gone for milk.

Too-too Modern Sets

FOR my sins the other day I had to go to tea with some of my relations, who proudly exposed their new radio set to my view. They said it was "just too modern, don't you think?" I *did* think, and



Snakes are charmed.

to save further argument I simply said "Yes." It was a modernist's nightmare—constructed in almost white wood with bands of chromium plate sprinkled at angles. As the rest of their furniture was mahogany of the 1912 vintage, the combined effect was not too-too harmonious. It's this sort of thing that gets radio a bad name.

It is an unwritten law in the furnishing trades that you should not mix your woods, and nothing is more bizarre than bird's-eye maple in contiguity with walnut, mahogany, and oak. A radio set should be chosen to tone with the rest of the furniture as far as the colour is concerned, although it is practically impossible to select the receiver to match the *style*. Very few manufacturers are making receivers which will blend with a Jacobean, Tudor or Queen Anne style.



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Ultra-S.W. Reception

THE receiver section used for reception of pictures in the television apparatus must be capable of passing a very wide band of frequencies, and therefore the intermediate-frequency amplifier must be specially designed for this purpose—it must be tuned to a much higher frequency than the normal amplifier used in broadcast receivers. The sound accompaniment of the picture can be picked up without using this special high-frequency I.F. amplifier, however, and if a frequency-changing valve can be obtained that will function satisfactorily on wavelengths between 5 and 9 metres the intermediate-frequency amplifier normally associated with sound receivers may be used.

U.S. Converter

AS in the case of 12 to 60-metre reception, a converter may be used, coupled to the medium-long-wave receiver and thereby forming an ultra-short-wave superhet. A converter of this type must be very carefully constructed, however; the frequency-changing valve must be carefully chosen, and the leads to the tuning condenser and coil must be kept very short—it is advisable to mount the coil on the condenser. Some frequency-changers will not function below about 15 metres, and when they are used in ultra-short-wave sets a triode valve has to be employed in conjunction with them in order to ensure efficient frequency-changing. Mains valves are generally more efficient than their battery counterparts and satisfactory results can be obtained without the additional triode if a modern mains changer is employed.

Correct Ganging

IT is often found that accurate ganging at all points on the tuning scale cannot be obtained when cheap coils of doubtful make are used. This is generally due to the coils not having the same inductance, and the addition of a few turns to a canned coil is usually a somewhat difficult task. The best method of overcoming a defect of this type is to fit a small variable trimmer condenser across the aerial tuning condenser—the fixed vanes of the trimmer to the fixed vanes of the tuning condenser and the moving vanes of the former to the moving vanes of the latter. This extra condenser can be mounted on the chassis with its spindle protruding through the front panel so that it can be operated in conjunction with the main tuning control. An alternative method is to substitute a tuning drive having a variable concentric trimmer attached for the straight drive in use. This type of drive-trimmer combination is very useful when it is particularly desired not to interfere with the disposition of the controls already in use. The use of an extra trimmer is sometimes advantageous even when reasonably well matched coils are employed, as operation of the extra condenser often helps to cut out an interfering station either by bringing the two tuned circuits exactly into step, or, in some cases, by slightly detuning the circuit to which the trimmer is attached.

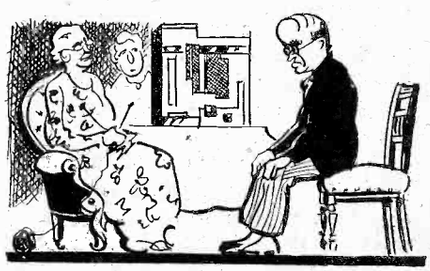
Of course, the bright young things who like to furnish in the ultra-modern style have no difficulty at all. They can select a set of almost surrealist appearance, such is the crazy tendency of modern times. If you can't sing you can make money as a crooner, if you can't draw you make a few daubs reminiscent of a child's first efforts with a box of crayons and become a surrealist, and my readers may retort if you cannot write you become a radio journalist. I thought I would make this crack myself to save my splenetic correspondents from doing so.

Cycle Radio

THIS from E. R. (Royston):—

"I'm very interested in the subject of cycle-radio, and I intend to try it myself. The idea of mounting the set on the handlebars is feasible, but has Mr. E. Hurran (his letter was published in a recent issue of PRACTICAL AND AMATEUR WIRELESS) found a loss in the leads to the accumulator? I should think that there is a loss which caused a good reduction of signal strength.

"Now about the suggested 'Readers' League.' I am, as are thousands more, interested in wireless as a hobby; it would be a very fine idea and should be launched as soon as possible. There is no club round here, and that's where a league would



Too-too modern set.

come in. We could swop experiences and ideas, and thus gain some first-class knowledge of an interesting subject.

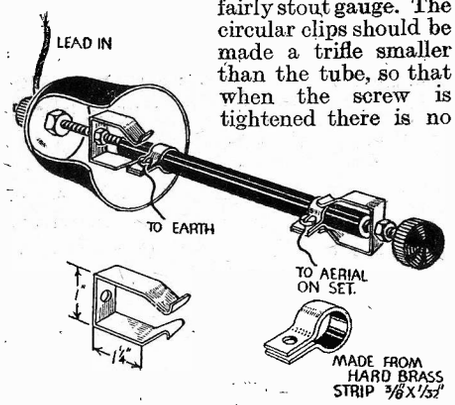
"I agree with E. A. Elliott (Hertford), and think that you should be 'president' of the league. But what's it matter about a badge for you? Crooners give me a pain in the neck and they ought to be punished by making them stick a few hours of 'crooning.' Are we becoming Americanised in jazz now? One of our leading dance band leaders went to U.S.A. and came back with awful tunes, which are the craze of America. Good old Thermion, keep at 'em. Well, here's the best of luck to PRACTICAL AND AMATEUR WIRELESS, and may you live many more years to entertain us with your views on wireless and radio entertainment."

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

Combined Lead-in and Earthing Switch

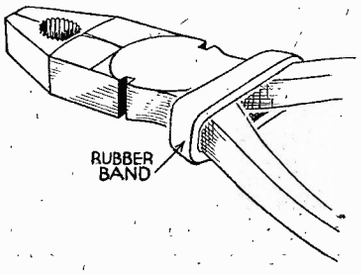
THE accompanying sketch shows how the conventional type of ebonite lead-in tube can be readily modified to form an efficient earthing switch by means of which the aerial is disconnected from the set and earthed without having to go outside the house. The device has the advantage of maintaining its insulation in the wettest weather. The ebonite tube is cut to the length required and two of each of the parts shown are then made from strip brass or phosphor bronze of a fairly stout gauge. The circular clips should be made a trifle smaller than the tube, so that when the screw is tightened there is no possibility of movement. The protective hood on the outside end of the lead-in tube is a bakelite picnic cup with the handle sawn off, and having a hole drilled in the bottom. When assembled, the switch should have about half an inch movement, and a small knob should be screwed to the inside end for operating purposes.—D. BESSANT (Mitcham).



A weatherproof combined lead-in and earthing switch.

A Useful Dodge

WHERE small articles such as nuts, bolts and screws have to be picked up out of awkward corners, the dodge illustrated in the accompanying sketch will be found useful. A strong rubber band is simply placed round the shoulders of a pair of pliers, as shown, to act as a spring. The pliers are opened in the ordinary way and the jaws placed over the article to be lifted, which remains gripped in the pliers when the pressure of the hand is released.—K. E. GAYLAND (Weybridge).



Adapting a pair of pliers for picking up small articles from awkward corners.

THAT DODGE OF YOURS!

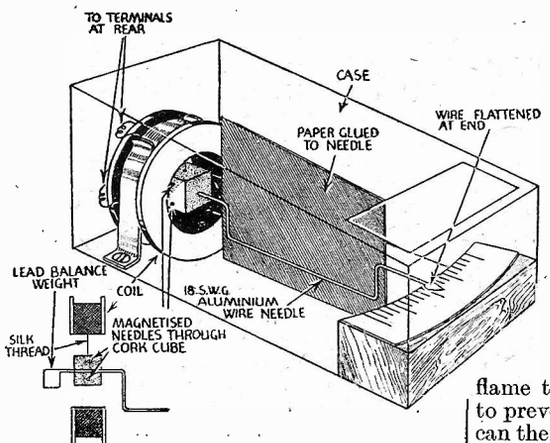
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account 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 Sensitive Galvanometer

THE accompanying sketch shows a sensitive centre-zero type galvanometer, which is easy to make and yet is not of too delicate construction. The essentials can be clearly seen in the diagram. The coil is wound from an old transformer, and the gauge and amount of wire is not critical; but, of course, the greater number of turns the more sensitive the instrument is. In some cases the transformer coils may be used without re-winding on a larger former, but usually the hole in the centre is too small to fit the suspended magnet assembly. The magnets are pieces of needle which have been magnetised and pushed through the cork cube in the same plane as that of the coil.

A paper sheet is glued to the needle to prevent it swinging too much. For best results the paper should be as large as possible, and should have as little clearance as practicable between it and the top and bottom of the case.

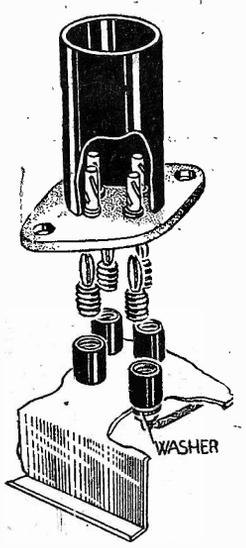
The needle will normally come to rest in an E/W position, but it may be brought to the zero mark in any position by the use of a small magnet moved about the top of the box just over the suspended magnet. With suitable adjustment of the control magnet this instrument can be used as a visual tuning indicator. This simple instrument will give a full deflection with .04 m/A.—R. B. MUTCH (Liverpool).



General view of a sensitive galvanometer, and details of coil and magnet suspension.

A Changeable Coil-former Assembly

THE simplicity of this idea is evident on referring to the illustration, and the only accuracy necessitated on the part of the constructor is in the marking out for drilling. The whole assembly comprises one ebonite tube 15/16ths-in. (outside diameter) of a length to suit the design of coil (the former used in this instance was obtained from an old power resistor); a chassis-mounting valveholder (ceramic or bakelite); four wander plugs, with screws and nuts as shown, and four insulating washers.



A method of arranging a changeable coil-former assembly.

After securing the wander-plug casings to the chassis, and insulating with washers underneath, the plugs should be screwed home sufficiently tight to make contact with the fixing screw heads. The former and valveholder assembly are worked on to the plugs, wiring being effected from the screw, as shown. To make the former secure, place a screwdriver between each pair of valve-leg sockets, and prise slightly, then work the former into position.—W. R. HOBBS (Ilford).

Dip Soldering

WHERE a number of small parts have to be soldered, instead of using the soldering iron the work may be more speedily executed by melting a quantity of solder over the gas ring, with the flame turned low, using plenty of Fluxite to prevent the solder oxidising. The parts can then readily be tinned and held together. Use two pairs of tweezers and, after dipping, hold the parts together until the solder has chilled off. This method is very effective when soldering tabs to fine wires, as an iron tends to destroy the strength of the wire.

LATHE-WORK FOR AMATEURS
by
F. J. CAMM
1/- or **1/2** by post from
Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

cat whiskers made of gold wire at 3s. 9d. per inch. What a pedigree they all had. Experience and expense are almost synonymous terms, and once you have gained experience you find it difficult to give away.

Great Snakes

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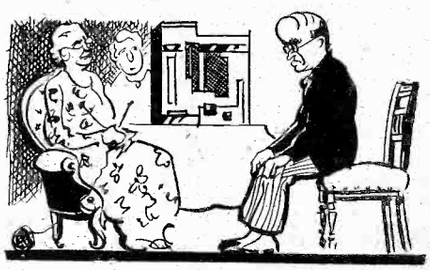
Of course, the bright young things who like to furnish in the ultra-modern style have no difficulty at all. They can select a set of almost surrealist appearance, such is the crazy tendency of modern times. If you can't sing you can make money as a crooner, if you can't draw you make a few daubs reminiscent of a child's first efforts with a box of crayons and become a surrealist, and my readers may retort if you cannot write you become a radio journalist. I thought I would make this crack myself to save my splenetic correspondents from doing so.

Cycle Radio

THIS from E. R. (Royston):—

"I'm very interested in the subject of cycle-radio, and I intend to try it myself. The idea of mounting the set on the handlebars is feasible, but has Mr. E. Hurran (his letter was published in a recent issue of PRACTICAL AND AMATEUR WIRELESS) found a loss in the leads to the accumulator? I should think that there is a loss which caused a good reduction of signal strength.

"Now about the suggested 'Readers' League.' I am, as are thousands more, interested in wireless as a hobby; it would be a very fine idea and should be launched as soon as possible. There is no club round here, and that's where a league would



Too-too modern set.

come in. We could swop experiences and ideas, and thus gain some first-class knowledge of an interesting subject.

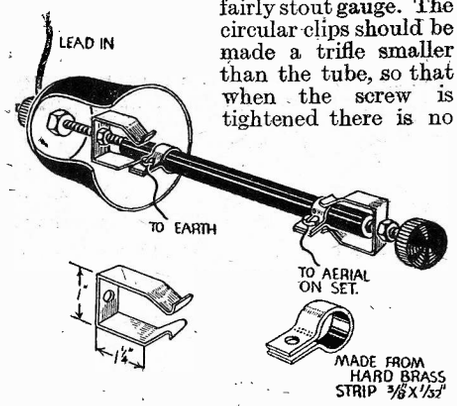
"I agree with E. A. Elliott (Hertford), and think that you should be 'president' of the league. But what's it matter about a badge for you? Crooners give me a pain in the neck and they ought to be punished by making them stick a few hours of 'crooning.' Are we becoming Americanised in jazz now? One of our leading dance band leaders went to U.S.A. and came back with awful tunes, which are the craze of America. Good old Thermion, keep at 'em. Well, here's the best of luck to PRACTICAL AND AMATEUR WIRELESS, and may you live many more years to entertain us with your views on wireless and radio entertainment."

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

Combined Lead-in and Earthing Switch

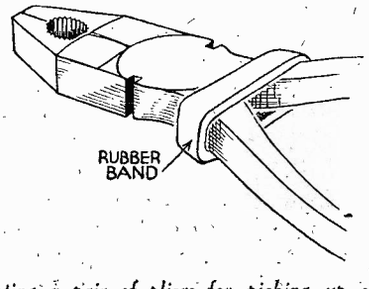
THE accompanying sketch shows how the conventional type of ebonite lead-in tube can be readily modified to form an efficient earthing switch by means of which the aerial is disconnected from the set and earthed without having to go outside the house. The device has the advantage of maintaining its insulation in the wettest weather. The ebonite tube is cut to the length required and two of each of the parts shown are then made from strip brass or phosphor bronze of a fairly stout gauge. The circular clips should be made a trifle smaller than the tube, so that when the screw is tightened there is no possibility of movement. The protective hood on the outside end of the lead-in tube is a bakelite picnic cup with the handle sawn off, and having a hole drilled in the bottom. When assembled, the switch should have about half an inch movement, and a small knob should be screwed to the inside end for operating purposes.—D. BESSANT (Mitcham).



