A MORNING WITH THE AMATEURS—See page 573

Practical and Amateur Wireless

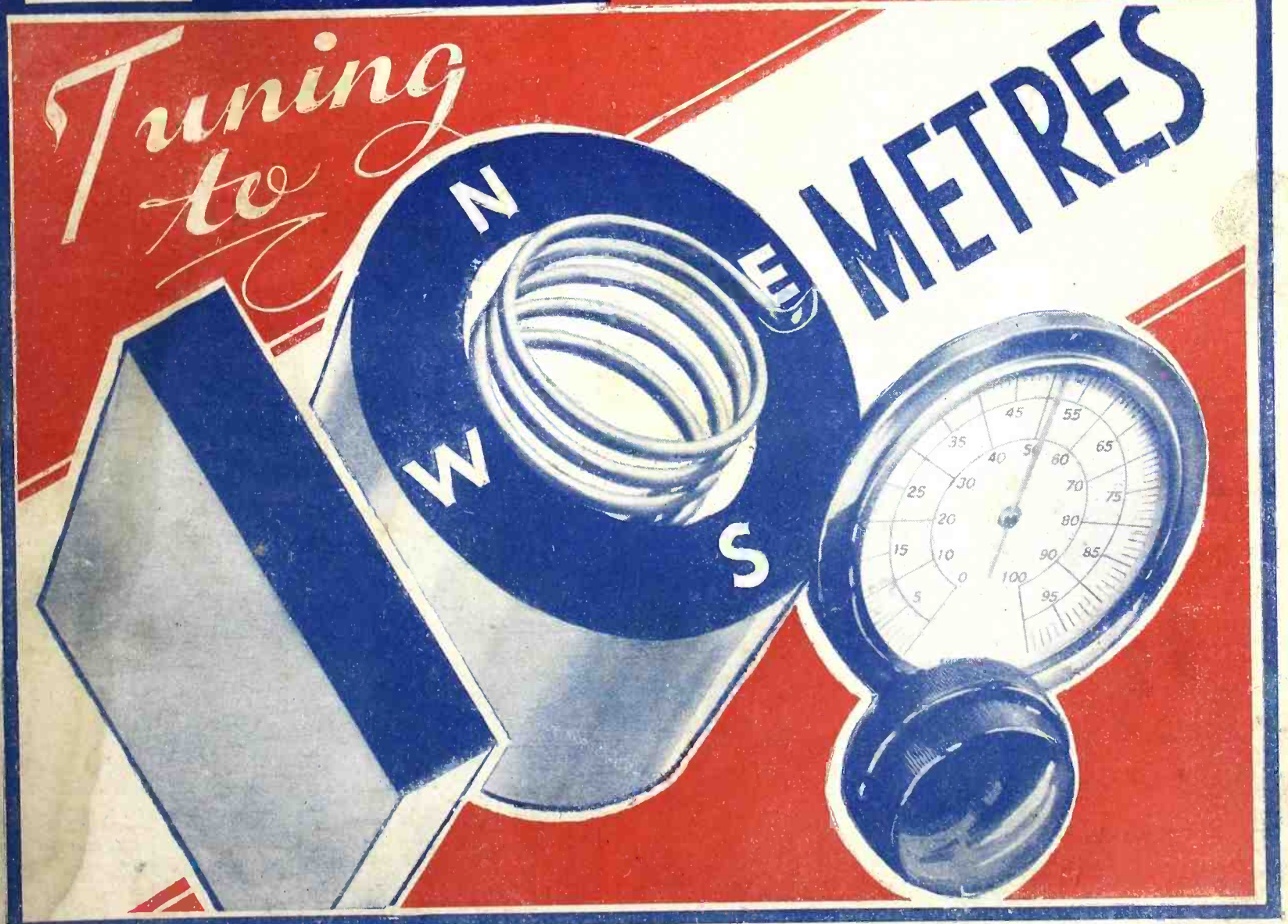
AND PRACTICAL TELEVISION

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 11. No. 281. February 5th, 1938.



The Superhet's Rival—See page 580

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. XI. No. 281. February 5th, 1938.

ROUND *the* WORLD *of* WIRELESS

Down to Ten Metres

IN designing short-wave apparatus it is found that there are certain rules which have to be observed in order to obtain maximum efficiency. Consequently, a receiver which is built to give the 40-metre band will generally be found incapable of giving best results on 10 metres or below. It is customary now to refer to wavelengths up to 10 metres as the ultra-short waves, and from 10 metres to 100 metres as the short waves. When dealing with the wavelengths below 10 metres it is not only essential to avoid all losses, but it will also be found that the wiring of the circuit becomes more difficult owing to the fact that the amount of wire required for tuning is so small. Thus, if proper care is not taken it may easily be found that the wire from a coil holder to the tuning condenser, for instance, is equal in inductance value to the coil required for tuning, and thus it will be impossible to tune down to the desired wavelength. The expedient of mounting the coil direct on the condenser is often adopted in ultra-short-wave apparatus, and in this issue we give some interesting constructional details of a receiver which is suitable for use on 10 metres.

Sunspots

THE recently-discovered sunspots are now definitely blamed for the erratic behaviour of the short waves during the past few months, and it is stated that conditions should now improve. The relationship between sunspots and interference, fading, and other short-wave troubles is claimed to have been definitely established.

Record Hypnosis

IN America it is stated that some special gramophone records have been produced which, played through a radiogram, produce monotonous musical tones and then talk about drowsiness and sleep, and finally suggest that pain has disappeared. They are played over to sufferers from headache, toothache, and similar nervous complaints, and are claimed to remove pain by a process of hypnotism.

Bamboo Pipe Bands

AS a result of a broadcast and series of talks to teachers on how to organise bamboo pipe bands among schoolchildren, it is stated that a number of these bands have now been formed in Ireland. Recitals are to be given over the air by the Pipe Guild's Quartette from time to time.

1937 Overseas Trade

FIGURES now available show that in 1937 Great Britain created a record in the sale of radio apparatus abroad.

ON OTHER PAGES

The favourable balance stands at £450,072, which is almost a threefold increase over the favourable balance for 1936. In 1937 also, the imports from U.S.A. dropped by £82,925 in respect of complete receivers and by £35,000 in respect of valves.

Relay Protest

WITH reference to the G.P.O. Relay proposals in the Southampton district which were recently proposed, the local M.P. has lodged a protest against any town being used for this relay system. He states that he sees no reason why private enterprise should be interfered with, and is satisfied that the retail trade in the town could supply the wants of the people without a relay system.

One-station Sets

A NUMBER of receivers now available in India are of the fix-tuned type, with the tuning pre-set to the local station. It is claimed that these meet with the approval of the natives, who are not keen to tamper with or make adjustments to the "electrical machines."

An Amateur Diver

ON February 17th the Regional programme will include a broadcast from an amateur diver, who will enter a tank and endeavour to carry out some of the tasks met with by a real salvage man. The tank has an observation window through which a member of the Outside Broadcast department will watch proceedings and add his comments to the performance. Rescue arrangements will be handy and the broadcast will end with the amateur diver—John Snagge—breaking surface and having his helmet unscrewed to tell listeners that all is well.

A Zither Broadcast

A RELAY from the Munich studios will be given in the London Regional programme on February 12th and will include an orchestra composed of one hundred German zither players. The melodies have been specially arranged for this orchestra, which is the first of its kind to broadcast. The nearest approach to it was a large balalaika orchestra which was playing in London in the early days of broadcasting.

Radio Version of "Top Hat"

LISTENERS will be interested to know that Richard Dolman, the well-known young stage and screen actor, has been chosen to play the part made famous by Fred Astaire in the forthcoming radio version of the sound film "Top Hat."

Twelve actors were auditioned before a choice was made, and each had the opportunity of singing in a studio one or more of Astaire's numbers in the film. Richard Dolman, incidentally, is a close friend of Fred Astaire, whom he has understudied on the stage. Diana Ward is to play the part originally taken by Ginger Rogers, and the cast will also include Douglas Young, Joan Miller, Dino Galvani and Arthur Pusey.

ROUND the WORLD of WIRELESS (Continued)

Cooking by Wireless

ACCORDING to a message from Berlin, experiments are nearly completed with a new radio device by which meals can be cooked by wireless.

Australia's Millionth Licence

IT is reported that Australia's Director-General of Posts and Telegraphs has just issued the millionth licence for a wireless receiving set. This means that 62 per cent. of Australian homes now have wireless sets.

INTERESTING and TOPICAL NEWS and NOTES

Joe Loss, the well-known band leader, with his fiancée, Miss Mildred Rose, who are to be married at the end of this month.

This percentage is only surpassed by Great Britain, Sweden, Denmark, and the United States.

New Radio Beacons

THE American Department of Commerce have ordered several new radio range stations for transmitting signals for marking the lanes of the National Airways. Commencing next month, the stations are to be installed at the rate of six a month. When an aeroplane is on the correct course, the pilot hears a continuous signal, but when the 'plane is off the course, the pilot hears a broken signal of dot and dash.

High-power Station for Addis Ababa

A MESSAGE from Rome states that a high-power radio station is to be erected in Addis Ababa, through which the Italian Government will broadcast in Italian, Amhara, Galla and Arabic.

World's Bob-sleigh Championship

ARRANGEMENTS have been made to broadcast a description of the famous annual World's Bob-sleigh Championship of St. Moritz. The commentary will be given by Hubert Martineau, well known for his exploits on the Cresta run. The championship is at present held by Fred McEvoy, who will be defending his title. This broadcast will be given in the National Programme on February 10th.

"Music for Faust"

SIX composers who dealt with the Faust legend will be represented in a concert by the City of Birmingham Orchestra from the Town Hall, Birmingham, on February 6th. They are Wagner, Spohr, Berlioz, Liszt, Boito, and Gounod. Leslie Heward will conduct. The solo vocalists will be Nora Gruhn (soprano) and Trefor Jones (tenor).

Pantomime Broadcast

"ALADDIN" at the Theatre Royal, Leeds, on February 7th in the Northern programme, supplies a skilfully devised excerpt. Francis Laidler has arranged it so that despite the broadcast being shorter than in former years listeners will get maximum entertainment and a really fair sample of a show full of good things. Eda Peel as "Aladdin" is principal boy, and Connie Graham is "Widow Twankey," Frank Randle being "The Old Vizier."

Dixon at the Organ

JUDGING from the fervour of his fans, quite a number of people will be hastening home a little earlier on February 9th to hear Reginald Dixon who will be broadcasting from the Tower Ballroom at Blackpool in the Northern programme.

Broadcasts in Esperanto

IN celebration of the tenth anniversary of broadcasts in Esperanto from Brno, the Czechoslovak broadcasting authorities have recently published an 80-page book in Esperanto, giving the history of the broadcasts. Esperantists all over Europe follow with great interest the weekly and monthly features from Brno. The latter, which are always relayed by the powerful Prague station, last an hour or more, and among other ambitious programmes, operas of Smetana and Dvorák have been broadcast entirely in Esperanto.

Encyclopædia Britannica Year Book

WE understand that Sir John Reith and Sir Noel Ashbridge are the contributors on wireless to the new Encyclopædia Britannica Year Book to be published early in April. Sir John is providing 1,500 words on British and European broadcasting, and Sir Noel 1,200 on radio, with references to the technical side. The Year Book, incidentally, will take the form of a complete survey of current political, economic and scientific developments during the year. Its contributors have been recruited from all over the world.

America Speaks

AN important new series of talks from America, entitled "America Speaks," will be heard by National listeners towards the end of this month. The B.B.C. has arranged for eminent speakers in the United States to review, for British listeners, the various aspects of the American situation. The first talk, on February 22nd, will be given by Mr. Ickes, the Secretary of the Interior. His subject will be "The Future of the New Deal." The second talk in this series will be given by Glenn Frank on March 1st, entitled "Republican Thought."

SOLVE THIS!

PROBLEM No. 281.

Jaggers built a four-valve A.C. receiver with a single power valve in the output stage, and when tested found that there was severe distortion, which was finally traced to the fact that the output valve was overloaded. He therefore decided to modify this stage, and accordingly bought another power valve of the same type and wired this in parallel with the existing valve. When tested, however, he found that the trouble was still present. Why was this, and what was the correct way of overcoming his difficulty? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Envelopes must be marked Problem No. 281 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, February 7th, 1938.

Solution to Problem No. 280.

The trouble in Hoskins' receiver was that he omitted to fit a switch in the volume control circuit, with the result that the grid bias battery discharged through the potentiometer whilst the set was not in use. A three-point switch should have been used in place of the existing switch, or a single switch should have been included in the bias circuit to open it whilst the set was not in use.

The following three readers successfully solved Problem No. 279: G. H. Gresswell, 35, Silver Street, Bradford, Yorks; H. A. Wells, 178, Park Lane, Tottenham, N.17; E. Hepple, 4, Collinson Avenue, Whinney Banks, Middlesbrough.

A New Use for the Double-diode-triode

In this Short Article the Principles of Delayed Automatic Volume Control are Explained

MANY readers who have constructed their own battery sets must have desired to employ Automatic Volume Control—preferably Delayed A.V.C. Among those who have fitted D.A.V.C. in their receivers, undoubtedly there are many who have derived very little advantage from its inclusion. There is a very simple method of ascertaining whether or not your D.A.V.C. is working correctly :—

Tune the receiver to the local station and put the volume control to maximum. Leave the set tuned to this station for a few seconds, then, with a quick movement, turn the tuning dial so that the set is tuned to an adjacent station. If the D.A.V.C. is functioning correctly, about a second will elapse before the station and background noises can be heard at full volume. If there is no "time-lag" the system is not working correctly; the absence of any signal when the set is quickly detuned (if the D.A.V.C. is working) is due to the fact that the high grid-bias on the H.F. stages had not had time to leak away, and these stages are, therefore, partially paralysed, which is quite correct.

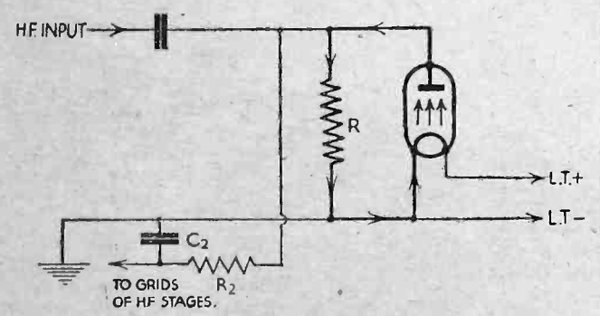


Fig. 1.—The direction of the electron flow is shown by the heavy lines and arrow heads.