A weatherproof combined lead-in and earthing switch.

A Useful Dodge

WHERE small articles such as nuts, bolts and screws have to be picked up out of awkward corners, the dodge illustrated in the accompanying sketch will be found useful. A strong rubber band is simply placed round the shoulders of a pair of pliers, as shown, to act as a spring. The pliers are opened in the ordinary way and the jaws placed over the article to be lifted, which remains gripped in the pliers when the pressure of the hand is released. —K. E. GAYLAND (Weybridge).



Adapting a pair of pliers for picking up small articles from awkward corners.

THAT DODGE OF YOURS!

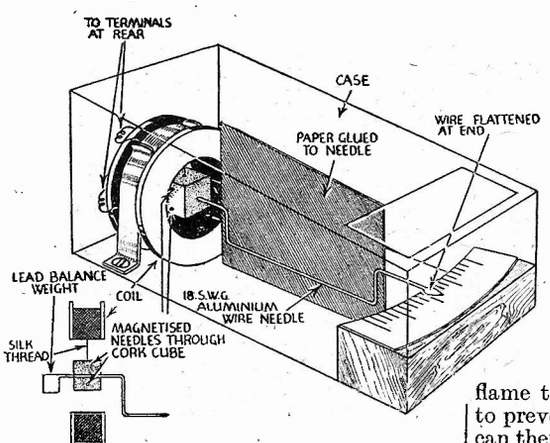
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account 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 Sensitive Galvanometer

THE accompanying sketch shows a sensitive centre-zero type galvanometer, which is easy to make and yet is not of too delicate construction. The essentials can be clearly seen in the diagram. The coil is wound from an old transformer, and the gauge and amount of wire is not critical; but, of course, the greater number of turns the more sensitive the instrument is. In some cases the transformer coils may be used without re-winding on a larger former, but usually the hole in the centre is too small to fit the suspended magnet assembly. The magnets are pieces of needle which have been magnetised and pushed through the cork cube in the same plane as that of the coil.

A paper sheet is glued to the needle to prevent it swinging too much. For best results the paper should be as large as possible, and should have as little clearance as practicable between it and the top and bottom of the case.

The needle will normally come to rest in an E/W position, but it may be brought to the zero mark in any position by the use of a small magnet moved about the top of the box just over the suspended magnet. With suitable adjustment of the control magnet this instrument can be used as a visual tuning indicator. This simple instrument will give a full deflection with .04 m/A.—R. B. MUTCH (Liverpool).

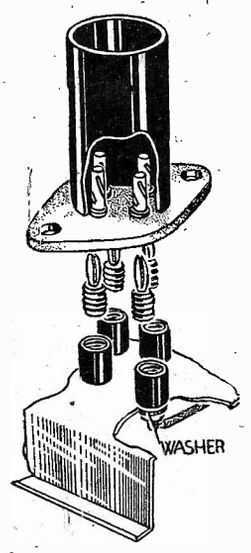


General view of a sensitive galvanometer, and details of coil and magnet suspension.

A Changeable Coil-former Assembly

THE simplicity of this idea is evident on referring to the illustration, and the only accuracy necessitated on the part of the constructor is in the marking out for drilling. The whole assembly comprises one ebonite tube 15/16ths-in. (outside diameter) of a length to suit the design of coil (the former used in this instance was obtained from an old power resistor); a chassis-mounting valveholder (ceramic or bakelite); four wander plugs, with screws and nuts as shown, and four insulating washers.

After securing the wander-plug casings to the chassis, and insulating with washers underneath, the plugs should be screwed home sufficiently tight to make contact with the fixing screw heads. The former and valveholder assembly are worked on to the plugs, wiring being effected from the screw, as shown. To make the former secure, place a screwdriver between each pair of valve-leg sockets, and prise slightly, then work the former into position.—W. R. HOBBS (Ilford).



A method of arranging a changeable coil-former assembly.

Dip Soldering

WHERE a number of small parts have to be soldered, instead of using the soldering iron the work may be more speedily executed by melting a quantity of solder over the gas ring, with the flame turned low, using plenty of Fluxite to prevent the solder oxidising. The parts can then readily be tinned and held together. Use two pairs of tweezers and, after dipping, hold the parts together until the solder has chilled off. This method is very effective when soldering tabs to fine wires, as an iron tends to destroy the strength of the wire.

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Practical Television

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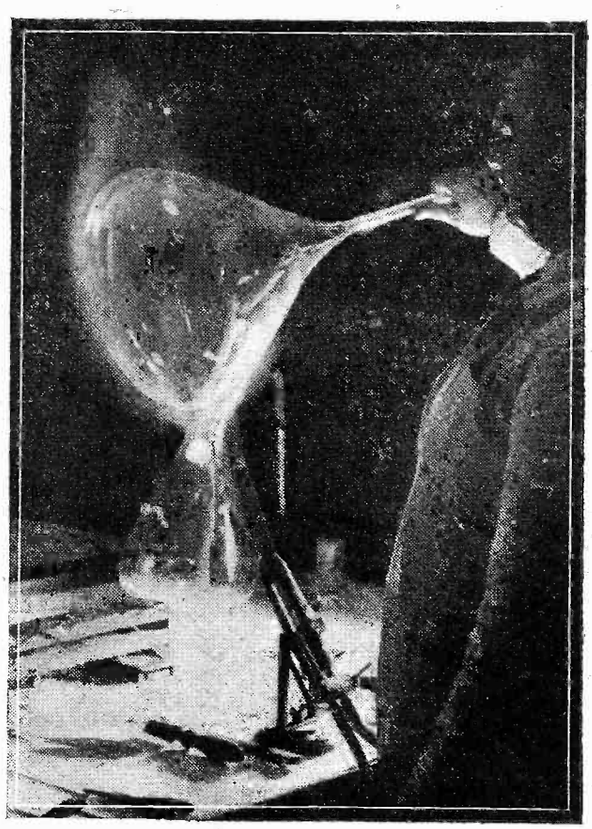
D.C. Light

A CERTAIN amount of confusion still seems to exist with reference to the expression "D.C. light," which is now used so often when information is published concerning the forthcoming high-definition television transmissions. It concerns the *relative* degree of lighting used in the studio, or when televising exterior scenes. The form taken by the signal to be transmitted by each company at the Alexandra Palace is known to have a "black" carrier level of 30 per cent. for Marconi-E.M.I. and 40 per cent. for Baird's, and all carrier amplitudes below these figures are concerned only with the synchronising pulses which for distinction are said to occur in the "blacker than black" region. When the carrier wave of the ultra-short-wave radio transmitting station is on the air with L.F. and H.F. synchronising pulses only, the signal remains at this constant level. As soon as the picture comes on, however, the amplitude level of the carrier will rise into the region which gives a total gradation of from black to white. The continuous variations of the carrier level correspond to the degrees of light and shade in the televised picture, which, when retranslated at the receiving end, give the gradation that conveys to the eye the picture or scene which is transmitted. To quote an easily assimilated analogy this can be likened to the *varying* current in the output circuit of a standard radio set, which variation is converted by the loud-speaker into intelligible sound. In the output-valve circuit of the set, however, there is a steady current flowing, and although it has no real significance as far as the final sound is concerned, the presence of this steady state is well known.

Coming to any studio scene or outdoor shot, however, there is a steady state of D.C. lighting effect present—namely, the degree of overall lighting which is employed to illuminate the scene or subject. When we view scenes naturally by the eye, or watch cinema pictures, we can appreciate immediately whether the steady state is one of brilliant sunshine, artificial illumination, twilight and so on. To complete the pictorial effect of the televised pictures this overall lighting must be incorporated in some way in the signal, otherwise the *average* brilliance of the scene will remain unaltered from the level set by the receiver user at the beginning of the transmission. This is what happened in the earlier days of low-definition television, but with the advent of high-definition images the situation is changed completely. Both companies have agreed that the picture brightness component will be transmitted as an amplitude modulation. In this way the mean brightness of the D.C. light value of the picture is made implicit in the signal, or, in other words, there will not be any fixed value for the average carrier as this will vary according to the measure of lighting present in the transmitted picture. This adds considerably to the quality of the picture, but unless precautions are taken at the receiving end it will be lost. The average thermionic valve amplifier cuts off any D.C. component due to the presence of the interstage-coupling condenser. If the coupling arrangement, however, is designed to have a large time constant, then this D.C. component will be operative, and the full beauty of the picture appreciated.

Frequency Band Involved

Would-be constructors of ultra-short-wave radio sets for tuning in the radiated television signals so that after amplification they can be made to modulate the picture-reproducing device, seem to display a little uncertainty as to the frequency band involved in the vision signal. Two separate standards are employed according to which company's equipment is being used (alternate weeks of use is the B.B.C.'s proposal at present, but this may be modified after experience when the service starts). In one transmission the definition is one of 240 line horizontal dissection repeated at 25 frames (and pictures) per second, the dimensions of the picture having a ratio of 4 horizontal to 3 vertical. Assuming equal definition both horizontally and vertically, therefore, the total number of tiny square elements in the picture is obviously $240 \times 240 \times \frac{3}{4}$, that is 76,800. The total number of elements scanned in one second, therefore, is this figure multiplied by 25, that is 1,920,000. Taking a limiting case of alternate black and white elements, the frequency involved in the modulation is half this—namely, 960,000, since one complete cycle corresponds to a black and a white square. Roughly speaking, it is safe to say that the modulation frequency under these conditions is one megacycle, or the sideband involved in the radiated carrier wave is two megacycles (band width is always twice the maximum frequency). On the other hand, if the scanning equipment is worked to the limit so that the scanning aperture or spot *just* fails to differentiate between separate black and white elements, this condition will be met by reducing the length of each element in the direction of line scan to half the previous side. The maximum modulation frequency is then doubled to 2 megacycles, and the carrier sideband width to 4 megacycles, and this is the condition which will operate in practice. To take full advantage of the radiated picture under the initial standard mentioned, the vision radio receiver must be capable of accepting and amplifying a maximum modulation frequency of 2 megacycles without any amplitude distortion. That is to say, the characteristic of the amplifier must be horizontal (decibels plotted against frequency) up to the full 2 megacycles. This may seem a very arduous task after the standard of quality sound amplifiers, which were rated as first class if they passed a modulation frequency of 10 kilocycles, but it can be accomplished if a proper study is made of the new amplifier technique.



This is the most difficult operation in the making of cathode-ray tubes. Here you see an expert glass-blower in the television laboratories of the German Post Office in Berlin making the "front of the tube" as flat as possible. This portion of the tube later is to hold the screen, and it requires very special skill to produce an even surface.

With the other picture standard, line definition is 405, complete pictures 25 and picture dimensions five to four. Calculating on the same basis as previously, the total elements in each picture for equal definition horizontally and vertically is $405 \times 405 \times \frac{5}{4}$, that is 205,031, and the modulation frequency becomes 2,562,900 (band width is twice this figure). Working to the limit, however, so that the scanner just fails to differentiate between black and white, the modulation frequency is doubled, and for all practical purposes can be taken as 5 megacycles, a figure more than twice that quoted for the other picture standard. Readers will appreciate from these calculations, therefore, that vision set design and layout are two factors which merit very careful attention if full advantage is to be taken of the radiated picture detail.

Not in Opposition

A representative of four hundred newspapers told the United States Federal Communications Commission that he did not believe that either television or facsimile broadcasting could in any way be regarded as an opposition to newspapers. Mr. Leinert gave details of a television system capable of producing full-size theatre screen pictures (24ft. by 18ft.) without any time delay factor. Similar principles were being developed to enable home television sets to give a picture about 3ft. wide, and yet sell for a sum not exceeding fifty pounds.

A Few Quality Circuits

Brief Descriptions are Given of Various Circuit Arrangements of Comparatively Simple Type which can be used when Good Reproduction is Desired at a Modest Cost

By FRANK PRESTON

THE average keen constructor has long since learned that, for real and lasting enjoyment of broadcast programmes, good-quality reception is essential. His chief difficulty is, however, that he is frequently uncertain as to the method of ensuring such reproduction without going to considerable expense. He knows that an expensive amplifier with push-pull, paraphase or Duophase output would fulfil his requirements—but he also knows that his pocket is not deep enough for such luxuries. In this article, therefore, it is not proposed to deal with circuit arrangements which can be considered as "the last word," but rather with comparatively simple ones which can be tried without any considerable expenditure.

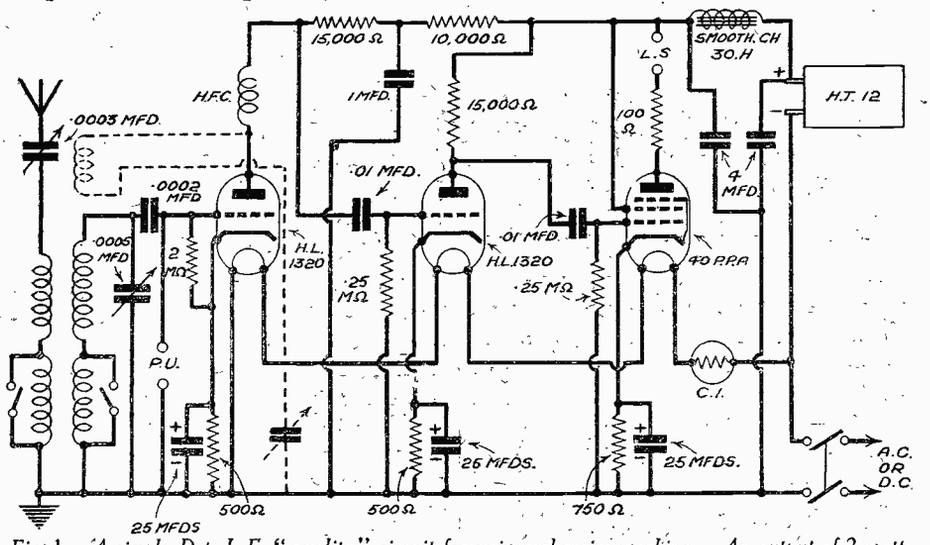


Fig. 1.—A simple Det.-L.F. "quality" circuit for universal mains working. An output of 2 watts can be obtained.

Mains Operation Preferred

A few of the main points which have to be considered with regard to quality reproduction were outlined in the "Beginners' Supplement" last week, so it will be sufficient to proceed from the point at which that explanation was concluded. In order to obtain reception which is more than just "good," a mains-operated receiver is practically essential, although there are exceptions, as will be explained later. The average constructor does not want to be troubled with unusual and apparently complicated circuits, but would generally prefer to employ an arrangement which is as nearly as possible similar to those he has used before; the circuit shown in Fig. 1 is a typical example of what is meant. This circuit is the same in principle as the Det.-two L.F. circuit which has been popular for many years, but it is intended for really good reproduction of a few programmes. Selectivity is not a strong feature; long range is not intended; but good reproduction at ample volume is assured.