I have tested many home-constructed battery sets in this manner, and, in most cases, the D.A.V.C. has not functioned, and on further investigation I have found that shorting the supply of D.A.V.C. voltage makes no difference to the performance of the receiver. This trouble, however, rarely occurs in "All Mains" receivers, but is peculiar only to battery sets—let us see why this is so.

Principles of D.A.V.C.

First, we will go over the principles of D.A.V.C. It is, in its most elementary stage, only a method of regulating the grid bias on Variable Mu valves in proportion to the strength of the incoming signal. If the signal rises above a certain value the bias on the Variable Mu valves automatically increases, and consequently the "gain" or amplification of these valves is reduced, thus decreasing the strength of the signal to a predetermined value. Considerable variations in signal strength are compensated for in this manner. Unfortunately, it is not quite as simple as this, as apart from the actual D.A.V.C. stage, certain essential features must be present in the receiver in order to make it function as mentioned above.

Consider further the circuit in Fig. 1. It is a simple Diode Detector from which our A.V.C. is derived and works as follows: The high-frequency signal is applied to the diode anode, thus making it positive and negative alternately, many times per second. On the positive half-cycles the diode anode attracts electrons (which are negative in nature) and on negative half-cycles it repels them. The load resistance R is connected between the diode anode and negative filament, in positive half-cycles electrons flow from negative filament to anode through the load resistance and back to negative filament. No current flows during the negative half-cycles, or, in other words, rectification is taking place.

If we are to employ this circuit for A.V.C. purposes the rectified H.F. voltage on the diode anode (after smoothing, by means of a combination of resistance and capacity) must be applied to the grids of the Variable Mu H.F. stages. It will be obvious that since electrons flow from filament to anode, i.e., negative to positive, the current through the load resistance R will make the diode anode negative with respect to the filament or earth. The Variable Mu valves, therefore, have a negative bias on their grids (from the Diode). It will be seen that the greater the signal input on the Diode the higher the grid bias on the Variable Mu stages, thus lowering their amplification, *but if the Diode is fed by an insufficient signal voltage it cannot supply a reasonable amount of grid bias for good "control."* This is where the battery set usually fails, there is rarely a sufficient input to the A.V.C. Diode, whereas, in the "All Mains" receiver more H.F. or I.F. stages are normally employed (I.F. stages in the case of super-hets), as well as greater anode voltages, higher-gain valves, etc., providing a large input to the A.V.C. Diode.

Obtaining Higher Selectivity

The circuit shown in Fig. 2 is a method of overcoming this difficulty in battery receivers *and also provides a means of obtaining high selectivity*! A Double Diode Triode is employed for this purpose, the Triode portion being used as an H.F. amplifier! Many readers are probably unaware that the valve can be used in this manner, but if they consider the capacity existing between grid and anode of the Triode portion and the external resistance and

(Continued overleaf)

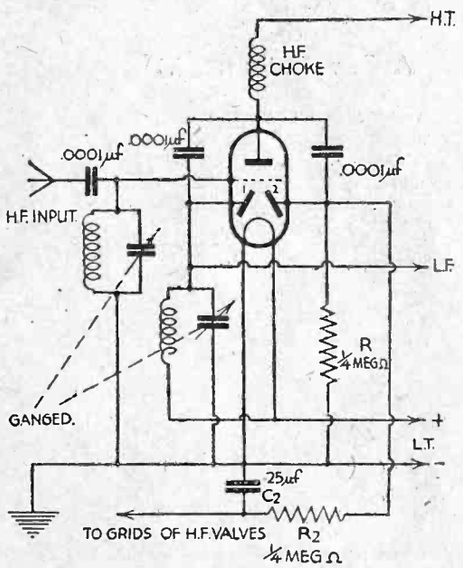


Fig. 2.—The circuit suggested for a battery receiver, based on the ideas expressed in this article.

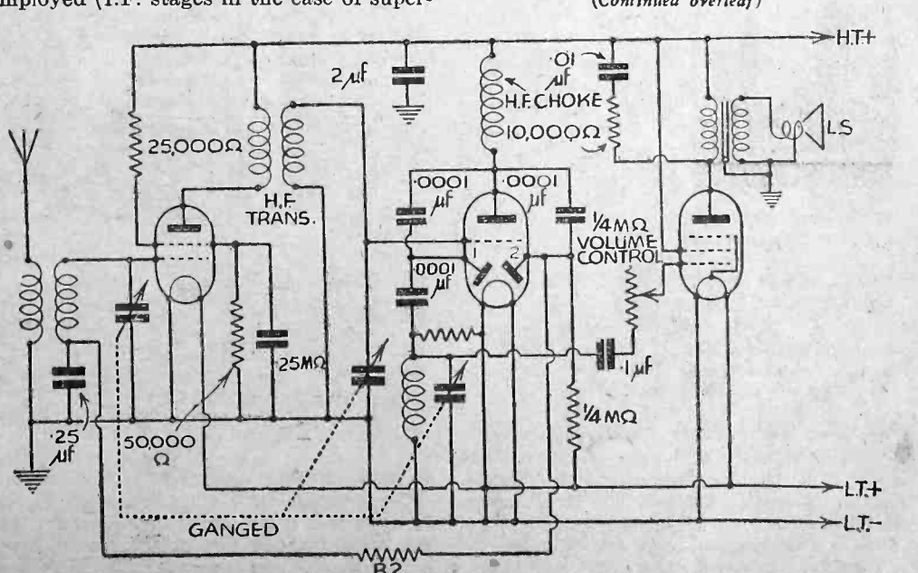


Fig. 3.—Complete circuit of a battery 3-valver incorporating the new double-diode-triode arrangement.

A NEW USE FOR THE DOUBLE-DIODE-TRIODE

(*Continued from previous page*)

capacity by-pass to earth as shown in Fig. 2, they will realise that a certain amount of reaction (although not enough to cause self-oscillation) is obtained. Therefore, the H.F. output from the Triode portion will be considerable (mainly due to reaction) and this output is fed via two small condensers to both Diodes: 1, the Signal Diode or Detector which employs a tuned circuit enabling high selectivity to be obtained; and 2, the A.V.C. Diode. Both Diodes then are fully loaded from the Triode portion of the D.D.T.

Rectification occurs at Diode No. 2, and the rectified voltage, after smoothing by C2, R2, is applied to the grids of the H.F. stages for control. With only one H.F. stage, very good A.V.C. control may be obtained by this method, and since the Signal Diode is connected to L.T. positive and the other Diode to L.T. negative a delay of two volts is imposed upon the A.V.C. Diode, i.e., weak signals that do not produce two volts on the Diode will not actuate the A.V.C., or, in other words, weak signals will not be attenuated. It is advisable to use an H.F. choke in the anode circuit as shown, although a resistance of about 10,000 ohms may be used.

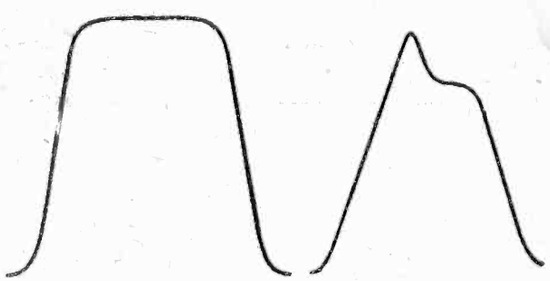
Rectification also occurs at Diode No. 1, but in this case its purpose is to separate the L.F. component from the H.F., and the L.F. voltages being passed to the output stage or stages for amplification until they are applied to the loudspeaker.

I have tested this circuit very extensively, and find it works excellently; I feel sure that many readers will find it a boon in the simple 1 S.G. H.F., detector and output type of set. A well-tested circuit giving excellent results is shown in Fig. 3. The three tuned circuits give very high selectivity, and the already mentioned reaction on the Triode helps both selectivity and sensitivity. Diode detection and R.C.C. coupling in the L.F. ensures good quality of reproduction.

I.F. Microphony

A Few Notes on its Cause, and How Best to Cure the Trouble

IN the early days of radio, microphony was invariably due to lack of rigidity in the valve. In due course this trouble became only a memory, and with the introduction of really high gain receivers, particularly those covering one or more short-wave bands, microphony arose in variable condensers, but again this was eliminated by the introduction of die-cast assemblies and the mounting of suitable components on sponge rubber.



Figs. 1 and 2.—Typical I.F. response curves.

To-day microphony is rare, but it is by no means unknown in short-wave superhets in which the most elaborate precautions have been taken. The chassis may be hung on elastic; the valves may be snugly covered up with jackets of suitable sound absorbing material; die-cast condensers may be so rigid that they are impervious to vibration, but still the receiver is horribly microphonic. The cause is probably not a mechanical one in the normally accepted fashion, but is due to slight mechanical trouble heavily aided by electrical trouble; in other words, intermediate-frequency microphony.

Mechanical Microphony

Microphony must necessarily build itself up, and there be able to maintain itself either for a short, long, or indefinite duration, and since it gives rise to a continuous note, it must necessarily be caused by some phenomena capable of repetition. In mechanical microphony what really happens is that some object capable of varying the electrical constancy of the circuit is set in motion by some temporary change, such as a particular note from the loudspeaker, and by reproducing itself in the speaker, sets up the fatal note which will not only sustain the vibration, but cause it to build up to a maximum determined either by the mechanical elasticity of the offending object or the output available from the loudspeaker.

I. F. microphony is a state of affairs which is brought about by the I. F. response curve being of such shape that the most insignificant mechanical movement will produce an electrical change of great magnitude. Fig. 1 shows the ideal type of I. F. response curve, while Fig. 2 is a typical curve that will permit microphony. It will be observed that the latter illustration shows a needle-pointed kink. Now if the fundamental I.F. frequency lands precisely on the point of the needle, as it will do if the set is aligned for maximum gain, then a trifling movement of an associated component resulting in what should be a negligible change in either the I.F. frequency or the position of the response curve, will bring about a tremendous change in amplitude. This will cause a note to emanate from the loudspeaker that will bear such relationship to the vibration that started the trouble that a violent microphonic howl will build up with disconcerting suddenness. This type of microphony builds up so suddenly that it resembles a sudden but sustained blast from a factory hooter, rather than the swelling volume of the trouble experienced in the old days.

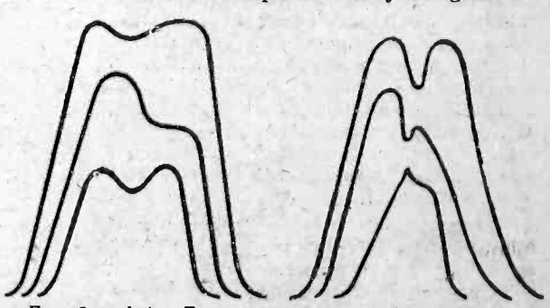
Variation in Frequency Drift

In addition to mechanically aided I.F. microphony, there is a closely related trouble which is brought about entirely without mechanical assistance. Reference to Fig. 2 will show that if the fundamental I.F. frequency is liable to any slight periodic variation due to, say, irregular behaviour of the frequency-changer valve, then the receiver will be capable of building up a howl purely due to the large variation in amplitude caused by the equally small variation in frequency drift. The only satisfactory way of avoiding this trouble is by adjusting the intermediate-frequency circuits so that no steep sections are present. It is not reasonable to assume that the ideal curve shown in Fig. 1 can necessarily be produced, but in order to make the point clear, a number of safe curves are shown in Fig. 3, while for comparative purposes a number of dangerous curves are shown at Fig. 4. It should be understood that the shifting of the response curve shown in Fig. 2 a little to one side so that the I.F. frequency does not fall on the needle point will not materially help, as the modulation will swing over the whole breadth of the curve and the trouble will be introduced in precisely the same manner, the only difference being that when the fundamental frequency is on the needle point, the howl may set up during a programme interval, whereas if the needle point is just off the fundamental frequency, the howl will only start up when the receiver carrier wave is modulated.

A Warning

In giving the above details it must not be assumed that commercial receivers must be adjusted by users to avoid the trouble, as in the majority of cases the design of the apparatus, and the adjustments carried out by the manufacturers will have taken into account the trouble mentioned. It is in the case of home-constructed apparatus, or commercial receivers which have been adjusted or modified that the trouble is to be met with, and research is at present being undertaken with a view to designing a new type of I.F. transformer which will not give rise to difficulties of this kind.

When referring to the accompanying illustrations it should be remembered that the shape only is significant, they are not to scale; therefore, their respective widths and amplitudes may be ignored.



Figs. 3 and 4.—Frequency response curves showing the effects of frequency drift on the response curves.

A Morning With the Amateurs

The Keen Experimenter Will Find More Enjoyment in Listening to the Amateurs on Sunday Morning than in a Whole Week's Reception of B.B.C. Programmes. Additionally, he will Extend his Radio Knowledge to a Considerable Extent. By FRANK PRESTON

FOR the keen, comparatively inexperienced experimenter there is probably no better method of extending his knowledge and practical experience than by listening to the amateur transmitters. There are thousands of these enthusiastic people—mainly men, but including a few women—all over the world constantly experimenting in every conceivable direction.

As would be expected, due to the large number of amateur stations in operation, they are to be found on the shorter wavebands. A number of alternative bands have been allotted to amateurs, but those of principal interest to the class of reader mentioned in the opening paragraph are the so-called 20 and 40-metre bands. Tune to either of these bands on any Sunday morning, and you are almost certain to find a good selection of transmissions. The quality will not always be good, there might sometimes be interference; while you are listening to an interesting conversation signals might be blotted-out by a powerful signal. Despite all of these objections, however, the interested experimenter will have an enjoyable Sunday morning.

The Instructional Side

Of course, those constructors who hope eventually to take out a transmitting licence will learn a considerable amount. They will quickly "get the hang" of the general procedure of calling other transmitters, replying to calls and reporting on reception. They will have opportunities of comparing the effects of different systems of modulation, different microphones, alternative aerial systems and all kinds of other things. Many readers who have been wireless "fans" for a number of years will remember the amateur transmissions of the "old days" that were made on the 440- and 180-metre bands. If such readers have not followed the amateurs down the wavelength scale in the intervening years they will have a pleasant surprise in observing the different methods of procedure and the—in most cases—vastly improved quality of the transmissions.