Detector-Two L.F.

It will be seen that the circuit is intended for universal mains working and that standard triode and pentode valves are incorporated. A simple two-circuit tuning coil (of any good make) is used in the input circuit, and this feeds into a leaky-grid detector. This is coupled to the second valve by means of a resistance-capacity network, whilst coupling between the second valve and the output pentode is of the same type. Despite the fact that R.C. coupling is not as popular as it used to be, it is still better than any other when complete simplicity and absence of "snags," combined with cheapness, are the first considerations. The two anode-coupling resistances have a value rather lower than the theoretically-correct one, but this has been purposely arranged so that the anode voltage is cut down as little as possible. A pentode is not always considered desirable in a quality set, but it is certainly the best in a universal receiver. In any case, if reproduction is rather on the shrill side it is a simple matter to connect a tone control between the anode of the output valve and earth.

Reaction is not strictly desirable in a circuit of this nature, and connections are therefore shown in broken lines; if these connections are used care should be taken to use the smallest amount of reaction which suffices to sharpen tuning and give sufficient input to the detector. As to the power-supply system, this is as simple as possible, and an H.T.12 metal rectifier is used for half-wave rectification, whilst a Phillips type C.1 barretter is used as an automatic series resistance in the heater circuit; the set can be used on any mains having a voltage between 160 and 300.

Values of the principal components are indicated, and it should be added that the first two valves are Mazda, and the output valve a Cossor. All resistances can be of the 1-watt type, the smoothing choke should have a resistance of not more than 500 ohms, and the fixed condensers should be for not less than 300 volts working.

Push-pull

It would be possible to argue for a long time on the relative merits of the circuit shown in Fig. 1 and that in Fig. 2. The latter also employs three valves, but these are arranged as a detector valve followed by a push-pull stage. The output is not vastly different, but the second circuit is rather more costly and would perhaps not be considered quite as simple by constructors of modest experience. The second circuit is, however, shown in A.C. form, and provides an interesting alternative. One of the chief advantages of the Fig. 1 arrangement is that it provides a rather greater degree of amplification in spite of the similar maximum output. For that reason it can generally be used with a lower setting of reaction, and is more effective when the nearest transmitter is more than, say, 25 miles away. Again, the values of components are marked on the diagram, and further explanation need not be given.

There are many designers who consider that, even for a local-station "quality" set, a stage of high-frequency amplification is to be preferred. The pros and cons are apt to become rather involved, but the

(*Continued overleaf*)

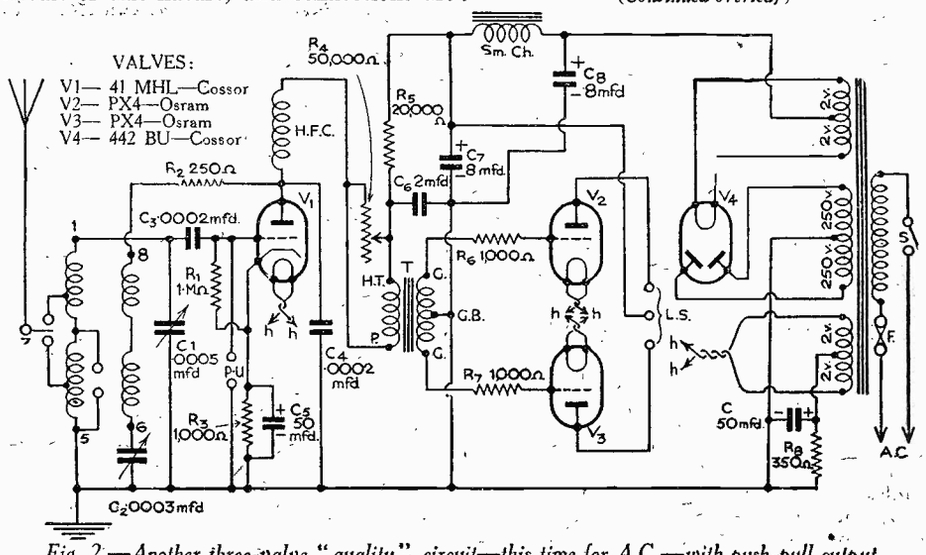


Fig. 2.—Another three-valve "quality" circuit—this time for A.C.—with push-pull output.

(*Continued from previous page*)

constructor who does not object to the slight extra complication of a receiver having a H.F. stage is advised to adopt it. One important reason for this is that it ensures that the detector valve can be fully loaded. As a result of this it might be possible to use rather less low-frequency amplification to obtain the same output, which in turn means that the L.F. side is simplified. On the other hand, it is probably true to say that—contrary to what is generally thought—a greater amount of distortion takes place in the H.F. than in the L.F. stage of most home-constructed receivers, unless built according to a complete published design.

Using H.F.

Another advantage of using H.F. amplification is that it can be followed by a diode detector. It is rarely satisfactory to connect a diode directly to the input tuning circuit since it produces too much damping and cannot be properly loaded. And it is safe to say that, in the hands of the average constructor, a diode gives better quality than a triode, even when the latter is used as a power-grid detector. Yet another point in favour of the H.F. stage is that it entirely obviates the need for reaction on stations up to 100 miles or so, and often makes possible the good reception of transmission over much greater distances. A simple, though very satisfactory circuit comprising an H.F.-pentode H.F. amplifier, a diode detector and two stages of L.F. amplification is given in Fig. 3. In this case the set is for A.C. operation, and it includes a mains transformer giving an output of 500 volts at 120 mA; this is necessary in order to feed the Mazda PP 5/400 output triode, which takes a maximum anode voltage of 400. The other two valves are Cossor, and the rectifier is a Cossor, type 460 BU, the output of which is 520 volts at 120 mA. Actually, the maximum voltage is not applied to the output valve, since a 2,500-ohm loudspeaker field winding is used for smoothing purposes, but this merely means that the valve is not worked "all out," which is an advantage.

Component values are indicated, these applying to the valves indicated. It will be understood that all smoothing and by-pass condensers must be designed for working at not less than 600 volts; the resistances may be of the 1-watt type, excepting that used for biassing the last valve, which should be a 2-watt component. The output valve has a directly-heated filament, but the other two are indirectly heated; because of this it is most convenient to employ a mains transformer with separate L.T. windings, each rated at 4 volts and not less than 2 amps.

Volume Control

Instead of using a variable-mu valve to control the input and prevent overloading on powerful signals, a differential condenser is used in the aerial circuit—a system which has previously been recommended in these pages for "quality" receivers. An unusual and simple method is adopted for feeding the screening grid of the H.F. pentode, for the double-diode triode and its anode decoupling resistance are used together as a fixed potentiometer. This circuit is probably the best simple one that could be devised for really high-class reproduction, but care should be taken in the choice of the low-frequency transformer. This should be of the best quality obtainable, and should have a step-up ratio of 1 : 2 or 1 : 3. The principal objection is the high H.T. voltage required, but since standard components can be used, this need not introduce any complication.

Battery Operation

In the case of a battery set a circuit similar to any of those described above could be used by employing suitable valves, but the output could not be expected to exceed about 1 watt—and even then the consumption of H.T. current would be high. It is worth mentioning, however, that a receiver such as the £5 Superhet can easily be converted into a good "quality" instrument simply by replacing the output pentode by two triodes, as shown in Fig. 4. Those who have built this set can testify to the excellent quality which it gives, but the connections shown in Fig. 4 make reproduction still better, and without detracting from the remarkable performance which the set is known to give. It can be seen that the first L.F. valve is a Cossor 215 P, and that it is connected to the output valve through a resistance-capacity coupling consisting of a .01-mfd. condenser and a 10,000-ohm resistance. The output valve is a 230 XP, which has a maximum undistorted output of 450 milliwatts and takes about 16 mA when using 120 volts H.T.

In order to ensure the best possible reproduction a slight degree of selectivity must be sacrificed by tightening the coupling between the windings of the I.F. transformers; even when this is done the set tunes very sharply and has the same long range of reception as before the alteration. The "Westector" is just as good as a diode where "quality" is concerned, but is not generally to be recommended for a "straight" set unless preceded by a couple of H.F. stages.

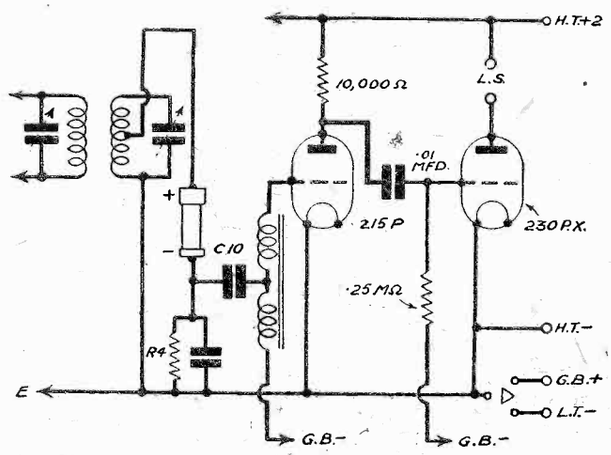


Fig. 4.—Showing how the pentode in the £5 Superhet can be replaced by two triodes in order to improve still further the quality of reproduction.

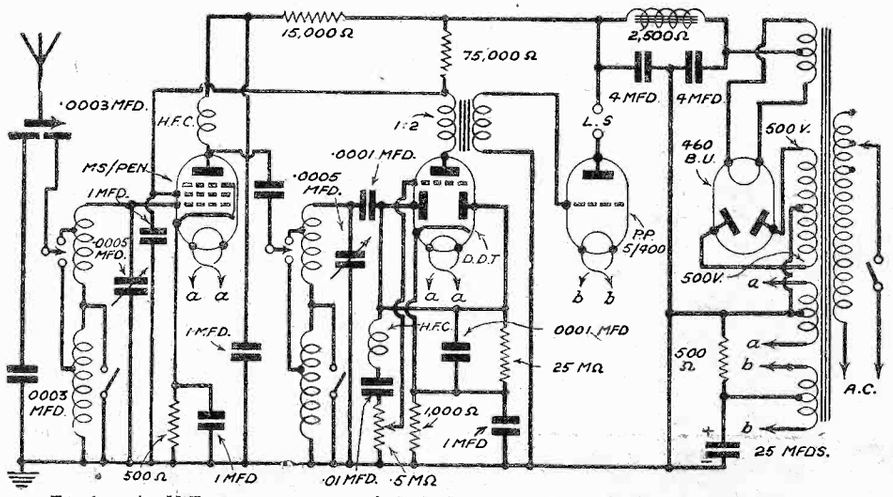


Fig. 3.—An H.F. receiver circuit with diode detection and capable of over 4 watts output.

HERE and THERE

Motor-Cycle Championships

THE Bank Holiday motor-cycle championships at Donington Park, some eight miles from Derby, have now been recognised as Grand Prix Races. There are over a hundred entries this year. The distance to be covered is one hundred miles—about forty-five laps of the course, which is the same as for the Grand Prix Races for cars. On August 3rd three commentators will be engaged for the Midland relay, Graham Walker, Vernon Brook and F. J. Moore. The two first are well-known T.T. Race Commentators, while Mr. Moore has done commentaries for the crowds round the course at Donington Park.

Stories of Fifty Years Ago

A FEATURE of the Midland Children's Hour on August 3rd is an exchange of stories of fifty years ago between a townsman and a countryman. The former is Joe Gutteridge, the Black Country broadcaster; and the latter, Sam Ball, a Shropshire gamekeeper.

Soviet Programme

AS mentioned in previous issues, the Soviet government has extended its short-wave programme service for listeners overseas, and for this purpose has brought two new transmitters into action. Moscow RW96 on 19.76 m. (15,180 kc/s) gives an English programme every Sunday at B.S.T. 18.30 and on 31.51 m. (9,520 kc/s), a daily broadcast from midnight to 02.00 B.S.T. At other periods on the lower channel you will hear telephony as it is largely used for communication with other stations in the U.S.S.R. You will recognise the station by the announcer's reiterated *da-da* (yes-yes) or *niete* (*knee-ett-aye*), which is equivalent to our "No."

SOUND RECORDING for the AMATEUR

By L. Ormond Sparks

A FEW years ago, home recording created a considerable amount of interest amongst those who wished to obtain a permanent or semi-permanent record of some particular vocal or musical item. Unfortunately, in spite of several manufacturers producing simple suitable apparatus, the interest did not last, and a very interesting branch of acoustics—so

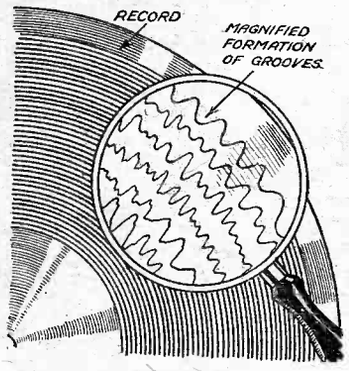


Fig. 1.—The standard gramophone record grooves as seen under a magnifying glass.

closely allied to radio—more or less faded away so far as the amateur was concerned. The probable reason for this was certain imperfections and snags which were then present, but, since its first introduction, home recording has made wonderful progress. There are, however, several points to be watched, and unless due consideration is given to these items, the amateur record-maker will become very disgusted with the results he obtains.

The purpose of this article is to stress the points to be watched and explain the elementary principles of record-making, so it is hoped that those new to this very interesting hobby will be able to avoid some of the pitfalls which can prove so annoying and disheartening.

Record-making

It can be said that the grooves or tracks on a blank record can be shaped to represent vibrations corresponding to sounds in two ways, one of which is known as the "hill-and-dale" system, and the other, the "lateral" method.

Both systems possess certain definite advantages, but for reasons which do not concern this article, the "lateral" system will be considered as the one most suitable for home recording.

If a record—using the lateral system—is examined under a microscope, it will be seen that the grooves which form the spiral track, are not smooth-sided channels as they appear to the naked eye. They have, actually, a zig-zag formation, as depicted in Fig. 1, which represents a plan view of some of the grooves—but more about that later.

The "hill-and-dale" method differs from the above, inasmuch that no lateral movement of the needle is produced, the zig-zag line across the record being replaced by one at right-angles to the surface of the record. This can be more readily understood if we think of the grooves in terms of the name given to the method, and refer to Fig. 2, which shows a side view of a section of a groove. It will be seen that the bottom of the groove is no longer level; the path of the needle being like a series of minute hills and dales, and it is worth noting, at this point, that the depth of the "dales" does not affect the width of the groove or track.

In this Article the Elementary Principles of Record-making are Explained, and Various Points to be Watched are Stressed

It is obvious that the stylus bar of a sound-box or pick-up will vibrate in a to-and-fro manner (Fig. 3) when the needle is following a *lateral* track, the diaphragm being at right-angles to the record surface, and that the maximum movement will be governed by the distance between grooves, i.e., the thickness of the walls. This governing factor has a great effect on the frequency response obtainable from a record using the lateral system; for

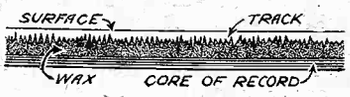


Fig. 2.—The "hill-and-dale" method of record making.

example, the large zig-zag represents a low-frequency note, and it is possible that, say, a 100-cycle note would produce a track which would occupy the total permissible width of the groove. Therefore, any note lower than that frequency would have to be attenuated or, in other words, restricted, otherwise the walls would be broken down and the spiral track ruined.

With the "hill-and-dale" method, the needle is given an "up-and-down" motion

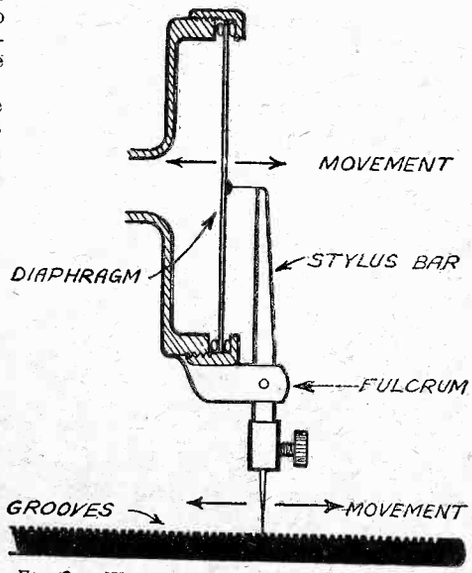


Fig. 3.—The ordinary sound-box is operated as shown here.

(Fig. 4), the diaphragm being fixed *parallel* to the record surface, therefore the low-frequency limitations do not apply, as the depth of the "dale" corresponding to a low note does not affect, as mentioned earlier, the width of the groove.

How the Track is Made

When records are made on a commercial basis, and many thousands have to be produced of one recording, it is usual for the following procedure to be adopted.

The sound to be recorded is converted into electrical impulses by suitably-designed and controlled microphones, whose output is amplified by specially corrected amplifiers until sufficient power is obtained to operate what is known as the "cutting head." For simplicity, the "cutting head" can be likened to a pick-up whose operation is reversed, that is, instead of producing electrical currents by the vibration of its needle arrangement, it is made to produce vibrations by supplying it with electrical power like, one might say, a loudspeaker. The cutting head is connected to a mechanical drive which causes it to follow a predetermined spiral path across a disc of specially-prepared wax, the cutting needle engraving or cutting out the minute zig-zag track which forms the mechanical/electrical equivalent of the sound being recorded.

When the recording is finished, the wax record is treated with a super-fine conducting medium—something like graphite—

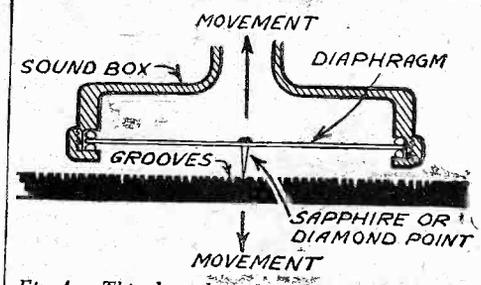


Fig. 4.—This shows how the diaphragm is operated in the "hill-and-dale" system.

and then immersed in a plating bath until a strong metal coating is deposited on the treated wax. This metal "positive" counterpart is used to produce "negative" metal plates which form—for want of a better name—a die to press out a composition into the familiar black discs. This is not the final stage, as the discs have to be given the finishing touches, their edges trued up and carefully examined for the most minute imperfections.

Home Recording

So much for the outline of the commercial process; now let us see what is necessary for the amateur record-maker, as it is obviously impossible for such complicated methods to be used in the home.

To overcome the problem of the wax disc, recording "blanks" have been made from aluminium, and while these have proved quite satisfactory from the recording point of view, they possess certain undesirable features when it comes to reproducing. However, they offer quite a good basis with which to start experiments but, if the matter is going to be tackled seriously, it

would be advisable to use one of the more modern processes.

Aluminium blanks should be cut with a sapphire cutter, and it is essential to use fibre trailer needles for replaying otherwise the useful life of the record is very short, say, six playings only with steel needles. Fibre needles are, of course, very satisfactory as regards quality and absence of surface noises, the only drawback being that they wear very rapidly, and once the contact surface becomes worn or distorted, objectionable snags are introduced.

While the term cutting has been used, this is not quite accurate when considering aluminium blanks, as the surface is actually indented and not cut like other substances. However, quite good results can be obtained, and the method has the advantage of being very cheap.

Before any recording can be considered, it is essential that some mechanical device is provided to cause the cutter head to traverse the record from edge to centre, as the blanks are free of all tracks or grooves. Such devices are known as "tracking" or "traversing" mechanisms, and they usually consist of a threaded rod, which is operated from the turntable spindle, and so arranged that it controls the movement of the cutter head carrier. Fig. 5 shows the fundamental principle where "A" represents the drive fastened to the turntable spindle, and, "B" the simple gears to transmit the motion to the horizontal threaded rod "C" which actuates the cutter carrier "D" by means of the threaded contact piece "E." The pitch or number of threads per inch of the threaded rod plays a very important part, and it is absolutely essential for it to be a precision job, otherwise the distance between each groove will vary, the separating walls will differ in thickness and a true spiral will not be formed.

With commercial recording, it is usual to operate at 100 grooves to an inch, but for home purposes it is not advisable to cut more than, say, 80 to 90 per inch as there is always the danger, unless a very accurate check is kept on the cutter head input, of the cut of the low notes breaking down the walls of the grooves and completely spoiling the track.

It will be appreciated that to overcome the drag imposed by the cutter—especially with aluminium blanks, and the load of driving the tracking mechanism, a powerful motor is required, so particular attention must be given to that item. As a guide, it should be noted that a single spring or small double spring motor is not likely to be satisfactory; in fact, some of the small electric motors are not capable of driving a 10 or 12 inch blank.

Motor speed is a very critical item and use should be made of one of the many devices for checking this, otherwise the whole tempo and pitch of the recording will vary. To show how closely the question of speed is studied in commercial recording, it is interesting to note that "gravity" or weight operated motors are used in many of the studios.

One more item which calls for special attention in recording, is the weight of the cutter head, or rather the actual weight imposed on the cutter. If the weight or load is too light, the cutter may wander off its track or jump clear on some of the lower frequencies. Most of the cutter head carriers are fitted with an adjustable counter balance which allows very accurate adjustment to be obtained.

Cutter Heads

As the frequency response of a loudspeaker depends on its design, ignoring for the moment the input, so will the quality of the recording depend on the characteristics of the cutter head. Therefore, it is no use providing first-class gear if attention is not given to this important item.

Special cutters can be secured from firms which specialise in this class of work or, on the other hand, any *good* make of electromagnetic pick-up can be used, providing the question of weight is considered, as mentioned above. Suitable cutting needles can also be purchased, and, while they can be made if so desired, it is really better to obtain them from the actual makers.

Power and Feed

For satisfactory results, the L.F. amplifier feeding the cutter should have an undistorted output of at least 3 watts, the output stage, for preference, being push-pull. If, however, this form of output circuit is not employed, a choke filter circuit, or output transformer, should be used, thus protecting the windings of the cutter head from D.C. current, and removing any possibility of L.F. instability.

The amplifier circuit should embody an efficient form of "high" and "low" note control, to allow adequate adjustment to be made to the overall frequency response.

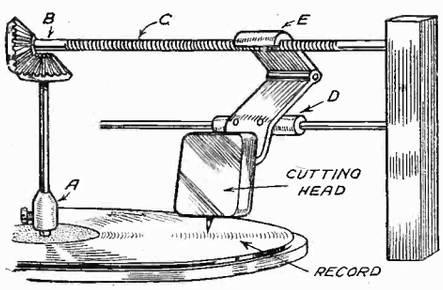


Fig. 5.—How correct tracking is obtained.

It may be necessary to attenuate the lower frequencies if the cutter input is too great, or if more than 80 grooves per inch are cut.

The input circuit of the amplifier should be arranged to suit the type of microphone in use, and, if possible, it is advisable to make use of a mixer circuit to allow speech and music or other combinations of sounds to be blended as desired, as very pleasing and, incidentally, very professional, effects can be so produced. As regards the microphone, any good make of "transverse current" will be quite satisfactory, although if a moving-coil job is available, so much the better.

Blanks

As mentioned earlier, the aluminium blanks are not too satisfactory if long record life is required, or if serious work is to be undertaken, therefore, it is well worth while considering one of the more modern methods, and while there are several processes now in being, I do not think the amateur can do better than employ the system outlined below, which is handled by Messrs Musikon Ltd. They still employ an aluminium blank, but only as a base for a film or coating of a plastic substance very similar to bakelite. The nature of the substance allows recording to be carried out, in the normal manner, with a steel cutter, and owing to the nature of the surface, very little drag is imposed on the turntable. After cutting, the record can, if so desired, be replayed immediately, but this is not recommended, as the surface is too soft and must be hardened before use. The hardening process is carried out by the simple process of placing the blank in an oven—maintained at a certain constant temperature—for about three hours, after which a glass-hard surface is produced which allows steel trailer needles to be use.

The finished records have a remarkable frequency response, very long life, and surface noises are practically absent.

Important Pointers

Whichever system is used, never start recording and run a blank right through, without having previously made a test strip of the matter to be recorded. It is advisable to keep one blank for this purpose, and run off a few grooves, under operating conditions, to see if volume, speech or the placing of the microphone is all right. Make quite sure than no external interference is likely to be introduced into the microphone or amplifier circuits. Check up the time to be taken by the item to be recorded, and the time length of the blank, thus avoiding one finishing before the other. See that the input to the microphone is constant or, better still, have headphones in circuit and a proper volume control. And last, but by no means least, keep your eye on the speed of the motor.

A NEW TELEVISION "SERVICE"

THE other day a newspaper stated that a television service had at last started, but this was meant to refer to the bus service which has now been inaugurated as a regular afternoon journey between Broadcasting House and Alexandra Park. With the constant delays which have accrued, and so prevented the radiation of picture signals this sarcasm is perhaps excusable, but in suggesting dates for the initial service the authorities failed to realise the amount of work which had to be accomplished. Every effort is now being made to expedite the work, and in spite of the air of complete secrecy which surrounds the installation, at the summit of the steel lattice mast engineers can be seen perched very precariously while putting into position the radial arms which ultimately will hold the specially designed vision and sound aerials. Then it is known that the two large studios can be sectionalised by means of curtains on "railways" so as to apportion the backgrounds according to the size of the scene it is intended to televise. The control engineers are above the studio floors, and anyone in that room can therefore see into the studio and watch the actual scene. Equipment assembly is proceeding apace, while quite recently a section of the new television staff paid a visit to the Alexandra Palace in order to see the film scanners in operation. This was part of the course of instruction which they are undergoing in order to become acclimatised to B.B.C. methods. No doubt in August their work will become more specialised in relation to television itself. It is also learned that physical exercises will be featured in the television programmes. Readers will no doubt recall that this was quite a popular item in the low-definition television programmes, but the scope was rather limited. Using the present forms of direct pick-up scanners, however, far more detail will be possible.

IMPRESSIONS ON THE WAX

By T. Onearm

Two Famous Orchestras

OF the lighter overtures, one of the most popular is "The Merry Wives of Windsor." It has been recorded this month by the Berlin Philharmonic Orchestra, conducted by Dr. Karl Bohm on *H.M.V. DB* 4444, a particularly fine record.

The "Blue Danube" waltz is always a favourite with Strauss admirers, and the Minneapolis Symphony Orchestra has made an extremely good rendering of it on *H.M.V. DB* 2621.

From the Films

JAMES MELTON, who appears in the film, "Stars over Broadway," has recorded "Where Am I?" ("Am I in Heaven"), and "Carry me back to the Lone Prairie" on *H.M.V. B* 8444. Both of these tunes are from the film.

Another new film, "Give us this night," is represented by "Sweet Melody of Night" and "My Love and I," which are attractively sung by Webster Booth on *H.M.V. B* 8442.

Sam Browne sings "Melody from the Sky," a popular tune from the new colour film, "The Trail of the Lonesome Pine," coupled with "Lost" on *H.M.V. BD* 351.

Musical Comedy Successes

SOME of the best known musical comedy successes are recalled in "Medley of Daly's Favourites," played by Reginald Foort on the organ of the Paramount Theatre, London. The number of the record is *H.M.V. BD* 352.

Derek Oldham sings two light numbers, "A little love, a little kiss" ("Un peu d'amour"), and "Nocturne" ("Song of Love") on *H.M.V. B* 8446.

Two songs of totally different category, but which offer pleasing contrast, are sung by Stuart Robertson (baritone) on *H.M.V. B* 8445. The titles are "Spanish Lady," and "Limehouse Reach."

A New Toscanini Record

TWO brilliant recordings by Toscanini and the New York Philharmonic Symphony Orchestra appear in this month's list. They are "Götterdämmerung"—Dawn and Siegfried's Rhine Journey, and "Lohengrin"—Prelude to Act 3, and are recorded on *H.M.V. C* 2860-1. Although Toscanini has retired from the New York Philharmonic Symphony Orchestra, he will still appear with them occasionally.

Dancing Time

ROY FOX and his Orchestra have recorded "Poor Little Angeline" and "Calling me Home" on *H.M.V. BD* 5075, also "My First Love Song" (from the film, Queen of Hearts) and "Would You" on *H.M.V. BD* 5076.

Joe Loss and his Orchestra contribute two lively dance numbers, "I like Bananas" and "Madame—ah! La Marquise—ah!" on *H.M.V. BD* 5080, also "Cuban Pete," and "At the close of a long, long day" on *H.M.V. BD* 5079. These records are interesting in view of the recent publicity given to Joe Loss in connection with his dance tempo, which is considered to be ideal.

"Fats" Waller new recordings are "All my Life," from the film "Laughing Irish Eyes," and "Cabin in the Sky"—*H.M.V. BD* 5077. These tunes should please those who like rhythmic piano choruses.

In the Swing Music series, four records are released this month; of these, one of the most representative is "You Started Me Dreaming," and "Tormented," played by Wingy Mannone and his Orchestra, on *H.M.V.* B 8451.

Decca Records

"ALEXANDER'S RAGTIME BAND" and "Broken Doll," are two old tunes that are served up anew this month by Brian Lawrence and the Lansdowne House Sextet on *Decca F* 5981.

"These Foolish Things," coupled with "Lights Out," on *Decca F* 5987, is the latest Greta Keller recording, and Danny Malone, the Irish tenor, sings "The Glory of Love" and "Poor Little Angeline," on *Decca F* 5988.