A Suitable Receiver

These amateur stations can be tuned-in with any broadcast set that covers the short-wave bands, but it is generally much better to use a special short-wave set for the purpose. There are various reasons for this, the first of which is that tuning must be carried out very quickly and accurately if the full conversation between two transmitters is to be followed. First one transmits for a few minutes, and then he changes over to "receive" and listens to the reply from the person he is "working." There is scarcely any break between one transmitter finishing, and the other starting, so you must be able to manipulate the tuning condenser very quickly.

The only really satisfactory type of receiver is one with band-spread tuning. This means that there are two tuning condensers in parallel, one of which gives rough tuning over the full wave-band covered by the particular coil in use, while the other has a much smaller capacity and serves for fine tuning over a limited range of frequencies. The idea is shown in Fig. 1, where condensers of .00016-mfd. and 25-mmfd. are shown; these are usual values

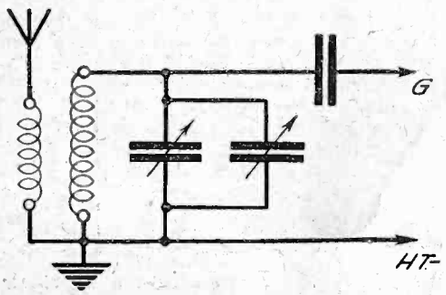


Fig. 1.—This shows how band-spread tuning is arranged, by connecting a small capacity variable condenser in parallel with the normal condenser.

for a short-wave receiver, but are not critical.

A large number of suitable circuits have been given in these pages in the past, and one that is typical is shown in Fig. 2. Constructional details of a receiver using this circuit appeared in the issues of PRACTICAL AND AMATEUR WIRELESS, dated August 29th and September 5th, 1936, copies of which can be obtained, if desired, for 4d. each, post paid, from The Publishing Department, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. This circuit employs three valves, and should, for preference, be used with 'phones for the purpose in question. As a matter of fact, it is always desirable to use 'phones for amateur reception until a fair amount of experience has been gained in rapid tuning. If preferred, the first valve could be cut out by those who have sufficient experience of receiver design. The receiver would still be sensitive enough for the purpose and tuning would be only slightly more difficult.

Band-spread Tuning

Those who are using an all-wave receiver of the Det.-L.F. type can employ this for amateur-band reception by connecting a second tuning condenser of about 25 mmfd. in parallel with that already fitted. After the wave-change switch has been set to the short-wave position, turn the main tuning condenser (generally referred to as the tank) until a batch of signals can be heard around the 40-metre band. Notice the dial readings at the beginning and end of the band when the low-capacity tuning (or band-spread) condenser is set to its midway position, and then turn the pointer of the tank condenser to the centre of the band. After that, it will be found an easy matter to do all tuning over that band with the band-spread condenser. This process can be repeated for the 20-metre band (on which there are generally fewer telephony transmissions), and a note made of the dial readings of the tank condenser.

Learning the "Language"

Now you are ready to "try your arm." Any time on Sunday morning turn to 40 metres and then slowly turn the knob of the band-spread condenser which should, for

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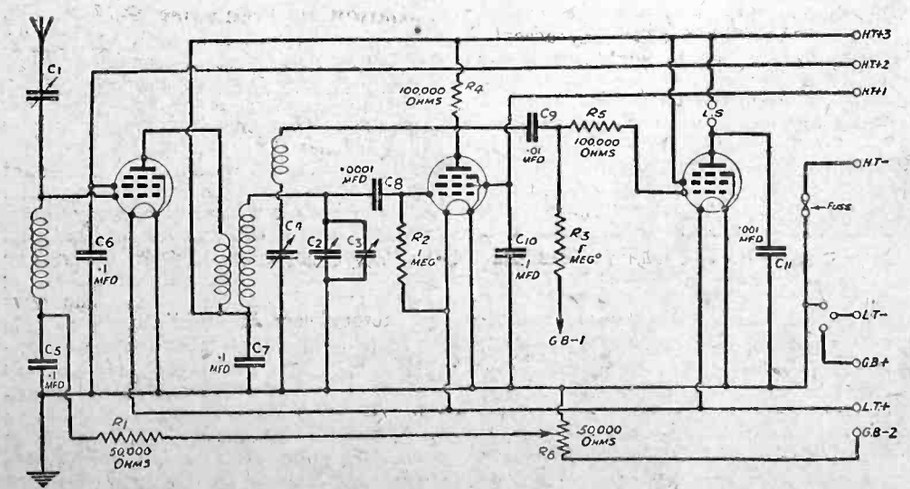
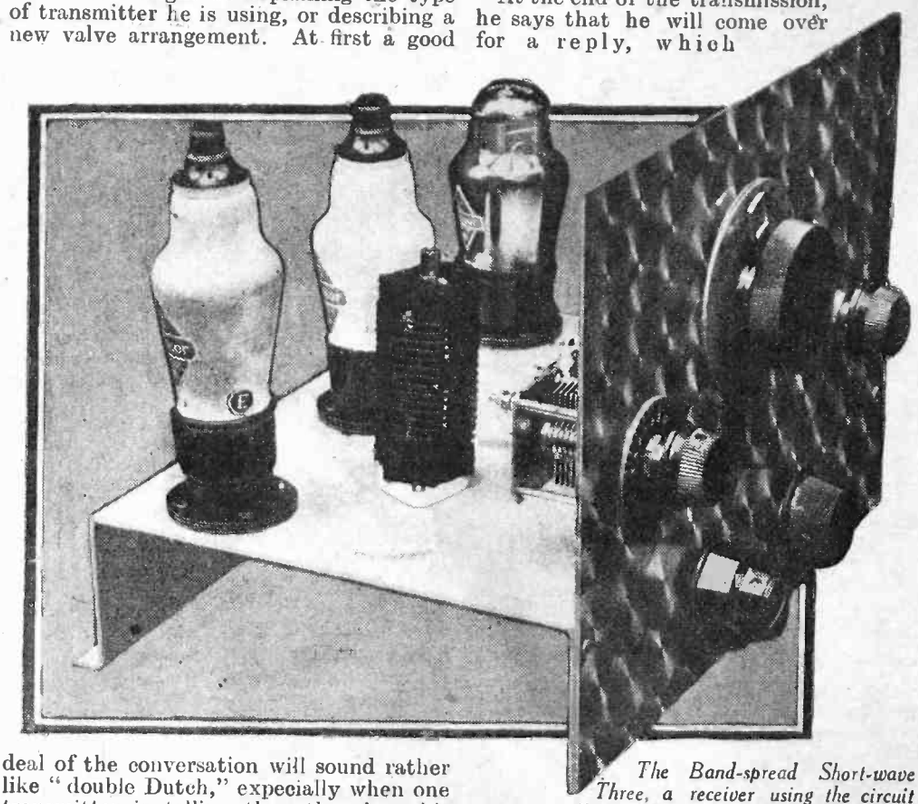


Fig. 2.—A circuit of this nature is ideal for 'phone reception of amateur transmissions. It was described in "Practical and Amateur Wireless," dated August 29th, and September 5th, 1936

A MORNING WITH THE AMATEURS

(*Continued from previous page.*)

preference, have a double-ratio drive permitting of both fast and slow motion. Keep the detector fairly close to the oscillation point until a signal is received. You will probably break into the middle of a conversation, in the course of which the transmitter might be explaining the type of transmitter he is using, or describing a new valve arrangement. At first a good deal of the conversation will sound rather like "double Dutch," expecially when one transmitter is telling the other how his signals have been received. For example, you might learn that the signals were "T9, QSA5, R7, with a good deal of QRM towards the end of the transmission." Then he might continue: "Thanks very much for the QSO; considering the QRB and the low power you are using I think the contact is very good. I will send you a QSL and before closing down I will come over for your reply. Dah-de-dah."



The Band-spread Short-wave Three, a receiver using the circuit illustrated on the previous page.

Translation

It is rare that the signal would be quite as complicated as that, but I have used a number of common code expressions so that they can be explained. The description of the reception means that the tone (T) was excellent, since the "T"-code is from T1 to T9. This code, by the way, is intended principally for reporting on C.W. (morse) transmissions, but some amateurs use it on telephony as well. QSA5 means that the signals were very good and perfectly readable, for the "QRA" code ranges from QSA1, meaning "signals hardly perceptible; scarcely readable," to QSA5. This code is widely used for telephony and has proved very useful.

The "R" code is used with reference to the strength of the received signals and ranges from R1 for signals that are barely readable, to R9, meaning extremely strong signals. Incidentally, readers will be interested to know that all three codes are given in the book, "Wireless Coils, Chokes and Transformers" (Newnes, 2s. 6d.).

You noticed from the report that there was a good deal of QRM towards the end of the transmission. This means that interference was experienced, probably from another transmission on a similar wavelength. Then there were thanks for the QSO, which means communication or contact (two-way working). QRB means he distance between the two stations; a QSL is an acknowledgment of reception, generally in the form of a printed card on which details of the reception can be written.

At the end of the transmission, he says that he will come over for a reply, which means that he will switch his transmitter off and his receiver on. Dah-de-dah is the method of saying the morse dash-dot-dash, which is the letter K, short for key. The expression "key" really means "operate your morse key," but is now used for telephony as well, in asking the other transmitter to transmit or speak into his microphone.

So you see that the "double Dutch" resolves itself into a very complete and effective form of radio shorthand. Apart from the spoken word, it is invaluable for giving complete details of reception in the small amount of space provided on the QSL card.

"Calling Test 40"

While searching round the amateur bands you will probably hear a call of this nature: "G6NJ calling test 40," repeated several times. After this call has been made continuously for a few minutes the transmitter will state that he is going over for replies: "Come in." This means that the British station (G is the prefix for British) wishes to "work" another amateur on the 40-metre band; "come in" is synonymous with "key" or "dah-de-dah."

If you search over the 40-metre band after G6NJ has changed over you will probably hear from another station: "Hello, 6NJ . . ." repeated several times . . . "EI2M (hypothetical call-sign) replying to your test call." After the whole of this has been repeated a few times "EI2M" will probably say: "If you are getting me 6NJ please give me a shout, and then we can carry on with tests. Dah-de-dah." G6NJ might or might not have heard this reply, so if you return to his wavelength you cannot be sure that he will again be calling EI2M. Several other stations might have replied to his test call, and he might be working one of them.

International Prefixes

Incidentally, EI is the prefix for the Irish Free State. A few of the many other prefixes in use are: F3 and F8, France; OZ, Denmark; GI, Northern Ireland; HB, Switzerland; TF, Iceland; W, United States, and VE, Canada. As there are about 150 different prefixes in use, it would be impossible to list them all.

There is another little "trick" used by transmitters that is confusing to the new listener. The call letters are often given as words to avoid misunderstanding. For example, you might hear "Two Victoria Oslo, calling Six Norway Greenland," or, "Hello, Five India Cairo, this is Two Jamaica Turkey." The initial letters of the words along with the preceding figure give the call sign. It will be observed that in these examples the country prefix is omitted, as it often is when amateurs in the same country are working together.

If you try amateur reception you will come across numerous other expressions, but the majority will be understandable if those referred to above are remembered. You could, of course, learn all the radio shorthand off by heart, but the process is simplified if you learn it—more slowly, perhaps—as a result of experience in amateur-station reception.

Just one final word of advice; please do not allow your receiver to oscillate when tuning in the transmissions.

THE INTERNATIONAL DX'ERS CONVENTION

WITH the object of creating greater fellowship among all those interested in the hobby of DX'ing an International DX'ers Convention will be held at San Francisco during July, 1939. Although originated by the International DX'ers Alliance, the Convention will be sponsored jointly by all DX Clubs desiring to participate.

The most outstanding attraction, will be the Golden Gate International Exposition—A Pageant of the Pacific! Its theme will be modern developments in transportation and communication as symbolised by the bridges, by the trans-oceanic air services and the progress in radio and television.

The setting and architectural design of the Exposition offer possibilities unequalled by any previous world fair. Surrounded as it is by water, the site, which is a man-made island in the centre of San Francisco Bay, will offer unprecedented opportunity to demonstrate the magic of modern illumination.

With over a year and a half to go, DX'ers from all parts of the world have already stated that they are making plans to attend. To date, we have heard from DX'ers in Australia, Japan, New Zealand, Canada, and the Panama Canal Zone—all telling us that they will be there in 1939 to attend the Convention.

Address all communications to Mr. George C. Sholin, 55, Lapidge Street, San Francisco, California, U.S.A., who will be very happy to answer any questions pertaining to either the Convention or the Exposition by mail, but please enclose return postage, as their expenses are rather heavy.

ON YOUR WAVELENGTH

By Thermion

More Jokes

A. E. G., of London, sends me a letter he has received in his capacity as an employee of a radio shop: "I had this accumulator yesterday morning; it has not been charged right, it only gets medium waves." The customer returning the accumulator with this note was a lady, so I publish it without comment.

The B.B.C. Replies

I MENTIONED the other week that the B.B.C. has a pretty thin time of it with religious, non-smoking, teetotal, anti-crooner, pro-crooner, anti-classical, and pro-classical fanatics. I dealt particularly with the question of the B.B.C. permitting reference to drink in its broadcasts. It did so quite recently and all the teetotal fanatics let them know about it. Here is the B.B.C. reply:

"Drink advertisements, moreover, are rigorously excluded—even in the face of adverse criticism—from all B.B.C. publications. The Corporation is fully alive to the gravity of this social problem and to its own responsibility in reaching a huge audience, including adolescents and children. On the other hand—and we sometimes wonder whether this is not the real gravamen of the charge—the B.B.C. does not advocate teetotal doctrines. That would be to take sides in a public controversy—which the Corporation is not allowed to do. In its capacity as trustee for the great listening public, the B.B.C. must do its best to meet the public's legitimate demands. And the demand, so far as it can be judged, is for programmes that reflect the various sides of public entertainment. B.B.C. programmes include many outside broadcasts of plays, concerts and variety shows, the exclusion from which of all references to drink would obviously destroy part of a performer's normal stock-in-trade, would make his performance unreal and unrecognisable. This is not to say that liberty is one with licence. 'Drink references' are kept within reasonable limits and special vigilance is exercised in all matters of taste, particularly in the children's programmes. Of what is reasonable and in good taste the B.B.C. must be its own judge, and must rely on the tolerance of all people of good will.