Jessie Matthews has recorded four numbers this month, from her latest film "It's Love Again." They are: "It's Love Again" and "Tony's in Town" on *Decca F* 5982; and "I nearly let love go slipping through my fingers" and "Got to dance my way to Heaven" on *Decca F* 5983. In the recorded version of "Tony's in Town" and "Got to dance my way to Heaven," you hear her tap-dancing as well as singing.

Brunswick Records

THE third "Show Boat" film is being presented in London, and before very long it will go the rounds of all the big picture theatres. Although it is a new film, so far as it was made quite recently, two of the original artistes appear—Paul Robeson and Helen Morgan. Those readers who would like to hear these two artistes should obtain the Brunswick "Show Boat" Album, which consists of four records, with an artistic album, which can be purchased for 16s.

Bing Crosby makes a new recording this month on *Brunswick O* 2223. For this record he has chosen "Would You" and "Robins and Roses."

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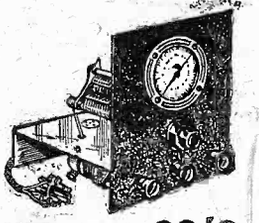
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Random Jottings

By JACE

Director of Staff Training

THE B.B.C. announces that Mr. G. C. Beadle has been appointed Director of Staff Training in the training reserve which will be formed on October 1st next. The Chief Instructor will be Mr. E. A. F. Harding, who is at present Northern Programme Director.

The purpose of the training reserve is to provide newly recruited staff with a training in broadcasting methods, to keep existing headquarters and regional staff in touch with the latest developments, and to create a small reserve of staff for emergency and holiday requirements.

Mr. Beadle, who is now Director of Programme Administration, will be succeeded in this position by Mr. R. J. F. Howgill.

Mendelssohn Concerto

MAURICE COLE will play the Mendelssohn Pianoforte Concerto in D minor on July 29th (National), and Clarence Raybould will conduct "Three Jewish Poems" of Ernest Bloch, "The Noonday Witch," by Dvorák, and "Variations on Three Blind Mice," by Joseph Holbrooke.

There will be a programme of light music conducted by Joseph Lewis the same evening (Regional), and on July 30th (National) Barbirolli will conduct an Elegy and Scherzo by Frederic d'Erlanger, and "Dances of Marosszek," by Kodály. On July 31st (Regional) Albert Coates will conduct a first performance in England of Symphony No. 2 of Dmitri Kabalevsky, as well as a first performance of his own Pianoforte Concerto in C, which will be played by Frank Lafitte.

Television Programmes

ALTHOUGH no definite programmes have yet been prepared for television, the Productions Department has already sketched out a number of plans for the first transmissions from Alexandra Palace in the autumn.

Apart from the "family" entertainment side, there is the question of "interest" features to be considered, these consisting of light programmes concerned with topics of the hour, people in the news, and general subjects of the "Magazine" type. Among the titles already suggested for these features are: "The Zoo To-day," "Cartoonists at Work," Travel, "Learning to Fly," "Radio Personalities" and "House Furnishing," "Games—Indoor and Outdoor," "Physical Training," and "World Affairs."

Broadcasts to Schools

FOR the seniors, aged eleven to fourteen, there will be a new music course, a series of concert lessons, "British History," "History in the Making," and topical events. Other items are dramatic readings from Shakespeare, book talks and experimental programmes of poetry and biography in the senior English Literature course, broadcasts on biology by famous biologists, a geography series on the New World by broadcasters who have known and lived in the countries they describe, and the modern language broadcasts for French and German by E. H. Stéphan and H. Winter.

A new series for seniors on Friday afternoons will include feature programmes, broadcasts of actual events, topical talks and talks on films.

The Central Council for School Broadcasts now test under school conditions all sets submitted to them by manufacturers and publish a list of approved apparatus.

H.F. Mains Interference

ONE form of interference arises from the presence of high-frequency currents in the mains leads. An H.F. choke will, of course, prevent this trouble, but in view of the fact that the current passing is on the high side special chokes must be employed designed to withstand the high currents. Such components may be obtained from the various firms whose advertisements appear from time to time in our pages, and it is possible to obtain components rated up to 300 amps, although, of course, such components are very expensive. For the ordinary receiver, the cheaper type of choke rated at .6 amp and costing 3s. 6d. (Ward & Goldstone type) will be found quite suitable.

Speedy Repairs

IF a bias resistance breaks down in either an A.C. or an A.C./D.C. receiver and a replacement is not available, a battery may be used, connecting its positive socket to the valve cathode and its negative socket to the H.T.—line in exactly the same position as the bias resistance is normally joined. Alternatively, the cathode may be joined in the negative line and the bias battery connected between the grid leak or transformer secondary and the negative line in the same manner as in a battery set.

A Seasonal Overhaul

WHEN overhauling your set do not forget to examine flexible leads and their connections to see that no single strand is projecting and causing a short, or is so loose that such a short may occur later. See that wiring is well away from fixing screws or bolts, and in the case of faults which defeat your powers of detection ascertain that in no case have screws pierced the insulation of wires or coils. It is also a good plan to test the insulation of components to their metal cases, especially when the cases are earthed. An instance occurred recently of an L.F. transformer secondary being earthed to its case. Had this component been mounted on a wooden base with the case not earthed, the fault would not have been noticed; but the case being earthed the result was that the secondary winding was, in effect, connected as a shunt to the grid-bias battery which accordingly ran down quickly and under-biasing the valve followed with consequent deterioration of quality, increased H.T. consumption, and damage to the valve itself.

Warm Work

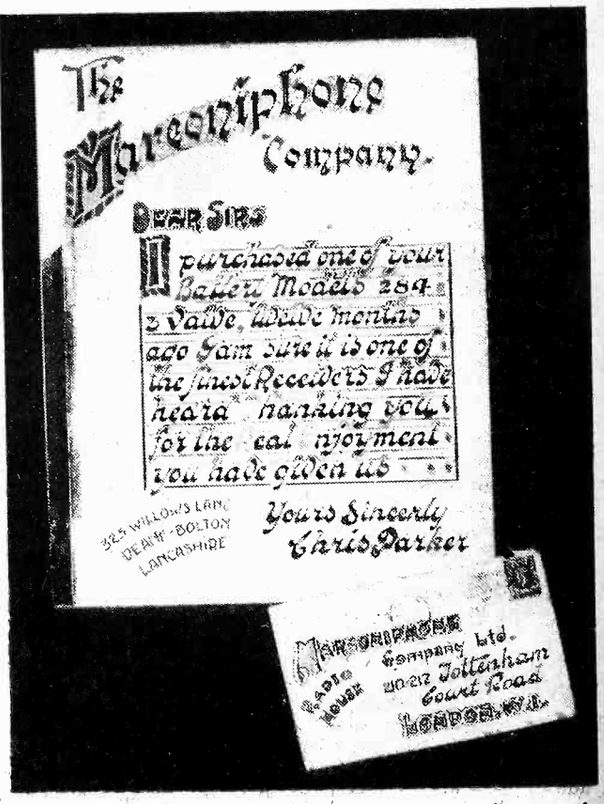
IN 1924, recording was carried out at the "His Master's Voice" studios, at Hayes, Middlesex, the artist singing, or speaking into a horn. As the studio was kept at the temperature of soft wax, it was found very necessary to discard coats and vests and roll up shirt-sleeves before commencing operations.

Was recording more difficult in those days? Yes, because of the numerous technical difficulties with which we had to contend. Owing to space limitations, the principals had to sing the choruses in addition to the solos, as there was only a small horn in which to sing. Imagine what it was like!—perhaps ten people crowded together like flies round a honey-pot, bobbing down to sing choruses and jumping up for the solos. In the circumstances, it was a miracle that acoustic recording was so successful.

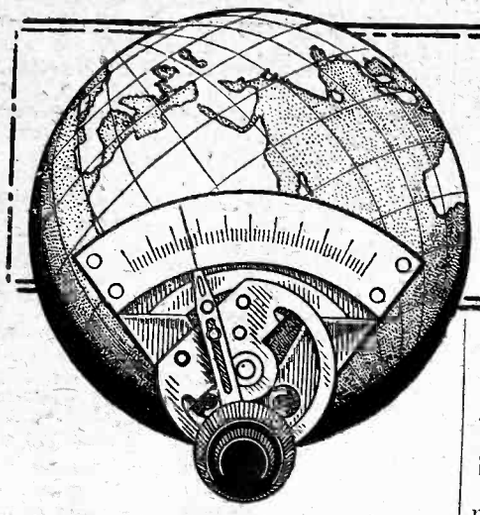
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SHORT WAVE SECTION

QUALITY REPRODUCTION ON THE ULTRA-SHORT WAVES

The Wider Use of Ultra-short Waves Provides Many Schemes for Improving the Quality of Reception - By H. J. BARTON CHAPPLE, B.Sc.

ULTRA-SHORT-WAVE radio is very much to the fore at the present moment, for in addition to its use for various official services it has, as most readers know, been adopted as the vehicle for the forthcoming television transmissions—wavelengths in the region of 7 metres having been decided upon. But what is of greater interest to the listener, as distinct from the television enthusiast, is the fact that the sound accompaniment of the television programme is also to be radiated on an ultra-short wavelength, namely 7.23 metres.

This opens up boundless possibilities in many directions; new ideas and possibly a new technique in receiver design and in aerial arrays, both affording fresh interests for the amateur and the constructor as well as to the professional engineer. One of the most important points about the ultra-short wave sound transmissions, however, is the potentialities held out for vastly improved fidelity in tonal quality.

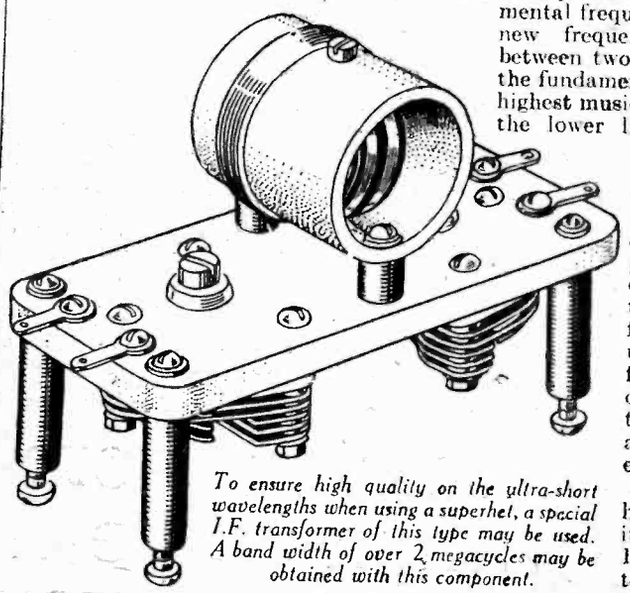
Four Links

High quality as applied to sound broadcasting depends upon at least four links forming a chain of circumstances, each of which must be favourable if high-class reproduction of the programmes is to be achieved. The first link is the actual transmission, and the practical requirement is that the modulation of the carrier as it leaves the transmitting aerial shall be a faithful replica of the actual programme. The second is summed up in the phrase "general reception conditions" and includes such factors as a consideration of the mutual interference between stations, and the absence or otherwise of various forms of electrical disturbance, either natural or man made. Third comes the question of set design, and last but by no means the least, the ability of the loud-speaker to reproduce faithfully the various musical frequencies present in the output from the set.

Although certain of these points have no specific relationship to the ultra-short waves, each must be dealt with, for such limitations as may be imposed by them have to be taken into consideration when assessing the extent to which the ultra-short-wave sound transmissions may improve the general standard of reproduction.

In the matter of transmission it may be said at once that microphone and amplifier design have now reached a standard at which it is possible to transmit, if desirable, a range of audio frequencies entirely adequate to do full justice to any class of sound—music, speech, or "effects." It is, therefore, possible to include in the carrier modulation frequencies covering practically the whole of the audible spectrum, and it is only on account of the impossibility of receiving the higher audio frequencies under the present condition of ether congestion in the broadcasting wavebands that the actual frequencies transmitted are considerably curtailed.

There is only one other matter in connection with transmissions which need be mentioned, namely, that, for technical reasons which cannot be explained in detail in this article, it is found necessary to adopt in the control room a process of "contrast compression" whereby the loudest sections of the programme are reduced somewhat and the softest sections amplified to a certain extent. The practical result is that the audible difference between fortissimo and pianissimo passages, that is the light and shade of the music, is not so marked when reproduced by the speaker as it would be if the original performance was heard in a concert hall. The necessity for this "mutilation" of the light and shade is, unfortunately, inevitable and will not really be removed by transmission on the ultra-short waves, but it may be noted in passing that devices have been developed whereby a special circuit in the receiver restores, to some extent, the contrast of the programme; these devices being applicable to any type of receiver, and for any wave-band.



To ensure high quality on the ultra-short wavelengths when using a superhet, a special I.F. transformer of this type may be used. A band width of over 2 megacycles may be obtained with this component.

Reception Conditions

Reception conditions at present really represent the main source of limitation of the degree of tonal fidelity attainable. Of the various aspects of reception conditions that of mutual interference between stations is perhaps the most important. The causes of mutual interference have been described many times in these pages and are generally known, but in view of the fact that transmissions on the ultra-short waves will undoubtedly effect a great improvement in this direction it is advisable to deal with the matter from a slightly different angle. To begin with, the fundamental conception of wavelength must, for the moment, be put aside and the carrier wave considered as occupying a single fixed frequency in the broadcast spectrum—a frequency of, for example, one million cycles for a 300-metre wave and so on. When the carrier is modulated with sound the physical effect is to produce, on either side of the fundamental frequency of the station, a band of new frequencies consisting of values between two limits—the upper limit being the fundamental station frequency plus the highest musical frequency transmitted, and the lower limit being the fundamental station frequency minus the highest musical frequency transmitted. By reason of these "sidebands," as they are called, each station monopolises a band of radio frequencies equal in width to twice the highest musical frequency transmitted and, unless the fundamental station frequency of two programmes differ by at least this amount, their sidebands will overlap and interference will be experienced.

Now assuming that the highest audio frequency which it is decided to transmit is 10,000 cycles—a figure none too high for even reasonably good reproduction—it would be necessary to select carrier frequencies for broadcasting stations at intervals of 20 kilocycles per second in order to avoid all risk of interference. The medium-wave broadcast band covers a width of just 1,000 kilocycles, and on the basis of a 20-kilocycle station separation contains room for only 50 channels. But according to the latest list of European broadcasting stations, there are, in actual fact, nearly 110 channels allotted in this band, corresponding to only 9 kilocycle separation and, moreover, these channels are shared by nearly 200 stations. Such a degree of congestion means two things. In the first place, receivers must be made so selective that they can separate stations operating on adjacent channels separated by only 9 kilocycles. This is done by so

(Continued overleaf)

SHORT WAVE SECTION

(Continued from previous page)

sharpening the tuning that all the side-bands are cut off above 4,500 cycles on either side of the station frequency so that no note or overtone above 4,500 cycles is reproduced. As quality reproduction depends upon the due reception and re-creation of these higher frequencies, quality reproduction of the ordinary broadcast programmes is impossible except in certain specially favourable circumstances to be explained later, or by manufacturing an artificial treble response in the set itself. The second result of ether congestion is that, since very little above 4,500 cycles is able to be reproduced, there seems little point in transmitting frequencies greatly in excess of this figure, so that the programmes put out from certain stations are not so perfectly transmitted as they might be.