"The measure of success with which the Corporation has so far exercised this judgment may perhaps be gauged from a recent example. On November 6th a 'Wine' programme was broadcast. It was hailed in one irresponsible quarter as 'a gesture of defiance.' It was, in fact, a programme that included extreme denunciation, as well as praise, of wine. Before the broadcast was given, 446 letters of protest were received from individual listeners and from temperance societies. They feared the worst. Incidentally, an eminent Nonconformist clergyman wrote expressing the hope that the B.B.C. would not be disturbed by the fanatics. 'If I could get my sons,' he declared, 'to have a real connoisseur's taste in wine I should be very happy, knowing that they were delivered from all fear of drunkenness.' After the broadcast had been given a newspaper which had been following the trail of the B.B.C.'s drink references in the interests of temperance, published a letter containing the following passage: 'I listened-in to the broadcast entitled "Wine" and found it most interesting and certainly nothing objectionable forced itself upon my notice. In fact, it appeared to me to be a very good piece of propaganda for temperance.' From which it seems that the canons of what is reasonable and in good taste were not so seriously misjudged.

"In short, if life is to be portrayed as it is—and not as the champions of this school or that school would like it to be—references to drink must have their place."

Jubilee

I SAW an interesting film the other day prepared by the Dunlop Rubber Company, and it dealt with the history of the pneumatic tyre from the time of its invention down to date. It was in July, 1888, that John Boyd Dunlop patented his air tyre. I am wondering what progress we shall have made when wireless celebrates its jubilee. There is something romantic about the passing of 50 years. I have no doubt that in 50 years' time the powers that be will have made up their minds that they ought to be doing something about television. Perhaps by that time we shall have developed micro-wave broadcasting; maybe the wireless industry will attract less attention than it now does. Certainly I hope that the B.B.C. will not have so much power as it at present possesses, not because I feel that it is misusing that power, but because I feel that it should be placed on the same footing as any other commercial undertaking and suffer fair competition. Nothing was ever achieved without competition, and whilst the B.B.C. has a Government monopoly it can do just exactly as it pleases. I deplore the use of radio for propaganda purposes unless equal facilities are given for broadcasting the opposing point of view. The refining furnace is practical experience, and radio is still a young industry. In 50 years' time, perhaps, we shall discover that it is not wise to plug one point of view only. I am aware that the B.B.C. endeavours to be impartial, but I have no doubt that it would welcome opposition as much as I should. It has really a Government monopoly for which we cannot blame the B.B.C.

Sound Reasoning

I NOTICE that the other day one of the leading cinema industry journals pointed out to its readers how the march of invention provides new tools that can be forged for the good of the public. Tracing the growth of the early valve to its present stage of efficiency and the first flickering pictures to the wonderful results now shown, it then went on to say that the newest of developments—television—would not, in their opinion, ever replace the film. The two arts are complementary, each has merits and advantages of its own which do not really overlap. It was pointed out that the film has

the immense advantage of preserving movement and making it possible to show a play or news event at any time, and again and again. It was, therefore, rather analagous to the gramophone record. Television has the advantage, also very important but of quite a different kind, of permitting events to be seen at the time they take place, but the opportunity for this is transitory and is, therefore, analagous to a wireless broadcast. It is well known that all sports events stand pre-eminently in the forefront as television attractions, for the element of suspense is the major factor of interest. If the result of a race or fight is known the news reel shown later lacks that important value. It is to be hoped that the cinema trade as a whole will bring similar sound reasoning to bear on the problems of co-operation when they arise, remembering that the advent of films was hailed as the death knell of acting and the live stage in quite similar circumstances some time ago.

Sensitivity

WHAT is a sensitive receiver, and how sensitive should the ideal be? Accurate answers could be given to these questions and the matter has previously received the attention of the Radio Manufacturers' Association.

I raise the point here because I was asked recently to give some advice to a very non-technical friend who had four receivers in his house from which to make a choice. (He admitted that he would like to build one but had insufficient time and wished to have the advantage of rapid service in the case of possible trouble.) However, the choice was eventually narrowed down to two sets. Both covered short as well as medium and long waves, but one employed a fairly simple four-valve superhet circuit while the other, of American style, had "umpteen toobs."

Theoretically, the second receiver, which was twice as costly, should have been far better than the simpler typically British set. But after trying both on all wavebands covered, my friend was strongly in favour of the smaller instrument. This was not because of the price, for he was prepared to pay up to £30 for a set that really pleased him. No, he was swayed by the quieter "background" of the four-valver, the fact that there was scarcely any between-station noises, and the better quality on short waves. It was clear that the smaller receiver did not bring in as many short-wave stations, but it was of more importance that those that could be received were of programme value—you could sit and enjoy them.

We both came to the conclusion that the larger and more expensive set was *too* sensitive. You might say that the volume control could be turned down, but even then results were not fully satisfactory. In my opinion the more sensitive instrument could be used successfully in most districts only by working it from a special aerial system. There are many ordinary listeners, in contrast to keen experimenters, who are disinclined to have such an aerial erected, even if they have sufficient space for it.

Gramophone Needles

ALTHOUGH not strictly a radio hint, we may be forgiven for mentioning here that needles of the permanent or semi-permanent type require to be used in the correct manner if damage to the records is to be avoided. A case recently came to our attention where a reader was using permanent needles, and found that his records wore out quicker than when cheap needles used once only were employed. It was subsequently discovered (after tests with the weight of the pick-up and tracking had been made) that he was taking out the needle at the end of a playing period, carefully putting it in a small holder, and placing it back in the pick-up when next required, keeping a careful tally of the number of times it was used. When any type of needle is used, the effect of friction of the record is to wear away the side of the needle, and this produces a small cutting edge which does damage if used again. Although this effect is very much less on permanent and semi-permanent needles, if the needle is taken out and replaced the worn "flat" may easily come into such a position that, owing to the additional hardness of this type of needle it will effectively score or cut away the sides of the groove in the record, and thus this type of needle must be left in position until replacement is necessary.

Everlasting Fuses

AN interesting type of fuse is apparently available for certain apparatus where, when the fuse blows, all that is necessary to restore the circuit is to shake the fuse when it again becomes useful as a protective device. Such a component would, of course, be of great value in a receiver used for experimental purposes but, unfortunately, it is not generally available. It is fitted to a special mains unit supplied for the operation of model railways, and would be of great value to the keen experimenter.

Wired Inter-communication

EXPERIMENTERS who are interested in working out new fields, may find some source of valuable work in building an inter-communication system to operate over the normal house A.C. wiring. Standard I.F. components or 465 kc/s or 110 kc/s units could be built up for the oscillator and by means of frequency doubling, etc., two-way simultaneous communication may be obtained. We should be glad to receive details from any experimenter who succeeds in evolving a practicable system.

Dance O.B.'s

DANCE enthusiasts should note that from the end of February late night dance music will come entirely from outside broadcast sources. Hitherto, late night dance music has been provided by bands playing in hotels and restaurants on five nights a week, while on one night a non-vocal programme has been broadcast by a band in a studio. From the end of February the non-vocal session will also become an outside broadcast.

The amount of dance music on the air will remain the same, and there will be no decrease in expenditure on this type of programme. The new arrangement will give more time to the better-known bands, and the object of the scheme is to raise the quality of dance band music. I understand that considerable dissatisfaction is expressed in some circles as a result of this move. A much lower fee is paid to O.B. bands, and some listeners prefer the studio performance.

A Good Samaritan

A READER has sent me a very nice letter explaining his progress in set construction, and as a result of his activities he has a number of standard broadcast components on hand and is prepared to give these to readers who are unemployed or disabled. He states that the gear includes H.F. and L.F. transformers, chokes, fixed and variable condensers, slow-motion drives, etc., and I shall be glad to receive applications from any unfortunate readers who come within the above class and will pass on the names to the donor. Please let me have the necessary details to avoid unnecessary waste of money in postage and correspondence.

Systematic Fault Finding—5

In this, the Concluding Article of the Series, the Testing of Components is Dealt With

WE have seen how it is possible to localise a fault in a receiver by making use of the properties of the various portions of the complete circuit, and reference has been made in previous sections to testing condensers, resistances, valves, and the like. The purpose of this final article, therefore, is to give more detailed information on the subject of testing a suspected component once the fault has been localised.

H.F. Chokes, L.F. Chokes, and Coils

The first test to be carried out is to measure the resistance of every winding with an ohm-meter and compare the results with the manufacturer's published data. In the event of an ohm-meter not being available, one can easily be made providing a milliammeter is available. A suggested circuit, which can easily be rigged up for temporary tests, is shown in Fig. 18.

The potentiometer R1 is connected across the battery, and R2 placed in series with it and the meter. With the terminals "A" and "B" shorted together, R1 is adjusted until a full-scale reading of the meter is obtained. If R2 is 1,000 ohms and the full-scale deflection of the meter 1 mA., the inclusion of a resistance of 1,000 ohms between terminals "A" and "B" will result in the meter reading being halved. The resistance of the component under test can be readily determined from the equation :—

$$\text{meter reading} = \frac{\text{applied voltage} \times 1{,}000}{\text{resistance to be measured, plus series resistance}}$$

Suppose, for example, the series resistance is 1,000 ohms and the full-scale consumption 5 mA. We know that the applied voltage for full-scale deflection must be 5 volts, so that if with the component under test we get a meter reading of 1.5 mA, we can easily determine the total value of the resistance in the circuit to be 3,300 ohms, giving a value to the unknown resistance of 2,300 ohms.

A straightforward resistance test, however, will not always indicate "the goodness" of the coil or choke, especially if an H.F. choke is under test.

The efficiency of an H.F. choke can be tested in two ways: (a) by connecting it in series with the aerial feeding a working receiver and noting the result (Fig. 19); a large decrease in signal strength would indicate that the choke was efficient: (b) connect the choke in parallel with the tuning condenser of a working receiver; a large decrease in signal strength would indicate that the choke was inefficient.

A rough idea of the inductance of an L.F. choke can usually be obtained by connecting it in series with a small battery and a milliammeter and noting the period taken for the current to reach its maximum value. The quicker this point is reached the lower the inductance of the choke.

Other than testing with an ohm-meter, and for the insulation between the various windings, little can be done to test coils without the use of elaborate and expensive

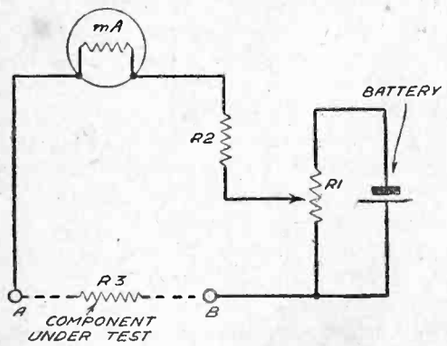


Fig. 18.—How to improvise an ohm-meter for component tests.

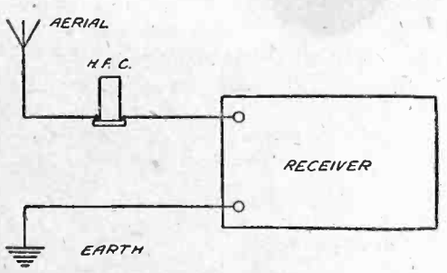


Fig. 19.—Testing the efficiency of an H.F. choke.

apparatus such as is necessary to test the inductance with H.F. applied to the coil. Testing the various windings for continuity, etc., was dealt with in the first article of this series.

Transformers

A circuit tester will show whether or not the windings of an L.F. transformer are complete, and the ohm-meter their resistance. The latter may also be used to test the insulation between the two windings, and between the windings and the core, but it will not show the presence of a few shorted turns. The latter are, however, usually shown up by a loss in amplification or by "thin" reproduction.

Other than complete breakdown, a common fault in transformers, especially those of the L.F. variety, is noisiness, and this can usually be traced by the circuit shown in Fig. 20. It will be seen that a small current is passed through each winding in turn, this complete circuit being resistance-capacity coupled to a small amplifier. Any crackles generated by the transformer are developed across R2 and magnified by the amplifier and are heard distinctly in the headphones. It is, of course, essential to use a battery and resistance R.1 which are known to be free from troubles of this nature, and they should be tested separately before the inclusion of the transformer windings.

Output transformers may be tested for continuity and resistance and also for noisiness as described above, but be careful when dealing with the secondary winding as this consists of a very few turns of wire, and accordingly even a 2-volt battery will cause a heavy current to pass and burn out the winding unless a series resistance to limit the current is in use.

A mains transformer must be tested for continuity of the windings, and insulation between them and the core. Once these have been proved in order, the transformer may be connected to an appropriate A.C. supply, and the open-circuit voltages of the various windings measured by a rectifier-type A.C. voltmeter. The readings obtained should be in excess of the normal rated output.

If one winding of a transformer gets very hot when in use, it is an indication that that winding is severely overloaded or else that there is a leakage between it and the core. If such is the case, be extra careful when testing the insulation of the suspected winding. If this is found to be in order, the only remedy is to reduce the loading.

Condenser Testing

The best method of testing a condenser is to apply a high D.C. voltage to it, and measure the current passed. A suitable power supply may be obtained from the use of two Westinghouse J. type rectifiers operated from the mains through a transformer in the voltage-doubler circuit, and a potential divider should be used to increase the supply voltage gradually in case of a complete fault. Always use a greater voltage for testing than that for which the condenser is rated.

Another method is to use the circuit shown in Fig. 21, where a neon lamp is connected to the D.C. supply of about 150/200 volts through a fixed resistance R of a value of 1 or 2 megohms. A large capacity condenser C is paralleled across the lamp, and this condenser charges up until the voltage reaches the critical point and causes the lamp to glow and conduct, when it discharges again causing the lamp to go out. By suitable adjustment of R and C the rate of "flicker" of the neon lamp

(Continued overleaf.)

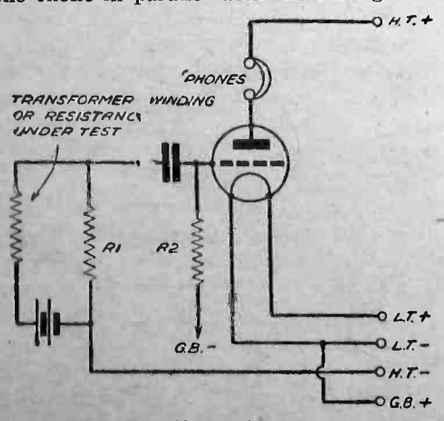


Fig. 20.—Testing for noisiness.