Relative Field Strengths

There is another point in connection with the question of mutual interference between stations which ought to be explained because it plays a big part in the improvement which can be expected when ultra-short-wave transmissions become available. It is that the degree of such interference depends to a great extent upon the relative field strengths, at the point of reception, of two stations occupying adjacent or practically adjacent channels. If, by reason of a station's power or the geographical situation of the listener's aerial these field strengths are comparable, only the highest degree of selectivity, equivalent to the very serious cutting of the side-bands, will give reasonable interference-free reception of either, and even so there is a considerable risk of some of the higher harmonics of the unwanted programme obtruding themselves on the wanted programme as "side-band splash"—that annoying semi-whispering noise which sometimes mars reception.

It must now be shown how the selectivity difficulty is greatly eased, if not entirely removed on the ultra-short waves. It has been stated that for reasonable quality there is room for approximately fifty channels on the medium waveband, and this statement can be even qualified by saying that for really good quality and the complete elimination of the risk of interference, the frequency separation of stations should be further widened, reducing the number of available channels to two or three dozen only, a matter which is impossible of achievement, having in mind the natural aspirations of the many different broadcasting stations. But on the ultra-short waves, the frequency range corresponding to the available band of wavelengths is much greater. For example, between wavelengths of 8 and 5 metres there is a frequency difference of no less than 22,500 kilocycles per second which, allowing for the very liberal frequency separation of 50 kilocycles between adjacent channels, gives room for 450 stations. Probably, such a wide separation would not be necessary, in which case the number of channels could be further increased. Moreover, 5 metres and 8 metres do not in any way represent the limits of the ultra-short waveband, and good results have been obtained on even 2 metres, so that between 1,000 and 2,000 channels can be accommodated.

Nor is this all, for the range of ultra-short-wave transmissions is more limited than for the medium waves, which means that the more distant stations will not interfere with those closer to the listener's aerial, even if the station frequency separation was not increased greatly beyond the present figures, so that still more stations could be accommodated without fear of mutual interference.

The Result

The practical implications of these facts are four-fold. In the first place frequency separation could be increased to values which would make mutual interference physically impossible; second, there would then be no reason for restricting the radiation of the widest possible band of audio frequencies, thus greatly improving the quality of transmissions; third, the limited range of ultra-short-wave radiations not only assists in avoiding the risk of mutual interference but offers possibilities of a wider choice of alternative programmes from local stations, either by way of separate performances or through relays from more distant stations. In this connection it is one of the disadvantages of high-quality reception at the present time that it must be limited to the reception of a very few programmes, for in very few spots is it found possible to select more than some half-dozen stations—and usually not more than two or three, which are receivable under *high quality* conditions. Fourth, the need for highly selective circuits being eliminated, the performance capabilities of receivers, from the quality point of view, can be very greatly improved, and this brings us to the third factor in quality reception, namely the receiver.

There are two aspects of receiver design which mainly affect quality. The first is the consideration of selectivity. The wider channel separations permissible with ultra-short-wave transmissions, and the reduction of interference due to the more limited distances covered by the stations, will render highly selective circuits for ultra-short-wave reception unnecessary so that the full advantage of the complete audio band can be taken. The remaining limiting factor in the receiver is the fidelity of the frequency response in the circuits, and in this connection all that it is necessary to say is that it has been proved conclusively that a substantially flat response curve is attainable readily over the whole of the useful frequency range, and that no difficulty of any kind need be anticipated in the design and construction of high-fidelity sets.

The Loud-speaker

Finally, but still of major importance, is the question of the loud-speaker. It has been shown that from the points of view of transmission, reception conditions, and set design there is nothing to mar the chances of very high quality in ultra-short-wave programmes—but there remains the loud-speaker. Listeners must recognise the fact that it will be quite useless to attempt to obtain even noticeable improvement in quality, in spite of the wonderful possibilities of ultra-short-wave working, unless the speaker used is capable of reproducing a wide band of frequencies. A number of suitable instruments are available to-day, and even many of the less expensive "ordinary" speakers have frequency responses beyond the capabilities of highly selective receivers, and it is safe to say that the average standard of speaker response will be still further improved in order to take full advantage of ultra-short-wave possibilities.

Leaves from a Short-wave Log

Swedish Relays

SO far there has been no short-wave relay of the Swedish programmes, although roughly twelve months ago we were told that the Stockholm broadcasting authorities were planning the installation of a special transmitter for this purpose. You may shortly hear excerpts of the Stockholm-Motala radio entertainments on about 25 metres, as I learn that a Swedish amateur station, SM5SX, whose address is Artillerigatan, 77, Stockholm, proposes to carry out such tests shortly. It is reported that the experiments are being made in conjunction with the Royal Technical Institute of the Stockholm University.

New Transmissions

Two new transmissions of which you may care to make a note are KAZ, the 40-kilowatt transmitter of the R.C.A. (U.S.A.), which frequently relays programmes from the medium-waver "Radio Manila" (KZRM, Manila, Philippine Islands). The channel is 30.03 m. (9,990 kc/s) and the time at which this broadcast was heard was between B.S.T. 10.00-11.00.

W2XBG, Hicksville (N.Y.) on 46.67 m. (6,427 kc/s), is an experimental station installed by Press Wireless Inc. for the transmission of news bulletins "in clear." A search should be made for these signals between B.S.T. 02.00-04.00.

We may shortly expect to pick up tests carried out by VK6ME, Perth (W. Australia) on 30.15 m. (9,950 kc/s), although I understand that later it will use the same frequency as VK2ME, Sydney. The latest news states that it may be ready by August.

South Americans

HI8Q, Ciudad Trujillo (Dominican Republic), which must still be considered a newcomer to the ether, does not yet appear to possess a regular schedule, but may be heard on some nights testing broadcasts on 48.08 m. (6,240 kc/s). The call is Radio-difusora HI8Q (phonetic: *achay-oono-otchecoo*), *Emisora Reale*. Although no address is given, I understand that reports should be sent to Señores Abbes y Garcia, Trujillo City (Dominican Republic). Another South American broadcaster which has been logged more frequently during the past few days is YV7RMO, Maracaibo (Venezuela), which was working at the beginning of the year on 51.46 m. (5,810 kc/s), and which is now found on 49.42 m. (6,070 kc/s) immediately below the reading of OXY, Skamlebaek. In its announcements it calls itself: *La Estación del Pueblo y Papa del Pueblo*, which I translate as the People's Station and the Father (?) of the People. Here again the transmitter does not seem to work to a regular schedule, but the broadcasts have been picked up between B.S.T. 02.00-04.00. Just below the condenser readings of JVN, Nazaki-Tokio (28.14 m.), you should try for CEC, La Granja, Santiago (Chile), which, operating on 28.12 m. (10,670 kc/s), with a power of 4 kilowatts is on the air nightly from 01.00-02.15.



METER SNAGS

The Beginner can Easily be Misled by the Use of Unsuitable Measuring Instruments and Some of the Pitfalls are Explained in this Article

THE amateur who is beginning to take a keener interest in his hobby of radio often realises that one of the first steps to a better knowledge is the acquisition of a meter or measuring instrument. He thereupon goes to the nearest radio shop and obtains one of the popular "dual range or double-reading voltmeters" which may be obtained for a sum as low as 10½d. Armed with this he attacks his radio problems by commencing to test his H.T., L.T. and G.B. batteries, and if the particular meter is also provided with a milliamp. scale he includes it in some convenient part of the circuit and then perhaps proceeds to wonder why the current is so low, or why he gets such good results from an H.T. battery which reads only 50 or 60 volts instead of 100 or more as he expected. The old hand will realise the difficulties which the beginner will encounter if he proceeds to rely upon this type of instrument, but, unfortunately, the oft repeated advice to purchase a meter having a resistance of 1,000 ohms per volt is met with either derision or amazement, and it still appears that readers endeavour to rely upon the cheap type of instrument to enable them to put a receiver in working order.

What Resistance Means

There are many different types of meter upon the market, but we will first explain why the cheap double-reading meter may prove misleading unless used only for particular purposes. On some of these meters it will be found that one voltage range (generally 0 to 12) is marked in black figures, whilst the high range, generally from 0 to 120, is marked in red figures, and upon the face of the instrument will appear the letter R followed by a figure, on one side of the dial in black and on the other in red. These figures indicate the resistance of the meter on both ranges, and a typical cheap meter will probably be found to have values of 200 ohms on the low-voltage range and 2,000 ohms on the high-voltage range, and to many amateurs these figures may appear to be unimportant.

Applying Ohm's Law

However, from the familiar Ohm's Law, we know that current is relative to voltage and resistance, and therefore if we have a meter reading 120 volts with a resistance of 2,000 ohms we can see that the current passing through that resistance (the meter) will be 120 divided by 2,000, or 60 milliamps. How many small battery receivers have an H.T. consumption approaching that value? Yet this means that if the meter is joined across the H.T. battery sockets in order to test the voltage of it, a current of 60 mA will be drawn, and so in a very few seconds you will be taking as much from the battery as your receiver would take in many hours of listening. Apart from this, however, you will not get a true idea of the state of the battery for the following reason. Suppose that the battery has been in use for some long time and is therefore in rather a poor state. Your receiver may consume, say, 10 or 15 mA, and the battery may be in such state that it can just about maintain this load for another week or so without the voltage dropping unduly. It is presumed, of course, that the reader is aware that current and voltage are related, and that as the current drain rises the voltage supplied will fall off, and vice versa. Well, then, when the meter is applied across such a battery, owing to the much higher current which is taken to drive the meter needle across the dial, the voltage which is indicated will be much less than the actual voltage of the battery. It may be argued that this will result in the user throwing away a battery which in any case is nearly exhausted, and is thus likely to give rise to trouble, but the main point is that the user is deprived of some hours of good listening due to the sudden load which has been imposed on the battery.

The Grid Battery

In the case of the grid-bias battery it must be remembered that no current is normally taken, and, therefore, if the cheap meter is used at frequent intervals an unnecessary drain is imposed and the life proportionately shortened. In the actual receiver circuit even more misleading results will be obtained, as in many cases the current taken by the meter will be added to that already taken in that part of the circuit, and thus will give either a lower voltage reading than is required, or will fail to give a reading at all. The latter trouble will occur if the voltage to the detector stage is measured, as in this stage the normal current is only of the order of 1 mA or so, and therefore the addition of a further drain of 60 mA will show its effect in the voltage dropped across the resistance in the anode circuit, in addition to which the detector valve may have a resistance of such a low value that it will also modify the current taken and so add to the trouble.

Measuring Anode Current

Suppose that the amateur wishes to know the anode current taken by the output valve. This may be about 9 or 10 mA for a good power valve, and normally included in the anode circuit will be a loudspeaker transformer primary having a D.C. resistance of perhaps 1,000 ohms, across which a drop of 10 volts would occur. If, now, a further resistance of 2,000 ohms is included in series (as it would be to read the anode current), a further drop of 20 volts would occur, and this will naturally result in a wrong reading being shown.

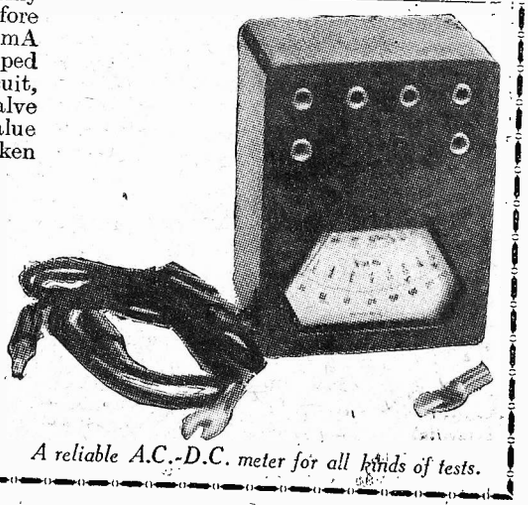
Versatility

Finally, the type of meter just referred to will only be suitable for instantaneous readings of voltage as delivered by the L.T. and H.T. batteries, and must therefore be placed in circuit and removed as quickly as possible, and beyond this they have no further application. On the other hand, if the amateur obtains one of the better-class of meters having a resistance of 1,000 ohms per volt, this may be used to test the batteries or to take actual readings whilst the receiver is working, and will give a true indication of the state of affairs. A better scheme, of course, is to obtain only a very low-reading milliammeter and to use this in conjunction with various resistances in order to take readings of voltage, current and other things, and this will give the amateur not only much better service, but will provide him with a device which will give many hours of interesting study in the way of showing how various components function, the effect of different methods of coupling, and so on. Practically all the large service-testing devices have as their basis a meter such as this, and the money required for such an item is well repaid.

H.T. SUPPLIES

IT may be noted that a transformer is connected between the mains leads and the rectifier; this serves the purpose of isolating the mains from the receiver and also drops or increases the voltage to that required by the rectifier. The choice of rectifier and transformer is important, and therefore the beginner is advised not to attempt the home-construction of an A.C. unit without consulting an experienced designer, or following a reliable published design.

The running cost of a mains unit is decidedly lower than that of batteries, and therefore if a mains supply is available it is advisable to use an eliminator. A possible draw-back of the eliminator as compared with the battery is the existence of mains hum, but if the unit is well designed this should not be sufficiently strong to affect reception materially.



A reliable A.C.-D.C. meter for all kinds of tests.

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

Midget Accumulators

READERS who are building miniature receivers and similar apparatus utilising the Hivac Midget valves and similar midget components will be interested to know that special midget accumulators are now available from the A.E.F. Manufacturing Co., of 17, Queensway, Ponders End, Middx. These accumulators are supplied with the jelly electrolyte and are fully charged ready for use. They should be given a re-charge when the voltage drops to 1.8 volts, or at least every three or four weeks, whether the accumulator has been in use or not.

To re-charge it is only necessary to remove the stopper, add sulphuric acid (1.200 Sp.G.) just sufficient to moisten the jelly and to charge at the rate specified on the label for approximately twelve to sixteen hours. After charge, and before putting the accumulator into service, all excess liquid should be drained off and the stopper replaced.

A range of 2 volt Midgets is given below, but the makers can supply any particular shape, size or capacity to special order.

TYPE	CAPACITY at 20 Hour Rate	Max. Discharge Rate, Amperes	Dimensions Overall in Inches			WEIGHT Charged, Ozs.	PRICE
			LENGTH	WIDTH	HEIGHT		
M 1	2	.2	1¼	1	3	8	4/9
M 2	2½	.25	1⅞	1	3 3/16	9	5/-
M 3	2	.2	3⅛	¾	2½	6	4/9
M 4	3	.3	2⅞	1	2¾	10	5/6
M 5	4	.4	3⅛	1	2¾	12	5/6
M 6	4	.4	3⅛	1 3/16	2½	12	5/9
M 7	5	.5	2½	1¼	3⅜	15	6/3
M 8	7	.7	3⅛	2⅛	2½	17	9/9
C P 5	10	1	2⅜	1½	5⅜	24	7/6

New H.M.V. Receivers

ALTHOUGH details of the H.M.V. new range of instruments are not yet available, it is stated that it will be one of the most comprehensive planned by the company. Full details, with specifications, prices and descriptions, will be published on August 10th next, but it is announced that the models already released will be supplemented by a series of battery receivers, mains receivers and radio-gramophones based on a family of 3 valve, 4 valve, 5 valve and 6 valve all-wave chassis.

New Colvern Coils

TEN new types of "Colpak" tuning unit have now been added to the Colvern range, bringing up the total to twelve models, suitable for practically every need, and ranging in price from £1 19s. to £3 15s. 6d. These tuning units consist of a set of Ferrocart iron-core coils and a ganged condenser, ready wired and ready for inclusion in a receiver. Various circuit arrangements are employed, including the superhet, and the full range will be shown at Olympia, together with a large number of the existing components which will be retained for the coming season.

Osram Gas-filled Relay

AN argon-filled relay, type GT1B, is shortly to be released by the General Electric Company. This is of particular interest in the construction of television time-bases and similar apparatus, and is provided with a heater rated at 4 volts 1.3 amps., and is fitted with a standard 5-pin base. The price is 20s.

Radio-meter Test Equipment

A NUMBER of new test instruments will shortly be introduced by Radiometers Ltd. and will be seen at the forthcoming Olympia exhibition. An adaptor and Allvalve Tester will appeal to the serviceman, as they enable all valves to be tested and include a 36 socket panel. A high-resistance moving-iron A.C. voltmeter with four ranges from 5 to 1,000 volts costing 3 guineas will also prove of value to set-testers and servicemen, whilst for resistance and capacity tests a special bridge with a directly calibrated scale suitable for measuring resistances from 100 ohms to 2 megohms and capacities from .00002 to 25 mfd. will be sold at 6 gns. A D.C. volt-milliamp-ohm meter with a resistance of 1,000 ohms per volt is also to be listed at 5 gns. and has ranges of 10, 25, 100, 250 and 1,000 volts, 25, 100 and 250 mA and 1 to 1,000 ohms.

Atlas Mains Units

MESSRS. H. CLARKE AND CO. (Manchester) Ltd. announce two new H.T. mains units both suitable for Class B and Q.P.P. receivers, and delivering 12 or 25 mA at 120 or 150 volts, according to the load. The first unit has three additional H.T. tappings and costs £2 7s. 6d., whilst the second has a similar arrangement but incorporates in addition an L.T. trickle charger designed to deliver .5 amps., for 2-volt batteries. This unit costs £2 17s. 6d.

A Tropical S.W. Set

MESSRS. STRATTON AND CO., makers of the well-known Eddystone short-wave apparatus, announce that they will shortly be introducing a special battery superhet designed primarily for use in the tropics. Full details are not yet available, but it is stated that the receiver will cover all the more popular wavebands and will be known as the Eddystone All-world Eight.

Rothermel Tuning Unit

A NEW tuning unit is to be produced by Messrs. Rothermel Ltd., and is to be given the novel name of the "Radio Heart." This will consist of a tuning coil and condenser assembly, with the necessary switch and coupling components, valve-holders, etc., ready wired and assembled for inclusion in a receiver. It will cover the short wavelengths from 16.5 metres upwards as well as the normal medium and long waves, and forms the nucleus of a superhet receiver, complete with oscillator section. The price will be £5 17s. 6d. ready aligned and calibrated, with an aeroplane dial.

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. F. (Blackpool). The trouble may be due to the H.F. choke you are using or to the damping of the aerial and earth system. Have you tried a condenser in the aerial lead?

L. D. (Carlow). We cannot supply the blueprint and do not know where one could be obtained. There is no standard book on the subject for the amateur so far as we are aware.

F. C. W. (Henley-on-Thames). It is possible to do as you say, but results are not worth while. A lower-rated valve will give better results with the low H.T. voltage.

F. S. (Edmonton). We have described several eliminators of the type mentioned, but you do not state the current you wish to take. If you let us have further details we may be able to recommend a suitable circuit.

F. E. S. (Gaywood). We cannot supply a diagram to enable you to use up the old coils and components. If you wish to build the latest superhet we suggest that you dispose of the present set as it stands and buy the necessary new parts for the Superhet 4.

G. T. G. (Walworth). We do not advise you to attempt to bring the set up-to-date, but to find out what has gone wrong. It is obvious that some component has broken down and we suggest that you check the eliminator first, and then the L.F. coupling components. Is the speaker in good order?

K. J. R. (Edgbaston). As no current is indicated when the set "goes dead" it would appear that either the L.T. or the H.T. is interrupted. The switch would be the most likely cause of this and we suggest that you short-circuit the switch contacts with some bare wire in order to test whether or not this is faulty.

F. R. (Bookham). Try the H.F. choke. You will no doubt find that this is inefficient and may be dispensed with in this particular circuit.

H. V. B. (Norwich). The choke should not be included in the mains lead as it will not carry the current. Special chokes are obtainable designed for this purpose.

J. E. (Holloway). Write to the Westinghouse Company giving them full details.

B. A. (York). We cannot trace the firm and it would appear that they have gone out of business since the last exhibition.

N. I. S. (Conway). We cannot service the receiver as it is not one of our designs. A good local radio dealer should be able to solve the mystery in a very short time with suitable instruments.

A. E. (Perth). We cannot trace the manufacturers but suggest that you communicate with the A. E. F. Manufacturing Company, whose advertisement appears in this issue.

S. W. E. (Truro). We do not intend to issue any instructions until the transmissions commence. This will avoid disappointment due to insufficient working data.

G. T. (Bristol). Neither of the valves should be used. You should communicate with the makers of the receiver and obtain their advice as to the best type of replacement.

F. R. (Blackheath). The dial is not novel and we have seen several similar arrangements in commercial receivers. However, perhaps you would prefer to get into touch with some good patent agent with a view to obtaining a more "official" view.

M. A. F. (Coventry). If selectivity is your main consideration we suggest you consider a good superhet. A good dealer may be able to give you a demonstration which will enable you to judge the particular local conditions.

G. H. (Dundee). Types 80 and 81 are not interchangeable, as type 80 is a full-wave rectifier, whilst 81 is a half-wave rectifier. Type 59 is a power amplifier. Furthermore, type 50 and type 81 has a 7.5 volt heater, whilst type 80 has a 50-volt heater. Thus the valves are not suitable for replacement one with the other.

A. T. (Newton Ramsbury). Unfortunately your address was torn from your letter and we cannot therefore reply by post. We do not supply blueprints for commercial receivers, and suggest that you communicate direct with the General Electric Company, Magnet House, Kingsway, W.C.2.

A. H. (Worth). We cannot trace the set referred to, and cannot insert requests for readers to supply back numbers.

W. Y. (Birmingham). The trouble is probably in the transformer primary winding and this may be checked by short-circuiting the winding, when the noise should cease. However, communicate direct with the makers or their local service agent.

L. P. B. (Bovington Camp). The fuse connection is quite correct. The S.W. Adaptor-converter, blueprint P. W. 48A, should be quite suitable.

J. B. (Hawick). No blueprint is now available for the particular receiver mentioned by you.

C. S. O'B. (Dublin). We cannot recommend any of our blueprints for the parts listed. You do not give any coil types.

J. S. (E.9). A blue glow generally indicates that the valve is being over-run. This may be due to excessive H.T. or insufficient G.B. and, therefore, these points should be checked.

F. R. T. (Paignton). We have no blueprint of the particular receiver nor of any similar set, but next week hope to publish details of a small portable which may meet your requirements.

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).

An Amateur's Station

SIR,—As a regular reader of your very interesting short-wave section, I trust that the enclosed photo and details of my receiving station will be of interest. The small receiver to the left is a 1-v-1, the R.F. stage being untuned, and I use this entirely for reception of DX-CW with 'phones. Beside it is a 2-v-3, having two tuned R.F. stages, an R.F. pentode working as a detector, transformer-coupled to the A.F. stage, which in turn is transformer-coupled to two super-power valves in parallel. This set is entirely home constructed, even down to the metal chassis and tuning condensers, and is the outcome of nearly a year's experiments. Stations from all over the world are received at local strength, Europe coming in with absolutely no reaction, and also America, given fair conditions.

Trouble was at first experienced with selectivity, but I have cured this by making my own "iron cored" short-wave coils. Loss of signals, due to the iron cores is negligible, as the two R.F. pentodes provide ample amplification.

The total anode consumption of this set is rather hefty, being 54 milliamps, so I am working from wet H.T. cells. Regarding the DX here, all continents have been verified, and 57 countries, including such places as Hong Kong, Bolivia, Peru, Salvador, Korea, Alaska, Mauritius, Hawaii, Ceylon, Siberia, Japan, New Zealand, Australia, and Ascension Island, etc.

The antenna has a 30ft. top, 30ft. down lead, is 30ft. high, and points due N. and S.

Sincerely hoping that the above will be of interest to your many short-wave "fans," and wishing your excellent weekly every success.—S. HOPPER (Brighton).

A Reader's Circuit

SIR,—*Re* Mr. Parker's letter (July 4th issue) and those of Messrs. Barce, Smith and Thornton (July 18th), I have been working on such a set as they require, and have evolved a circuit which appears to be eminently suitable. It is a 5-valve superhet on s.-wave bands, and a 3-valve 0-v-2 on medium and long waves. The circuit is extremely simple, and suited to amateurs who have on hand spare components, as all components are quite standard, normal det. S.G. and L.F. valves being used. The switching is also very simple, *i.e.*, one on/off switch and one 3-position wave-change switch. This latter brings in on s.-wave an extra 2 valves, making it a superhet. On M. and L. waves these 2 valves are cut out, giving L.T. economy.

The set, therefore, is cheap and easy to build, and if anything more ambitious is required extra stages could easily be added to my circuit, and more modern valves could be used. If anyone is interested in details of this receiver I should be pleased to supply them.—CYRIL SALTER (Hayes).

A Good S.W. One-valver

SIR,—I built one of your short-wave sets, a one-valver, last January, and have been amazed at the results.

Here are some stations received :—

Zeesen on 7 wavelengths, 2RO (25 and 31 m.), TPA2-3-4, HAS3, LRU, SPW, EAQ, LKJ1, PMN, OER2, RW59, CT1AA, ORK, OXY, HBP, VQ7LO, VK2ME, JVM, JVH, HVJ (19 and 50 m.), W3XAL, (16 and 49 m.), W2XAD, W2XAF, W2XE, W1XAL, W1XK, W3XAU, W8XK (19 and 25 m.). On the amateur bands :—

G2-5-6-8, W1-2-3-4-5-6-8-9, F3-8, LA, EA1-2-3-4-5-7-8, HB, PA, PI, CT, VE1-3, VO, EI, ON, OZ, SM, LY, OE, OK, I, LX, CO, PY, YN, HI, U, NY, VU, VP6, YV, SU. I have also heard many amateur and commercial morse stations.—N. L. PALMER (Thornton Heath).

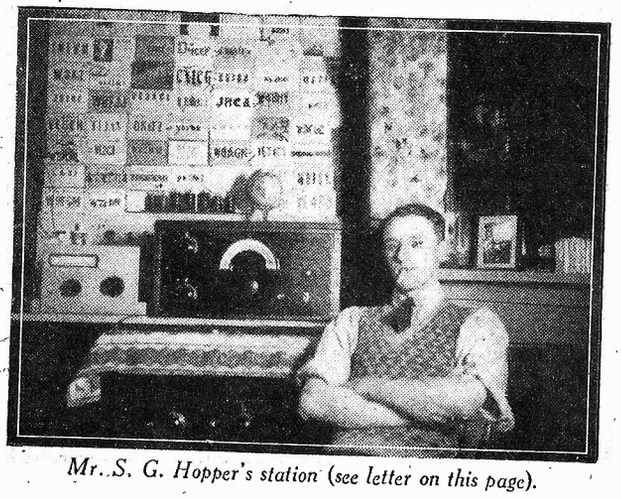
CUT THIS OUT EACH WEEK.

Do you know

—THAT when inductances are connected in parallel the total inductance is equal to the reciprocal of the sum of the reciprocals.
—THAT instability when using a pick-up with long leads may often be overcome by including an H.F. choke in the lead from the grid with a by-pass condenser to earth.
—THAT the tuned-anode circuit provides the greatest degree of amplification, and upon this account is likely to provide most difficulty from the point of view of stability.
—THAT when using an output filter circuit the inductance of the choke will affect the response and must be carefully chosen.
—THAT ordinary flash-lamp bulbs are not suitable for dial lights in a battery receiver unless a switch is included to open-circuit them when a station has been located.
—THAT the reason for the above precaution is that the current consumption of the average bulb is equal to, and sometimes greater than, three ordinary battery valves.

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, *George 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.



Mr. S. G. Hopper's station (see letter on this page).

BOOK RECEIVED

PROBLEMS IN RADIO ENGINEERING, by E. T. A. Rapson, A.C.G.I., D.I.C. etc. 103 pp. (Second Edition.) Published by Pitman, price 3s. 6d.

THIS book has been written to facilitate class-work in Radio Engineering and fully meets the requirements of students who are preparing for the Higher National Certificates in Electrical Engineering. It includes many problems and examples drawn from past examination papers of the City and Guilds of London Institute in Radio Communication, the Institution of Electrical Engineers in Electrical Communications, and the University of London in Telegraphy and Telephony. Forty-two separate subjects are dealt with, varying from capacitance and inductance to television, and all the test questions which are set in each section are referenced with regard to the examination paper from which they are taken. Ten pages are devoted at the back of the book to solutions to the examples given so that the student can check his answers. The book will prove invaluable to the student for either class or private study.

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 West London Radio Society

AT the Annual Ealing Hospital fête held in Walpole Park on Saturday, July 4th, this society provided a side-show which proved to be one of the most popular and attractive of the tents in the park. There was an interesting display of old wireless relics beside modern radio apparatus, of acorn beside transmitting valves, of crystal sets beside radio-gramophones, and many loudspeakers, amplifiers and microphones.