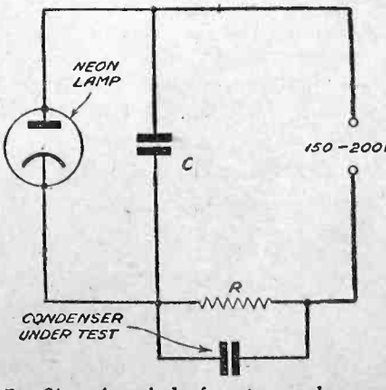


Fig. 21.—A method of testing condensers with a neon circuit.

SYSTEMATIC FAULT FINDING

(Continued from previous page)

can be controlled, and if a condenser is now connected in parallel with R it will speed up the rate of flicker according to the leakage current it passes. A leaky condenser, of course, acts as a high resistance, while a good condenser has infinite D.C. resistance, and will cause no alteration to the flicker.

Mica, paper, or variable condensers may be tested in this manner, the latter, of course, being rotated during the test.

When testing for shorts in gang condensers, by connecting a battery and voltmeter in series with each section in turn and rotating the moving plates and noting whether any reading is obtained, do not overlook shorts or faulty insulation caused by the various trimmers, and test also between each section for insulation.

Variable condensers may be tested for shorts and noisiness by using the circuit shown in Fig. 20, the condenser replacing R1, the transformer winding, and the battery. When using this circuit for suspected noisiness of a small fixed condenser, simply tap the condenser, or move its wire and connections or terminals. Any looseness will be distinctly heard in the 'phones.

Electrolytic condensers may be tested for leakage as described above, but be careful to connect them in the correct polarity. The minimum leakage value for any electrolytic condenser should be 0.1 mA and an 8 mfd. condenser rated for 500 volts peak D.C. working should have a leakage current of about 1 mA.

All types of condenser may be tested by the bridge method, but that is rather outside the scope of this article, as the tests already outlined will serve to indicate the "goodness" or otherwise.

Resistances, Volume Controls, and Tone Controls

Resistances, volume controls, etc., may be tested for value by means of an ohmmeter, and for noisiness by means of the circuit shown in Fig. 20. In the case of a volume control, the arm should be rotated while the test is being made.

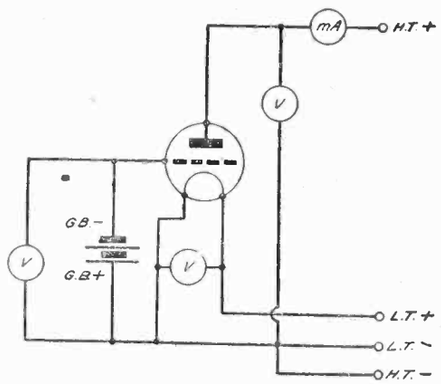


Fig. 22.—Circuit for testing valves.

The value of any resistance can always be determined from Ohms law by measuring the current passed by it when a known voltage is applied. The value of the resistance equals the applied voltage multiplied by 1,000, and divided by the current passed. For example, if a voltage of 10 is applied, and the current passed is 100 mA, then the value of the resistance is 100 ohms.

High resistances, however, are not so easily measured, as the applied voltage would have to be very high. A good method is to use the neon tester shown in Fig. 21, and connect it in circuit in place of R. If both resistances are of the same value, the rate of flicker will remain unchanged. A higher value of resistance will be indicated by a slower rate, and a lower value will cause the flickering to quicken.

Valves

Valves are tested by rigging up a circuit as shown in Fig. 22, adjusting the values of H.T., L.T. and grid-bias to the values recommended by the valve manufacturers, and then measuring the anode current and comparing it with that given on the valve curves. Details of these tests were included in the first article.

Important Broadcasts of the Week

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, February 2nd—Songs from The Rebel Maid, a romantic light opera.
Thursday, February 3rd.—Stanelli's Party.
Friday, February 4th.—Rope, an essay in the Macabre by Patrick Hamilton.
Saturday, February 5th.—Palace of Varieties programme.

REGIONAL (342.1 m.)
Wednesday, February 2nd.—Commentary on Open Police Boxing, from the Albert Hall.
Thursday, February 3rd.—Variety from the Argyle Theatre, Birkenhead.
Friday, February 4th.—Off to Murrayfield: Wales and Scotland join in presenting an impression of the preparation for to-morrow's Rugby Classic at Edinburgh.
Saturday, February 5th.—Rope, an essay in the Macabre by Patrick Hamilton.

MIDLAND (296.2 m.)
Wednesday. February 2nd.—The Changing Midlands: Severn Valley and Evesham Vale.
Thursday, February 3rd.—Manor to Mine: a programme of contemporary contrasts in village life.
Friday, February 4th.—Excerpts from Mother Goose, from the Theatre Royal, Birmingham.
Saturday, February 5th.—Variety Concert from the Birmingham Rocket Club.

NORTHERN (449.1 m.)
Wednesday, February 2nd.—Gypsy Orchestral programme.
Friday. February 4th.—Excerpt from Babes in the Wood, from the Theatre Royal, Newcastle-upon-Tyne.
Saturday, February 5th.—Eye-witness account of the English Open Table Tennis Championships at Blackpool.

WEST OF ENGLAND (285.7 m.)
Wednesday, February 2nd.—They Made the West, a talk.
Thursday, February 3rd.—Sid and Vilet, conversations overheard in a Bristol household.
Friday, February 4th.—Ice-hockey: running commentary from the Coliseum, Bristol.
Saturday. February 5th.—Dance Cabaret, from the Pavilion Ballroom, Bournemouth.

WELSH (373.1 m.)
Wednesday, February 2nd.—Programme of Welsh Ballads.
Thursday, February 3rd.—Choral programme, from Bethlehem Church Hall, Rhos, Wrexham.
Saturday, February 5th.—A Ballad of 1400: the romantic story of Owain. Glyn Dwr.

SCOTTISH (391.1 m.)
Wednesday, February 2nd.—Revels of 1938, from the Empress Playhouse, Glasgow.
Thursday, February 3rd.—Band programme.
Friday, February 4th.—Off to Murrayfield.
Saturday, February 5th.—Kemp's Tours: a mystery musical excursion in song and rhyme.

NORTHERN IRELAND (307.1 m.)
Wednesday, February 2nd.—Orchestral programme.
Thursday, February 3rd.—A Disciple, a play by Teresa Deevy.
Friday, February 4th. — Instrumental programme.
Saturday, February 5th.—An Orchestral Concert, from the Ulster Hall, Belfast.

ON THE SCREEN

"The Three Bears": February 7th

A CHILDREN'S ballet, "The Three Bears," is to be televised in the afternoon and evening programmes on February 7th. The music is by Eric Coates, who dedicated the score to his son Austin on his fourth birthday. The choreography is by Joy Newton, who will bring her Vic-Wells company of Child Dancers to the studios at Alexandra Palace.

The ballet tells the familiar story of Goldilocks and the Three Bears, which lends itself admirably to picturesque orchestral treatment. Running through the work is a kind of musical motto based on the bears' indignant exclamation: "Who's been sitting on *my* chair?" The music is picturesque and amusing, as, for instance, when, on the arrival of the bears at the cottage where Goldilocks is asleep, sounds on the oboe represent the Small Bear, on the clarinet the Mother, and the bassoon the Father Bear.

Goldilocks will be represented by Julia Farron, and the Father, Mother and Baby Bears will be Leslie Edwards, Wenda Horsbrugh and Margaret Bolam, respectively. The B.B.C. Television Orchestra will be conducted by Hyam Greenbaum.

"The Three Bears" will be presented by Elizabeth Cowell, the television announcer.

"Once in a Lifetime": February 2nd

"ONCE in a Lifetime," a ninety-minute play, and the longest yet attempted in the studios at Alexandra Palace, is to be repeated in the evening programme on February 2nd.

Charles Farrell will be seen as "George," and Guy Glover as "Jerry." Dr. Glogauer, the Hollywood director who is so impressed by George's "genius," will be played by Jos Greenspun, and Oscar Ebelsbacher will be seen as the German film producer "Kammerling."

Presentation will be by Eric Crozier.

A PAGE OF PRACTICAL HINTS

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

THAT DODGE OF YOURS!

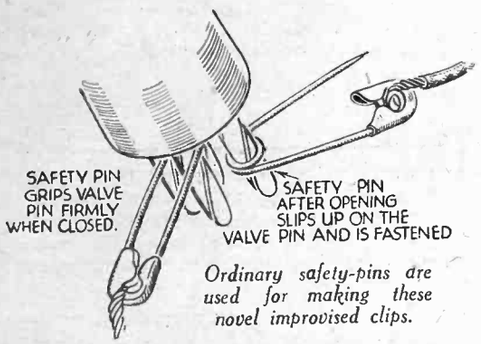
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover

Improvised Clips

MOST crocodile clips being reliant on the grip of teeth, or jaws, are apt to swing on round parts, and perhaps cause a short circuit. This possibility was overcome by the use of ordinary safety-pins, as shown in the accompanying sketch. The pins are opened, and then slipped up on the contact-pins of the coils or valves on test, and fastened. The fastening tightens the small coil on the end of the pin which grips the round shape firmly.—G. ROBERTS (Brixham).



Ordinary safety-pins are used for making these novel improvised clips.

A Novel Open-circuit Jack

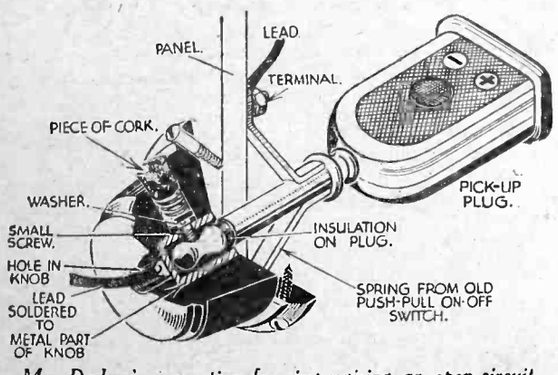
HAVING a plug, but being unsuccessful in obtaining an open-circuit jack, I made the device shown in the accompanying diagram. The chief components used were a knob from an old bakelite reaction condenser, having a ¼in. metal-bushed hole, 2 springs from an old push-pull switch, and a small piece of cork.

The hole in which the screw was tightened in the knob was enlarged with a screwdriver until it was about ¼in. diam. A small screw with a flat head was placed in the small hole as shown, and a washer, or round piece of metal, was then placed on top of this, followed by a stout steel wire spring. Finally a small piece of cork was inserted to plug the end of the hole.

The two springs from the push-pull switch were mounted on the panel at such a distance apart that when the plug was pushed through the hole the springs gripped it firmly. A terminal was placed on one of these springs, to which one lead was fastened.

A hole was bored centrally through the knob until the metal part of the latter could be seen, and the second lead was soldered to this.

The whole knob was then screwed on to the panel, as shown, so that the hole in the panel coincided with that of the knob. When the plug is inserted in the socket, the small screw slips into the neck of the plug, holds it firmly in place, and makes a good connection.—REX W. DADSON (Golders Green).

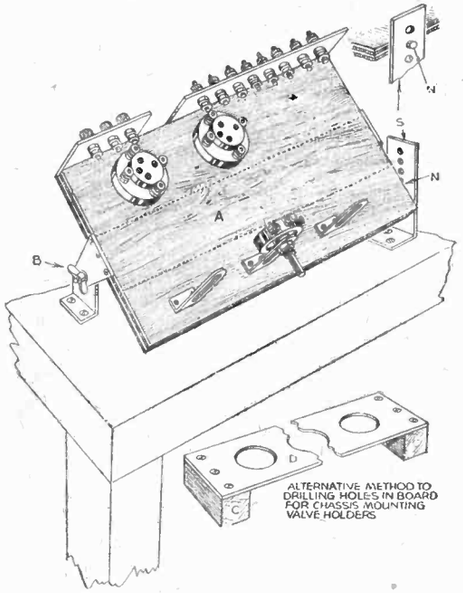


Mr. Dadson's suggestion for improvising an open-circuit jack.

A Useful Circuit-testing Board

HAVING just invested in a new drawing board, I have put the old one to good use by adapting it for testing different circuits from time to time, and the enclosed sketch shows the very serviceable nature of this idea. The board is raised off the bench in the manner illustrated, as I find that this is more comfortable to handle in my case, owing to the width of the board and the height of the bench; again, the occasion often arises when "under-chassis" wiring is necessary, and provision is thus afforded by this method.

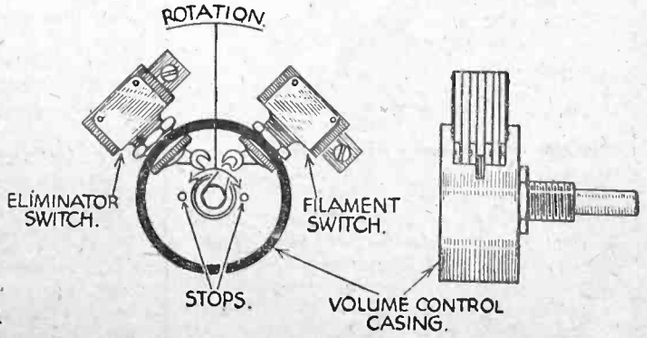
The adjustment is very simple, aluminium hinge pieces being screwed to each end and pivoted by two small wing nuts and bolts "B." The board elevation adjustment is arranged by fixing at one end of the board a springy piece of metal (brass will do) drilled to accommodate the end of a nail "N," and this is clearly depicted in the small inset. The section "A" was allowed for the various pieces of apparatus required in each test, and the terminal strips were finally added to the back. For chassis-mounting-valve-holders I constructed a separate unit to obviate the necessity of spoiling the board by drilling large holes. This unit was made of bakelite, "D," with wooden end blocks, "C."—R. G. WEATHERSTONE (Mansfield).



An adjustable board for testing components and trying out circuits.

A Dual-purpose Switch

THE accompanying illustration shows a dual-purpose switch I have fitted to my eliminator-operated set, to avoid the trouble experienced owing to people switching the eliminator on before the valve filaments. By arranging two Q.M.B. switches as shown, the filament switch is automatically closed before the eliminator switch is operated, and vice versa. The two switches are fitted to an old volume control casing, and are fixed with lock-nuts on the inside. A shaped piece of brass, soldered to the end of the spindle, engages with the slots filed in the ends of the switch "dollies."—W. H. MENZIES (Johnstone).



A dual-purpose switch for use with an eliminator-operated set.