A "radio car," constructed by one of our members, which had to be steered over a winding course without the neon light striking, which it did when the car went off the road, was of great interest to the crowd. Gramophone records of one's own voice could be made in the same tent. An enjoyable day was spent by all members of the society who helped at this function.

Particulars of this radio society may be obtained from the hon. sec., H. A. Williamson, 22, Cambourne Avenue, West Ealing, W.13.

Irish Short-wave Radio Club

A LONG-FELT want has been filled by the inauguration of a short-wave club for those keenly interested experimenters who find that radio still holds a fascinating thrill if activities are directed on short waves and their ultimate possibilities. The value of such an association to the experimenter is incalculable in its scope for the advancement of ideas through experimental work, lectures, testing and examination of new apparatus, and general pooling of ideas gained from research. At the outset, work will be confined to reception only, but at a later date the transmission side will be dealt with, and it is planned to erect an experimental transmitter for members' benefit. In addition the services of two well-known Dublin amateurs will be available for lecture work. These are E.1.2.F. and E.1.8.D.

The terms of membership are : Entrance fee 2s. ; weekly subscription, 6d. ; country members, 5s. per annum. Meetings are held every Tuesday evening at 8 p.m. in the club's temporary premises, 47, Dolphins Barn St. Persons wishing to become members should call at the club room on any Tuesday evening at 8 p.m., or apply by letter only to the secretary. All communications should be addressed to the Secretary, Club Room, 47, Dolphins Barn St., Dublin. Secretary : J. O. F. James, 3, Clare Lane.

Practical and Amateur Wireless
BLUEPRINT SERVICE

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.

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	PW36B
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.))	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)	—	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)	—	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, 2 LF (R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	31.8.35	PW36
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	—	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	—	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)	—	PW30A
The Prefect 3 (D, 2LF, RC and trans.)	8.2.36	PW63

PORTABLES.

Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable. (HF Pen, D, Pen)	16.5.36	PW65
Four-valve : Blueprints, 1s. each.		
Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12

MISCELLANEOUS.

S.W. Converter-Adapter (1 valve)	—	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, QPP)	5.8.33	AW396
B.B.C. National Two with Lucerne Coil (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)	2.4.33	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)	—	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
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

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	*Apl.* '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.

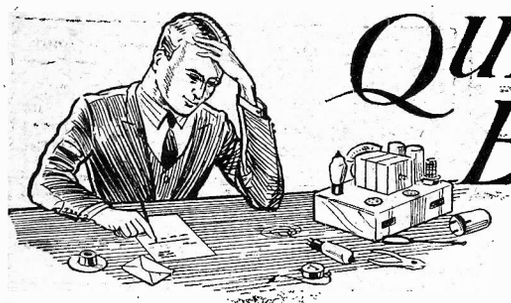
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (price 6d.)	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det, Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
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	WM43
New style Short-wave Adapter (1s.)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW402
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet Converter	*Dec.* 1, '34	AW457



QUERIES and ENQUIRIES

Burnt-out Volume Control

"I have built a three-valve A.C. receiver in which the first stage employs a variable-mu H.F. pentode. This has never worked really satisfactorily, and the control has been jumpy. Twice I have replaced the control, changing the value each time, but the control works too suddenly and two of them have burnt completely out. Is it possible to give any indication as to what is wrong?"—P. T. S. (Manchester).

IF the wrong value of control has been chosen this will cause the erratic control. Normally the current flowing in this part of the circuit should no cause a burnt-out, and we therefore suggest that you have selected the wrong type of circuit. In an A.C. H.F. stage the usual arrangement is to include the volume control as part of a potentiometer across the total H.T. supply, tapping off a portion for the application of the screen-grid voltage. It would be possible to obtain the latter voltage and yet leave a very high current across the potentiometer which could cause a burn-out, but we would imagine that you have selected the wrong values of resistance for the potentiometer in view of the erratic volume control. If components have been supplied as a kit, check the values of the resistances in the S.G. potentiometer feed, and if colour coded make quite certain that some "noughts" have not been missed out in calculating the values. If they are correctly colour coded or marked, perhaps it would be as well to test them in case they are wrongly marked, although this is hardly likely.

L.F. Distortion

"My four-valve battery set has been giving quite good results, but I have endeavoured to improve quality and have met with the following difficulty. The first L.F. stage was R.C. coupled, and the second transformer coupled, using a —— transformer. I wished to get better bass response and changed the second stage to parallel-feed, but now I find that quality is worse, bass response is not so good, and the volume also is less. Is there any reason for this that you can see from the details I have given you? My aim is better quality and more bass."—G. R. T. (Norwich).

THE transformer you were using is a very high-grade component having a high-inductance primary winding, and is fitted with a by-pass condenser internally mounted and joined across the primary. The high value of the inductance no doubt gave good matching with your previous direct method of connection, and the new arrangement has probably been adopted with a low-value anode resistance in order to permit ample H.T. to be applied to the valve. Consequently the matching is not so good and volume and quality have suffered. The condenser across the primary must also be taken into account in these particular circumstances. We think you will find that by transferring the transformer to the first stage, that is, so that the primary is included in the anode circuit of the detector valve, and by using the resistance-capacity coupling in the second stage, the quality will be improved, but ample H.T. must be employed to permit the second valve to have an adequate working curve, or over-loading will take place and destroy the advantages otherwise gained.

Five- or Seven-pin Pentodes

"While looking through a valve book I found that pentode valves could be bought with either five- or seven-pin bases. I understand that there are three grids, one plate, and two filament connections in a pentode. One of the grids is connected to one side of the filament and so this leaves five connections. What I cannot understand is why have a seven-pin base if only five pins are needed? Are there more 'works' in a seven-pin pentode?"—F. R. (Longdon).

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, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

WE presume that you refer to the indirectly-heated H.F. pentodes, in which a combination of electrodes as mentioned by you is to be found. In the five-pin valve the control grid and the screening grid are joined to two pins whilst the heaters are also joined to two pins. The suppressor grid is then internally connected to the cathode which is joined to the centre or fifth pin, the anode going to the cap on top of the valve. In a seven-pin valve, however, the suppressor grid is brought out to a separate pin so that it may be joined direct to earth, as it will be realised that the cathode will be earthed through a biasing resistor and it may be found, under some circumstances, that the stability will be improved when the suppressor is earthed direct and not through the bias circuit. To ensure stability the seven-pin valve, when of the metallised type, also has the metallising brought out to a separate pin for a similar reason, and we think you will find that the five-pin pentode is now only supplied unmetallised, whereas formerly the metallising was connected direct to the cathode.

Experimental Coils

"As I wish to carry out some experiments on the short waves I should be glad to know what you consider the best method of arranging the tuning circuits. I am not yet certain what wavelength will be best for my experiments, and the new detector experiments I am going to carry out may introduce varying degrees of damping, etc. Would you let me know what you think would be the best method of building the tuned circuits to cover wavelengths from about 5 to 20 metres."—B. L. (Leicester).

AS there is some doubt about the performance of the receiver we think it would be inadvisable to endeavour to use separate coils for aerial coupling, grid tuning and reaction. We do not know, of course, whether your proposed experimental circuits will incorporate a reaction arrangement, but in any case by building a single self-supporting solenoid with heavy gauge wire mounted on a low-loss base, you could fit clips to the various leads and tap these on to different parts of the coil in order to obtain the desired coupling and tuning range. Small clips may be made from springy brass and soldered to the various leads.

Ballast Lamp

"I am trying out a universal receiver with the D.C. mains type of valve. I have several on hand and am not certain regarding the permissible variations in voltage, etc., which may be used in a single circuit. Furthermore, for reasons of economy, I should like to use a standard electric lamp for voltage dropping and should be glad to know how to calculate the correct type of lamp for any particular circuit."—D. O. (Henley).

IT will only be possible to use different voltage ratings when two or more valves may be paralleled to obtain a similar rating to the remaining valves. The governing factor is not the voltage but the current which is passed, and thus the valves must be so arranged that the total current flowing through the heater circuit is correct for each valve, and different types may be used provided that parallel and series connections will enable this important point to be observed. The problem of selecting a suitable electric lamp was dealt with in our issue last week, and we refer you to that for more detailed observations.

A Live Chassis

"I have a home-built mains set in which I have used a chassis bought from a surplus store. This is painted with some kind of cream paint which is very hard, and I have scraped this away for earth connections. The set is unstable, however, and cannot be made to work properly, and, in addition, if I touch the chassis I get a tingling through my finger as though it is alive. Should this be the case, or does it indicate some fault? There is no actual shock, and even if I wet my finger the effect does not rise above a gentle tingling sensation which can be felt as far as the first joint of the finger."—G. B. M. (Finchley).

IF you are on D.C. mains, there is a possibility that a mild shock will be felt when the chassis is touched, owing to the return path to earth through your body. For this reason it is always essential to fit a fixed condenser in the earth lead to avoid blowing the mains fuse in the event of the mains plug being inserted a certain way round in the house socket. The chassis was probably cadmium coated, and it is essential that this should be entirely removed for sound earthing. Without further details, we cannot explain the reason why the set is unstable, but as you are probably on D.C. the above precautions should first be taken. With a set of this type it is also advisable to try the effect of using the receiver without an earth connection.

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

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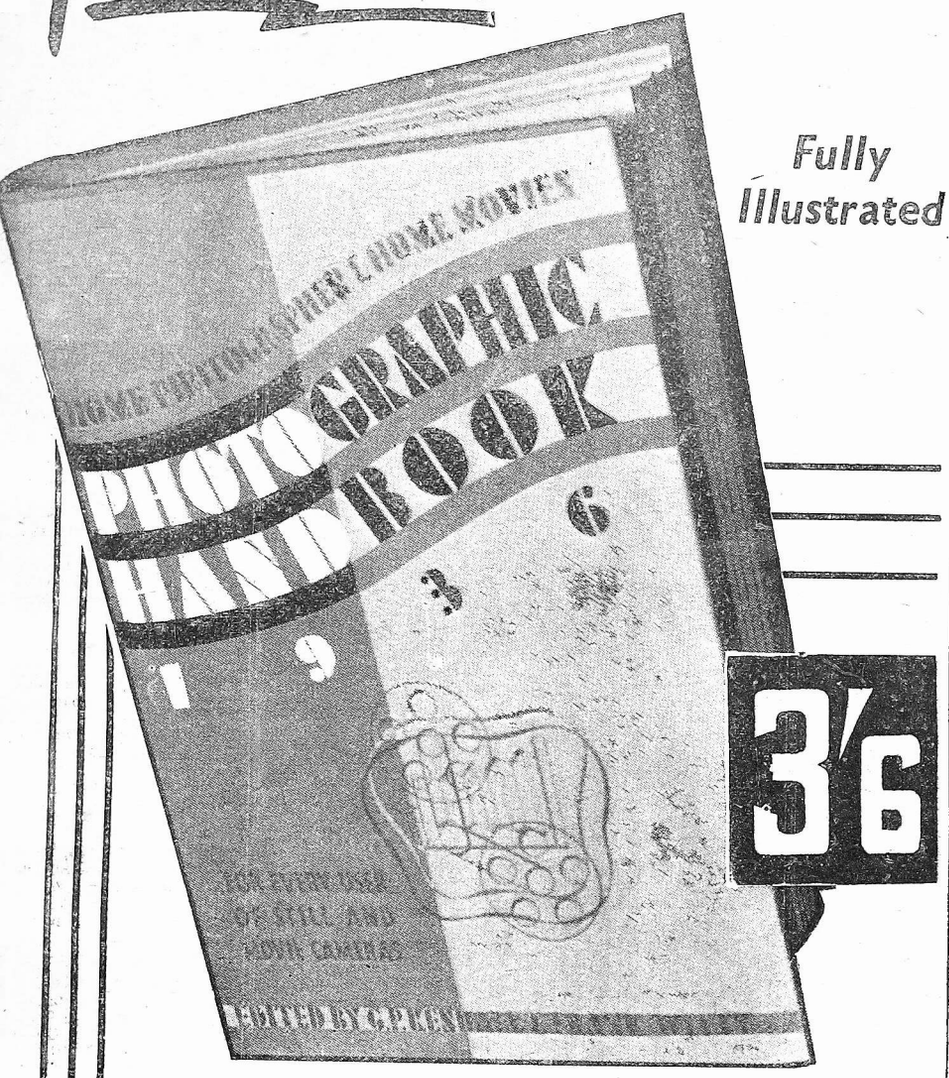
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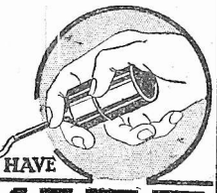
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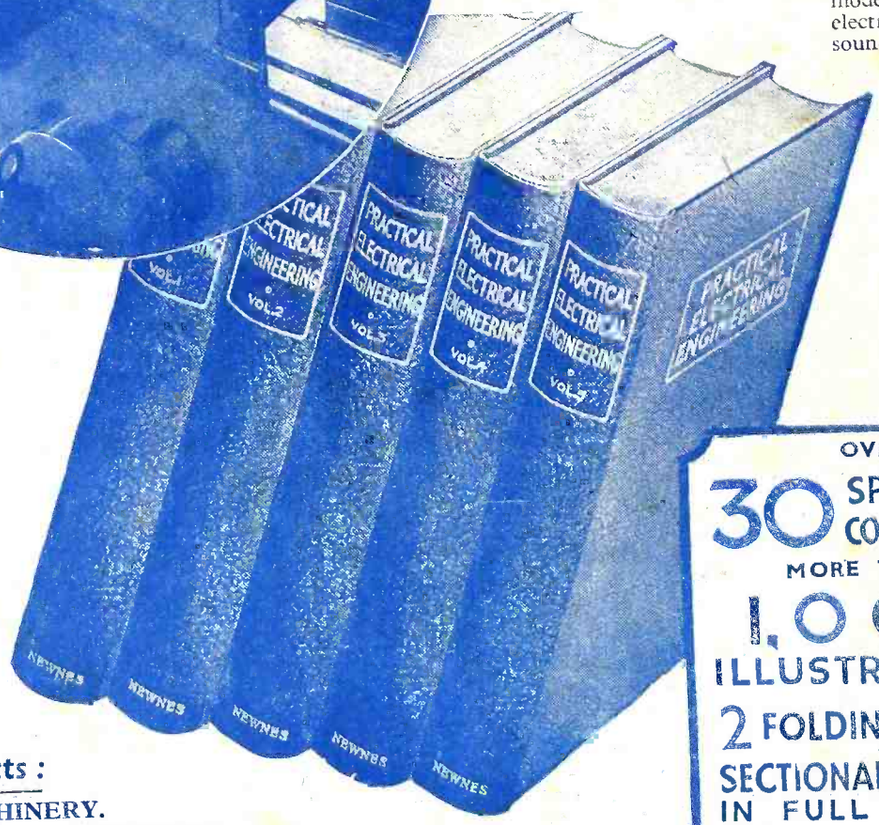
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