THE SUPERHET'S RIVAL

The Superhet Circuit is By No Means the Only Type of Receiver for Present-day Purposes, and the Merits of a Certain Type of Straight Receiver are Explained in this Article - - - By W. J. DELANEY

THE present crowding of stations on the ether, and the difficulty which has been experienced in many cases in separating them has led to a general adoption of the superhet type of receiver. Furthermore, this type of set, owing to its large amount of H.F. amplification has enabled the automatic volume control circuit to be perfected and this in turn has led to the incorporation of magic eye tuning and similar devices. As a result there are many listeners who are under the impression that this type of receiver is the best or the only one for modern conditions. Such a statement is very far from the true state of affairs, and there is one type of receiver which is its equal, if not its superior in certain respects.

The main features of a good modern superhet are high selectivity (controllable in certain cases for special requirements), adequate H.F. amplification to enable a very wide choice of distant programmes to be obtained, and single-knob control. Against these desirable features, however, there are a number of undesirable points which, to the listener who requires high quality reproduction, are practically insurmountable. For instance, second-channel whistle interference is not a simple matter to avoid without high-note cutting resulting in deterioration of quality. The majority of A.V.C. circuits incorporated in superhets lead to a form of frequency distortion which is noticeable to a very large number of listeners. The necessity of maintaining accurate trimming of the many circuits often results in this type of receiver having to be adjusted frequently, due to the effects of temperature and similar changes.

The Straight Set

If we take all the desirable features of a good modern superhet we will find that they are all capable of incorporation in a straight circuit, and the latter will have certain features which are essential to good quality reproduction and it will be much easier to build such a set. Dealing first of all with range of reception we can state quite safely that two H.F. stages incorporating modern coils and H.F. pentodes will, under the correct operating conditions give just as great a range as a superhet employing a signal H.F. stage. The elimination of the frequency-changing circuit will remove all risk of second channel whistle interference, and provided that the two H.F. stages are suitably designed and built, there should be no risk of H.F. instability.

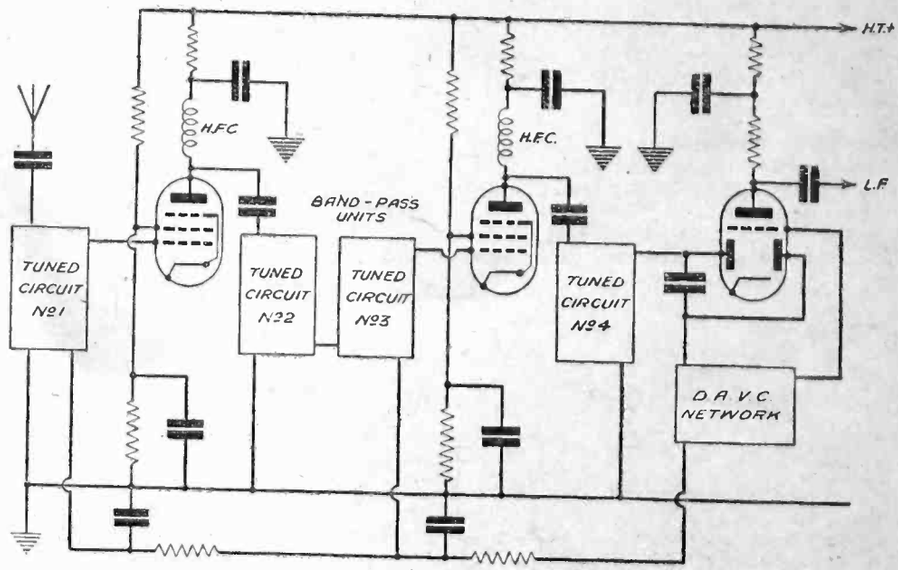
Selectivity

The selectivity of a superhet is due to the large number of tuned circuits which are employed as well as to the fact that the frequency difference obtained in the frequency changer provides a selectivity device. For all normal requirements, however, it will be found that four tuned circuits, with modern iron-core coils, will provide sufficient selectivity to enable all the worth-while stations to be tuned-in clear of interference. There are several methods of incorporating four such circuits in a two-H.F. receiver, and although two circuits will obviously have to be included in one of the stages, the utilisation of the band-pass arrangement will make this quite a simple matter. The band-pass pair may be included in the grid circuit of either the first or the second H.F. stage, or in the grid circuit of the detector, the most convenient position being in the second H.F. stage.

A.V.C.

For good A.V.C. working adequate H.F. amplification is needed, and two stages such as have already been mentioned will enable almost perfect automatic-volume control to be obtained, and if this is designed on the amplified, or the delayed and amplified arrangement, quality will be maintained at a high level. The same type of valve may be used for this purpose as is employed in the modern superhet, a double diode-triode enabling detection, A.V.C. and first L.F. circuits to be combined. The H.F. stages would, of course, under these conditions, be controlled just as in a superhet, and thus a visual tuning indicator may be used in conjunction with the second H.F. stage, treating this as the I.F. stage preceding the second-detector in the superhet, and this gives us, so far, an arrangement which is identical with the modern superhet.

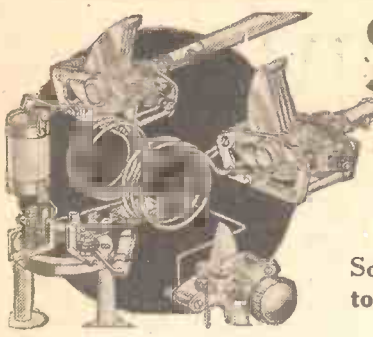
Early attempts to design a receiver of the above-mentioned straight type met with failure mainly on account of the fact that the valves then available were not ideal for the purpose. The modern H.F. pentode, however, has such a low grid-to-anode capacity that practically maximum amplification may be obtained in the stage, and the latest types of iron-core coil will provide almost uniform selectivity on both medium and long-wave bands. Thus, the only drawback to this type of circuit is that it is not easily adaptable to "all-wave" tuning, but the listener who requires really high quality from the different programmes which he is able to get will, no doubt, be quite prepared to use a separate short-wave receiver which may also be designed from a quality point of view.



Diagrammatic representation of a powerful straight receiver which provides practically all of the advantages of the superhet, with none of the disadvantages of the latter.

Unit Sets

We have described two or three high-quality amplifiers, and described radio units for them. A unit built on the type of straight circuit just mentioned could easily be built and would justify the use of a quality amplifier such as the Paraphase unit described in our issue dated January 18th, 1936, and would enable the user to obtain at least 30 stations at a volume and quality level equal almost to the local B.B.C. station. The difficulty of accurately trimming a four-stage tuner is not so great as that required in a superhet, but is probably the only drawback to a type of receiver which should shortly return to favour, and if sufficient reader interest is shown in this type of apparatus, we shall describe a unit suitable for the amplifier mentioned. Perhaps, therefore, readers would let us know whether they are interested in this type of apparatus, and would at the same time let us know whether any further details are required concerning the service which may be expected from such a receiver.



Short Wave Section

TUNING-IN TO TEN METRES

Some Practical Notes of Special Interest to Listeners on the Ultra-short Wavebands

THE 10-metre waveband has been of increasing interest during the last few months. The considerable amateur activity on 10 metres is mostly due to the heavy interference on 20, as an increasing number of stations are taking a step in the downward direction for keeping schedules, so as to obtain telephony contacts without a welter of heterodynes and wipe-outs from the higher-powered stations. To the short-wave listener only, 10 metres should be extremely interesting, as it is often possible to hear amateur stations from parts of the globe that cannot be heard on the other wavebands due to the receiving location.

Low-angle Radiation

It must be remembered that 10 metres might be termed an intermediate waveband, being just as exacting as the 5-metre region, while at the same time retaining the long-distance communication capabilities of 20 metres. Putting it more technically, a certain amount of the low-angle radiation is utilised for long-distance communication under given atmospheric conditions. Below 10 metres the low-angle radiation both diminishes and also, under normal conditions, passes right through the upper reflecting layers; although it has been shown that even at 5 metres energy is sometimes returned to earth at a distant point from the transmitter.

The short-wave experimenter should give careful consideration to the receiving equipment on 10 metres. While a great many receivers can be made to work on 10, merely by winding suitable coils, it is seldom possible to obtain very good results this way. For instance, the tuning condenser is usually of too high a capacity, although perfectly suitable for the normal short wavebands, and even where a band-spread condenser is used it must be remembered that it is usually in parallel with a larger condenser, the total circuit capacity being much too large for efficient working on 10 metres. In the case of a straight receiver using a reactive detector, trouble is often encountered with non-oscillation, feed-back, hum, etc. While a superhet receiver overcomes some of these difficulties, trouble may be experienced with oscillator drift or a high noise level due to the valves.

Using a Converter

Taking into consideration the above-mentioned difficulties, it is preferable for the short-wave enthusiast to build a separate converter for 10-metre reception, rather than attempt to modify a standard short-wave receiver. There are several ways in which a converter can be used in conjunction with a receiver. The usual way is to connect the output of the converter to the aerial input of the set, where there is one or more stages of H.F. amplification. This applies both to a superhet as well as a straight receiver. The set is then tuned to any suitable wavelength for intermediate-frequency amplification of the output from the converter. When the receiver is of the Det. L.F. variety the L.F. portion only is used. So it will be seen that to fulfil everyone's requirements the design of a 10-metre converter must be fairly flexible, and the circuit shown in Fig. 1 seems to meet the case.

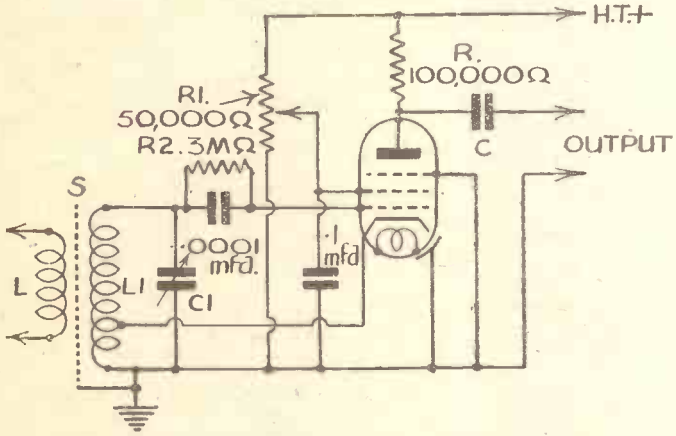


Fig. 1.—An electron-coupled circuit for a 10-metre converter.

Apart from being hooked up in the various ways described above, this circuit may be fed into an I.F. amplifier, using the first stage as resistance-coupled or as an oscillator feeding the first detector of a superhet.

Electron-coupled Circuit

Considering the circuit itself for a moment, it will be seen that it is of the electron-coupled variety, and therefore possesses a high degree of stability. Feed-back is obtained by means of the cathode tap on the grid coil, and oscillation is controlled by the 50,000-ohm potentiometer R1. The valve used is of the H.F. pentode type, of which the best kind for this class of work is the American metal octal 6J7. These valves are particularly adapted for use in the 10-metre region, being of small structure; also the control grid is brought out at the top to a small cap.

The value of the output capacity C will depend just how the circuit is coupled to existing apparatus. Where the unit is coupled to the aerial input of a receiver or direct to an I.F. amplifier, C should be .0001 microfarads, but where the converter is used as a detector followed by low-frequency stages .01 microfarads will be required.

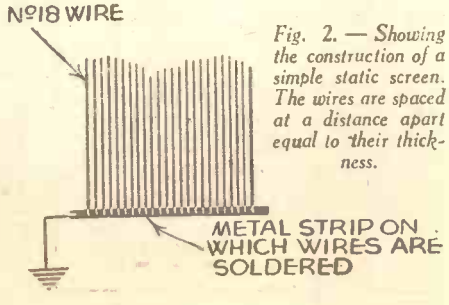


Fig. 2. — Showing the construction of a simple static screen. The wires are spaced at a distance apart equal to their thickness.

Static Screening

Special attention must be drawn to the static screen S. For those experimenters who have not used a static screen in an aerial coupling circuit before, a brief description of the screen and the reason for its inclusion will be given. The screen itself consists simply of a series of parallel wires soldered to a flat strip of metal, and interposed between the aerial and grid coils. One end of the screen is earthed. It must be emphasised that the wires must not be joined together at both ends, otherwise the screen becomes short-circuited and will load the grid of the detector, an opposite effect to that which is required. Fig. 2 shows the practical construction of a static screen. The area of the wires need only be sufficient to cover that of the coils, and in the present case quite a small screen is necessary.

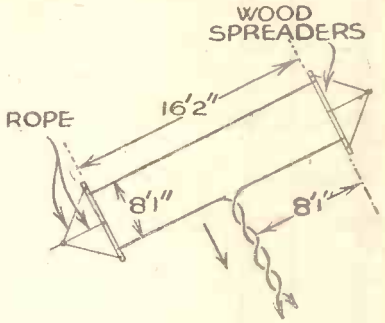


Fig. 3.—A half-wave aerial system for 10 metres. The aerial should face in the direction of the received signal, as indicated by the arrow.

Preventing Capacity Coupling

There are several reasons for static-screening the aerial input circuit, the most important of which is the fact that the screen prevents any capacity coupling between the aerial and grid circuit, so that there is no damping of the detector circuit from the aerial, making for less trouble from non-oscillation and all the other reactive detector worries that are due to high grid loading. Even a few inches of wire tapped on the grid at 10 metres, will be sufficient to prevent the valve from oscillating. Another of the beneficial effects from a static screen is that it lessens the pick-up of all atmospheric noises, such as ignition radiation and similar static discharges. This type of interference is aperiodic over a large band of frequencies, and it is mostly due to capacity coupling between the aerial and detector circuit that tends to increase the amplitude of the interference. It must be pointed out that the static screen does not impede the transference of signal energy, as the coils are still coupled together inductively.

(Continued on next page.)

SHORT-WAVE SECTION

(Continued from previous page)

Converter Details

The practical construction of the 10-metre converter should cause little trouble. The best method is to use a small chassis 8in. square, and about 2in. in depth. The tuning condenser C1 has a capacity of 20 micro-microfarads, and should be mounted close to the valve so that the grid condenser shunted by the grid leak R2 may be taken direct to the top cap of the valve from the fixed vanes with a minimum amount of wiring. The grid coil L1 has eight turns, with a diameter of ¾in., and is mounted directly in front of its tuning condenser. The cathode tap is made at two and a half turns from the earth end. The aerial coil L has four turns, and is mounted alongside the grid coil with the static screen between them; preferably, the aerial coupling should be made variable. Both coils may be wound with No. 16 gauge wire. The rest of the wiring of the components is done underneath the chassis, and it will be seen that the grid and anode wiring, with the H.T. feeds, are well separated. One other point must be mentioned, and that is all the earth wiring should be taken to one terminal point mounted at some convenient spot on the chassis, rather than have a straggling earth line all over the place with connections at different points.

Aerial Construction

For optimum results the aerial system requires a little consideration on 10 metres. On wavelengths lower than 10 metres it is usual to make use of vertical systems, but owing to the different character of the frequency, and also due to the fact that most 10-metre signals are transmitted with horizontal polarisation, it is more desirable to make use of a horizontal aerial for reception also. Fig. 3 shows the construction of a simple dipole with reflector. Connection from the receiver to the centre of the aerial should be made with twisted flex, as this makes for a more correct impedance match. The dimensions given in the diagram are such that the aerial is tuned to the middle of the 10-metre waveband.

It may be thought from the foregoing remarks that reception at 10 metres is very critical, but this is not so, though more attention must be given to the details outlined than is usual on the higher wavebands. It must be remembered, also, that the voltage to be picked up on the receiving aerial from a distant station is correspondingly smaller with the increase in frequency, and with a higher noise-to-signal ratio. It has been with these points in mind that the accompanying circuit and details have been described.

Leaves from a Short-wave Log

New Radio Service in Surinam

Daily transmissions on week-days are made at PZ1AA, Paramaribo (Surinam) from G.M.T. 12.40-13.40, and on Sundays between G.M.T. 19.40-21.40 on 16.95 m. (17.699 mc/s). All announcements are given out in Dutch and Malay languages. Address reports to Mynheer S. Mobach, Superintendent, Government Radio Service, Paramaribo, Dutch Guiana (South America).

Guatemala Changes Its Channel

TGWA, Guatemala City (Republic of Guatemala) hitherto operating in 31.75 m. (9.45 mc/s) is now working on 31.01 m. (9.675 mc/s), and was recently heard broadcasting a special programme for the International DXers' Alliance.

Honduras Transmissions

HRD, La Ceiba (Republic of Honduras), *La Voz del Atlantida*, will carry out a special broadcast for the International DXers' Alliance on January 31st, between G.M.T. 21.00-22.00. Although in the ordinary transmissions the Spanish language prevails for announcements, English is used about every half-hour. Regular transmissions are made on week-days between G.M.T. 01.00-04.00, and on Sundays between G.M.T. 21.00-23.00. The wavelength is 48.11 m. (6.235 mc/s).

British Honduras on the Air

A short transmission is carried out every Wednesday, Friday and Sunday in the English language through ZIK2, Belize (British Honduras) on 28.3 m. (10.06 mc/s), from G.M.T. 00.30-00.45.

Radio-Colonial (Paris)

IN addition to the channels used daily by the French Colonial overseas station at Pontoise, near Paris, namely, 19.68 m. (15.243 mc/s), 25.25 m. (11.885 mc/s) and 25.6 m. (11.72 mc/s), a broadcast of the French news bulletin may frequently be heard on 33.19 m. (9.04 mc/s). This is Paris TYA2, which works radio-telephony with ships, but is also brought into operation to relay the Paris broadcasts to Algiers (North Africa). Radio-Colonial is also trying out a new frequency, 6.04 mc/s (49.67 m.).

Barranquilla Moves Up

HJ1ABB, Barranquilla (Colombia), which, so far, has been occupying a position in the 49-metre band, has altered its frequency to 4.77 mc/s (62.89 m.), to which neighbourhood several other Colombians are likely to go shortly. Interval signal: four bells (one high, one low) every 15 minutes, followed by the call: *Aqui radiodifusora La Voz de Barranquilla.* HJ1ABB is an "old-timer," inasmuch as the station celebrated the anniversary of its eighth birthday on December 5th last. Address: Apartado Postal, 715, Barranquilla (Republic of Colombia, South America).

New Broadcasts from Malaya

The British Malaya Broadcasting Corporation announces that in March two new short-wave stations will be inaugurated at Singapore, namely, ZHP, on 31.48 m. (9.53 mc/s)—the frequency used by W2XAD, Schenectady—and ZHO, on 49.9 m. (6.012 mc/s). The former will transmit on Saturdays and Sundays, and the latter on weekdays only. At present there are only two short-wave broadcasting stations in the Malay peninsula, ZGE, Kuala Lumpur, owned by the Selangor Amateur Radio Society, with a programme on Tuesdays, Fridays and Sundays between G.M.T. 11.40-13.40 on 48.92 m. (6.13 mc/s), and ZHJ, Penang, operated by the Penang Wireless Society, on 49.34 m. (6.08 mc/s), giving a broadcast on weekdays from G.M.T. 12.40-14.40. Singapore is roughly 6,780 miles by airline from London. The small amateur station ZHI, which pioneered the first broadcasts at Singapore, was closed down a few months ago to make way for the official new transmitters.

A Chilean Absorption

According to a report from the U.S.A., CB615, Santiago (Chile), which has been working on 24.39 m. (12.3 mc/s), has been taken over by the owners of CB1170 in the same city. Transmissions are daily carried out through the latter transmitter on 25.64 m. (11.7 mc/s). The address is Estaçiones Otto Becker, Casilla Postal, 761, Santiago (Chile).

Although its power does not exceed 150 watts, a Chilean station which may be logged from time to time is CB960, Radio Real de Santiago, operating on 31.25 m. (9.6 mc/s); it is heard after midnight.

Manila Will Change Wavelength

KZRM, Manila (Philippine Islands), of which the broadcasts on 31.35 m. (9.57 mc/s) are easily captured in the British Isles, may shortly forsake this section of the band to operate on 11.84 mc/s (25.34 m.), a channel at present allotted to—but seldom used by—OLR, Prague-Podebrady (Czechoslovakia). Manila is roughly 6,800 miles from London, and Standard time is eight hours ahead of G.M.T. The station is on the air between G.M.T. 21.30-23.00, and again from 02.00-14.00.

More Broadcasts from Cuba

Two more stations situated at Havana (Cuba) are reported to have come on the air during the past month or so. They are COCU (short-wave outlet of CMCU) and COCA, acting in the same way for the medium-waver CMCA. The wavelengths are 45.52 m. (6.59 mc/s) and 46.44 m. (6.46 mc/s) respectively.

Switzerland's Projected Short-wave Transmitter

So far the Swiss radio programmes to be relayed to foreign countries have been re-transmitted through the Prangins (League of Nations) stations. It is stated that the Helvetian Government proposes to erect a new 20 kW transmitter in the neighbourhood of Berne.

A True Musical Pitch

Listeners to W2XE, Wayne (N.J.), U.S.A., the short-wave outlet of the Columbia Broadcasting System (WABC, New York), will shortly hear at the beginning of each programme the striking of a tubular gong, which, vibrating 440 times per second, will reproduce a true "A" in order to enable musicians the world over to tune their instruments.

Technical Fundamentals—2

The Principles of Tuning are Dealt With in This Second Article of the Series

BEFORE leaving this single modulation frequency case it is well to bear in mind that the ratio of the amplitude of the F + M (and also of the F—M) component to that of the F component is one-half of the modulation ratio B/A.

With modulation of the normal broadcast kind there is not just a single modulation frequency to consider, but a range of modulation frequencies. Extending our ideas from the simple case of Fig. 2, we have to regard a normal broadcast transmission as amounting to the radiation of unmodulated oscillations of the carrier frequency F, and two *ranges* of unmodulated oscillations of the "sideband" frequency ranges of

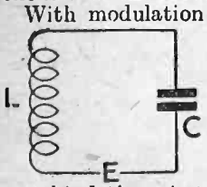


Fig. 3.—A tuned circuit in which L represents inductance, C represents capacity, and E the electromotive force operating in the circuit.

$$F + M \text{ to } F + m$$

and

$$F - M \text{ to } F - m$$

where M is the highest modulation frequency used, and m is the lowest modulation frequency used.

This means, in effect, that the radiation of a broadcast transmitter "spreads" over a band of frequencies stretching from F + M to F—M. That this greatly complicates the requirements for satisfactory broadcast reception is surely obvious. We shall return to this matter later.

Tuning: Series Resonance

Considering the characteristics of different broadcast transmissions it must be understood that the essential factor which must be utilised in reception to enable one particular transmission to be received is the carrier frequency value. This raises the subject of "tuning," for the receiver must contain one or more (normally more) "tuned" circuits.

Fig. 3 represents a circuit containing an inductance coil L and a condenser C, both in series. It is to be understood that a high-frequency electro-motive force E is operating in the circuit. The circuit must not be regarded as broken as the diagram might suggest. The diagram has been drawn that way to emphasise the fact that the e.m.f. is operating *internally* in the circuit.

A given value of E will produce a high-frequency current in the circuit, and the current value will be dependent upon the impedance of the circuit.

$$I = \frac{E}{\sqrt{R^2 + \left(\omega L \sim \frac{1}{\omega C}\right)^2}}$$

where I=current
E=e.m.f.
R=H.F. resistance of the circuit
L=inductance
C=capacity
ω=6.28 × frequency

The square root expression represents the impedance of the circuit.

As regards units, the current will be in amps. if the e.m.f. is in volts, resistance in ohms, inductance in henrys, capacity in farads, and frequency in cycles per second.

The current will be of peak value if the e.m.f. is of peak value, and the current will be of virtual (R.M.S.) value if the e.m.f. is of virtual value.

The bracketed expression ($\omega L \sim 1/\omega C$) is all-important. It represents the difference between the inductive reactance ωL and the capacitive reactance $1/\omega C$, and it can be called the net reactance of the circuit. It is to be noted that the smaller of the individual reactances is to be subtracted from the larger. That is why the $\sim$ sign is used instead of a minus sign in the above equation. Thus, sometimes we have ($\omega L - 1/\omega C$) and sometimes ($1/\omega C - \omega L$). ω=6.28 × frequency, so the net reactance is obviously a value that is dependent upon frequency. As a result the impedance of the circuit will vary with change of frequency.

Wavelength Metres.	Frequency Kilocycles	Wavelength Metres	Frequency Kilocycles
Long		Medium	
2000	150	290	1034.5
1750	171.4	280	1071.4
1500	200	270	1111.1
1250	240	260	1153.8
1000	300	250	1200
		240	1250
Medium		230	1304.3
560	535.7	220	1363.6
540	555.6	210	1428.6
520	576.9	200	1500
500	600	Short	Megacycles
490	612.2	100	3
480	625	90	3.33
470	638.3	80	3.75
460	652.2	70	4.29
450	666.7	60	5
440	681.8	50	6
430	697.7	49	6.12
420	714.3	40	7.5
410	731.7	31	9.68
400	750	25	12
390	769.2	20	15
380	789.5	19	15.79
370	810.8	17	17.65
360	833.3	15	20
350	857.1	13	23.08
340	882.4	11	27.27
330	909.1	Ultra-short	
320	937.5	7.23	41.5
310	967.7	6.66	45
300	1000		

Inspection of the impedance formula shows at a glance that there is a special possibility simply asking for comment. This is the possibility of ωL being exactly equal to $1/\omega C$. In this case the net reactance will obviously become zero, and the impedance expression will simplify down to R (the resistance). Therefore

$$I = \frac{E}{R}$$

This is the case of "resonance," and when the frequency of E is such as to produce the condition of resonance the impedance is lower than at any other frequency (being R, merely), and the current in the circuit is greater than at any other frequency. In making this statement we are assuming that R holds constant for different frequencies. There are, however, complications looming ahead in this connection.

Here, then, we have a circuit which behaves differently to one particular frequency than to any other—the very sort of thing that we need to enable a receiver to select a broadcast transmission of a certain carrier frequency from a number of transmissions of different carrier frequencies.

The question that arises now is, what governs the particular frequency value at which the circuit will be in the resonant condition?

The resonant frequency is that frequency which makes

$$\omega L = 1/\omega C$$

and is equal to

$$\frac{1}{6.28\sqrt{LC}} \text{ cycles per second}$$

where L=inductance (henrys)
C=capacity (farads)

To say that a circuit, such as that of Fig. 3, is "tuned to a frequency F" implies that F is the resonant frequency corresponding to the values of L and C in the circuit.

In case there may be some reader who, while he can appreciate from the equations given above the effect of the frequency reaching the resonant value, yet cannot quite "see" what is happening in the circuit, we give the following explanation:—

Referring to Fig. 3, the presence of L is responsible for a reactive voltage being developed in the circuit. This voltage is induced by the fluctuations of the magnetic field of L, and it is very important to note that this particular reactive voltage is lagging in phase behind the current by 90°. C is responsible for another reactive voltage. This is dependent upon the fluctuations of electric charge in the condenser, and is a voltage which, as regards phase, leads ahead of the current by 90°. Obviously these two reactive voltages will be 180° out of phase with each other, i.e., in direct opposition.

Individually, each of the two reactive voltages tends to bring about an increase in the circuit impedance but as, in the circuit of Fig. 3, they oppose each other, it is the difference between their two values which actually counts as regards the effect of L and C upon the circuit opposition, and the corresponding current value.

In the case of resonance, the two reactive voltages become equal, and therefore balance each other out (considering the circuit as a whole). That is why the circuit impedance reduces down to R only.

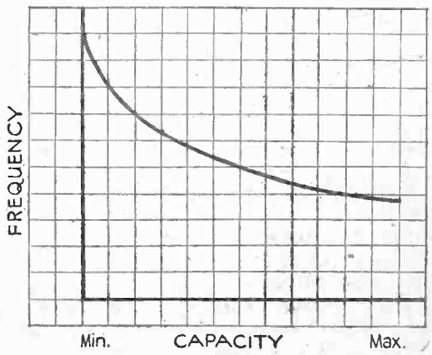


Fig. 4.—Graph showing the effects of reaction at various frequencies.

Two Particular Advantages of Resonance

There are two special features of the resonant condition which must be noted.

First, there is the fact that has already been pointed out, namely, for constant

(*Continued overleaf.*)

TECHNICAL FUNDAMENTALS

(*Continued from previous page*)

e.m.f. the current is maximum at the resonant frequency.

Secondly, it must be noted that although the two reactive voltages balance each other out as regards the circuit *as a whole*, they nevertheless are in active existence and, under favourable circumstances, will be considerably greater in value than the applied e.m.f. E. Across the half of the circuit which contains L (but not C) there can, therefore, actually be a voltage drop greater than the applied e.m.f. The same remark applies to the half of the circuit which contains C (but not L). Either of these voltage drops can be considered as offering considerable possibilities where radio reception is concerned, but we will defer a more detailed consideration until we come to the subject of circuit magnification.

Variable Tuning

We have seen that the resonant frequency is inversely proportional to $\sqrt{LC}$; correspondingly, the wavelength appropriate to the resonant frequency is directly proportional to $\sqrt{LC}$. It follows that if the resonant frequency value is to be adjustable, either L or C (or both) must be variable.

The normal practice, in H.F. receiving circuits, is for the tuning control to operate a variable condenser.

Tuning Range

For a given inductance value the circuit will be tuned to the lowest frequency (longest wavelength) when the condenser is at its maximum capacity setting. The highest frequency (shortest wavelength) that can be tuned to will now depend upon the value of residual capacity that still remains when the condenser is adjusted to its so-called zero setting. The residual ("stray") capacity of the circuit is, therefore, a factor of considerable importance when it comes to a question of what tuning range will be obtained.

We are assuming constant inductance. Upon this assumption it can be said that the variation of resonant frequency will depend upon the variation of $\sqrt{C}$. Thus, the ratio of the maximum to the minimum frequency will be equal to the square root of the ratio of the maximum to the minimum capacity.

The residual capacity is made up of a number of contributory factors: the minimum capacity of the variable condenser, the self-capacity of the tuning coil, the stray capacity of the wiring, and, in usual circumstances, there will be additional capacity imposed on the circuit by components connected across the circuit (e.g., the input capacity of a valve, valveholder capacity, etc.). In addition, there may be capacity "reflected" into the circuit by some other circuit coupled to it.

The minimum capacity of a variable condenser is not zero, for, even with no overlap between the plates there is still an electric field between the plate edges; moreover, there is always a certain permanent small capacity residing in the insulating plate mountings.

Self-capacity

The self-capacity of an inductance coil can sometimes have far-reaching results. It must be noted by the reader that it is impossible to wind a coil to have inductance *only*. It is easy to appreciate that it must inevitably have resistance, but not so easy perhaps to understand that it is equally inevitable that it should have capacity. This self-capacity is actually distributed throughout the coil. Between adjacent turns of the coil there is insulation—silk, cotton, etc., or perhaps air. The potential difference that exists between the turns sets up an electric field in the insulation. In other words, and taking an elementary viewpoint, the two turns of wire, and the insulation between them, act like two plates and dielectric of a condenser. It is, of course, one of the principles of good coil design that the self-capacity shall be made as small as possible. Spacing of turns, method of winding, type of insulation, nature of coil former, are all factors that have a bearing upon the value of the self-capacity.

In considering L and C as separate items of a circuit, we have seen that to the value of LC there is appropriate a certain resonant frequency. Could this same idea apply to the inductance of a coil and its self-capacity?

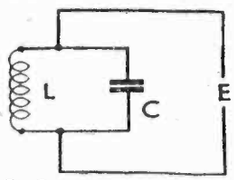


Fig. 5.—An external voltage applied to a tuned circuit as met with in standard radio circuits.

It does so apply, and it is a fact that any inductance coil can exhibit resonance effects quite on its own. We shall have to take this fact into account later in connection with certain special problems, but at the moment we are more concerned with the matter of tuning range.

Resonant Frequency

In the typical H.F. circuit, consisting of a coil with a variable condenser across it, the resonant frequency of the coil itself represents a frequency above which the circuit cannot be tuned by the variable condenser. Actually, the stray capacities which are additional to the self-capacity of the coil will prevent even this frequency being reached.

To get an idea of tuning range limitations imposed by residual-circuit capacity, let us work out an example. Suppose a coil of 157 microhenrys inductance is tuned by a variable condenser, and that the maximum capacity (inclusive of all factors) is .00057 microfarads.

The frequency to which the circuit will be tuned by this capacity can be found by the formula:

$$\frac{1{,}000}{6.28\sqrt{LC}}$$ kilocycles per second.

where L = microhenrys
C = microfarads

Substituting 157 and .00057 for L and C, respectively, the frequency works out to 532 kc/secs. approximately.

The corresponding wavelength may either be calculated direct from the frequency value or by the formula:

$$1{,}885\sqrt{LC}$$ metres

(L and C being in microhenrys and microfarads).

The wavelength works out to 564 metres approximately.

Now let us suppose that the minimum capacity obtainable is .00006 microfarad (i.e., 60 micro-microfarads).

The frequency and wavelength to which the circuit will be tuned with the variable condenser at its "zero" setting will be 1,640 kc/sec. and 183 metres.

As a consequence of the tuning range limitation with any one coil, it becomes necessary to split the tuning of the normal receiver into a number of "wave ranges," a different value of inductance being used for each range. Hence the familiar "wave switch."

It will be understood that the use of a trimming condenser in any one of a set of ganged circuits raises the residual capacity of the circuit, and that no more capacity than is absolutely necessary should be used.

Spreading the Stations over the Dial

The ratio of maximum to minimum capacity is not the only point of particular interest in connection with variable-condenser tuning. The manner in which the capacity varies as the condenser control is turned is a factor of importance, because it will determine how the tuning points for the various transmissions will be distributed over the tuning dial.

For normal reception purposes it is not desirable that the capacity shall increase by equal increments for each degree of rotation from minimum. If the capacity did vary directly with the rotation the resonant frequency of the circuit would not change uniformly but in the manner indicated graphically in Fig. 4. Obviously the station-tuning points would be much more congested at one end of the tuning scale than at the other.

In the early days of radio, variable condensers normally had vanes of semi-circular shape, giving more or less uniform change of capacity with rotation. Condensers of this simple plate shape still have their uses in certain work, but those now used for reception have plates of special shape, designed to give more uniform *tuning* control.

From what has been stated previously, the reader will see that for linear-frequency variation the value of $1/\sqrt{C}$ must change uniformly with rotation of the condenser.

The Possibility of Ganging

If a number of circuits have their tuning condensers ganged to the one control they will obviously keep to the same tuning frequency as one another if the product LC keeps of equal value in all the circuits. Coil manufacturers turn out coils which are sufficiently closely matched to make ganging possible as far as L is concerned. Condenser manufacturers, too, provide us with ganged condensers with close matching between the individual sections at all tuning settings.

Circuit Magnification

The reactive voltage developed by L and that developed by C will, in the case of resonance between L and C, be normally considerably greater than the e.m.f. operating internally in the circuit. The ratio of the reactive voltage of L to the e.m.f. is equal to

$$\omega L/R$$

(Remember that $\omega = 6.28 \times$ frequency)

Correspondingly, the ratio of the reactive voltage of C to the e.m.f. is equal to

$$\frac{1/\omega C}{R}$$ which simplifies to $$\frac{1}{\omega CR}$$

Either of these expressions can be referred to as the voltage magnification of the circuit. $\omega L/R$ is the one that is usually used.

We see that three factors—frequency, inductance and resistance control the values of the magnification. From the circuit design point of view, R is the factor of importance, for the frequency is frequently an independent value, while L is determined largely by considerations of convenient tuning arrangements, and any particular effort made to raise the magnification of a circuit is generally a matter of attacking the H.F. resistance. Intermediate frequency circuits of superhets represent the cases where the designer has got the most opportunities of fixing the magnification to a high and pre-determined value.

$\omega L/R$ is often designated by the symbol Q.

NEWS FROM THE TRADE

Columbia Record Player

COLUMBIA announce a new record player retailing at £3 19s. 6d., and a pick-up outfit listing at 21s. The record player is for A.C. operation, housed in a neat wooden cabinet with lid which can be closed during playing. A combined volume control and on/off switch can be operated while the lid is closed.

Quadrant Tuning Motors

THE Quadrant Carbon and Metal Products Company, of Stanmore, announce that they are producing a special motor for automatic tuning purposes. This motor, developed by the Alliance Mfg. Co., of America, is a very popular item, and is included in a number of American push-button tuning sets.

Decca Press Button Sets

A BRITISH manufactprer has now produced a receiver with push-button tuning, and the first model was released last week. It is a Decca product and has eight buttons, providing automatic tuning for National, London Regional, Midland Regional, North Regional, Scottish Regional (and long-wave Droitwich on the same button), Welsh Regional, Radio Normandie, and a separate button for converting the set to manual tuning. The dual button is used for either the medium- or the long-wave station and is controlled by the medium/long-wave switch. Further models are to be released shortly.

H.M.V. Record Player

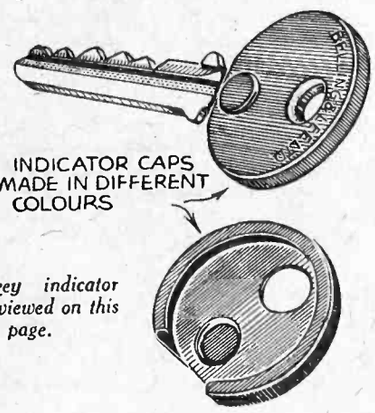
A NEW version of the H.M.V. Model 119 record player is now available, capable of handling either 10in. or 12in. discs with an automatic changing mechanism. It is slightly larger than the Model 119 and costs 9 guineas.

New Mazda Valves

TWO new output valves for A.C. receivers are shortly to be added to the Mazda range, and both are beam tetrodes. One is the AC/5Pen and the other the AC/5Pen/DD, and they will have somewhat similar characteristics to the AC/2Pen and the AC/2Pen/DD.

Keydex Indicators

AN interesting accessory is illustrated on this page, and is produced by Messrs. Belling and Lee for Keydex, Ltd. (distributed by Cross-Courtenay, Ltd., of High Holborn). These consist of celluloid covers for Yale-type keys, and they are available in six colours—red, yellow, green, black, white and blue. It is thus a simple matter easily to pick out a desired key where several of these keys are carried, and to enable them to be identified in the dark a special code is used in conjunction



The key indicator caps reviewed on this page.

with the colours, and is embossed upon them. The cover clips over the key and is placed on or removed in a second. The price is 3d. each.

Octal Valve Bases

THE following statement has been issued by the General Electric Company:

"In view of the number of valve bases now on the British market, we should like to make clear our policy so far as Osram Valves are concerned.

"We shall continue to use on Osram valves of the 'International' range the type of octal base which originated in America and is now in general use throughout the world. Our object in so doing is to aim at standardisation and to make Osram valves interchangeable with other valves in the world's market, and to avoid confusion in the minds of the trade. The main consideration in the adoption of the American-type base has been the convenience of manufacturers of receivers.

"It is a generally accepted view that British receiver manufacturers must to a large extent look to the export market for expansion in their business. We have satisfied ourselves by careful investigation that receivers fitted with valves different in characteristics or bases from what the trade already know and understand are likely to meet with a poor reception in world markets. Hence our decision to standardise a base identical with the American type base to enable the same chassis to serve for the home and export markets with resultant saving in cost. On battery and 4-volt A.C. mains valves we shall continue to use the existing resilient pin bases."

TELEVIEWS

An American Tube

THE work of the R.C.A. in the field of projection type cathode-ray tubes is still going ahead, but at the moment they do not appear to have been quite so successful as television companies in this country. In their last experimental demonstration the picture size was 4ft. by 3ft., representing a magnification factor of 24, since the image on the tube's screen was given as 2ins. by 1½ins. To accomplish this three metallic focusing discs were used, each having an aperture one millimetre in size. On emerging from the last of these three discs the electron stream was constrained to pass through a fourth disc having a hole too small to accommodate a human hair. After this the frame and line deflection was carried out electro-magnetically but there has been little comment on the picture quality achieved. It is known, however, that in the studio the Americans use considerably more lighting than the B.B.C. Whereas the intensity in studios at Alexandra Palace is of the order of 200 ft. candles, for quite small stage sets in the R.C.A. Radio City studios the loading which is stated to be used is as high as 30 kilowatts.

RADIO CLUBS & SOCIETIES

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

THE CROYDON RADIO SOCIETY

A LARGE attendance greeted Mr. V. Williams, member, for the Croydon Radio Society's meeting on Tuesday, January 18th, in St. Peter's Hall, Ledbury Road, S. Croydon. The occasion was a demonstration of his Voigt loudspeaker and push-pull Quality amplifier. The receiver covered three wavebands. A selection of records came first, beginning with a military band recording made by Mr. Voigt himself, and the society was asked to note the excellent reproduction of the cornet and "attack." The next item was ideal for showing what the guitar should sound like. Many other items followed, but it was disappointing that the B.B.C. had not provided a very suitable programme for the occasion and, as it was, jazz had to be mainly relied upon. Nor did it fail, as all the harsh noises and discords were faithfully revealed, and, of course, what was worse, the crooning was very lifelike! However, chamber music was also tried on the other wavelength, and the brilliance of the violins was very favourably commented upon. Although distant stations were not for the quality enthusiast, yet some German and Austrian bands were very faithfully reproduced and, indeed, appreciated after the society's enforced listening to jazz from Britain. On Tuesday, February 8th, Mr. H. J. Walters, of Belling and Lee, Ltd., will lecture on "Electrical Interference Suppression as applied to Broadcast Reception." The society looks forward to meeting PRACTICAL AND AMATEUR WIRELESS readers at this meeting.

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

SLOUGH AND DISTRICT SHORT-WAVE CLUB

AT the meeting held on January 18th Mr. R. Sly gave the first of a series of lectures on "fundamentals." His very interesting talk dealt with the composition of matter; definition of a current; and magnetic fields and their uses. Mr. Sly answered several questions on the subject after his talk. Following this a lively discussion on lay-out in the detector stage took place. At length, agreement was reached, and the detector stage of the club's receiver will be built to the agreed design and construction will be continued at the next meeting. There will also be a display and demonstration of apparatus constructed by members and Mr. R. Sly will give his second lecture on fundamentals.

Hon. Sec., J. White (2DAJ), 20, Chalvey Road E., Slough, Bucks.

DAVENTRY SHORT-WAVE CLUB

AT a recent meeting of short-wave enthusiasts held in Daventry, it was proposed to form a club under the name of "The Daventry Short-wave Club." It was also proposed to hold weekly Morse code practice under the guidance of a competent operator, with a view to helping members to obtain transmitting licences. One A.A. licence (2AFN) is already held, and other members will shortly make applications for licences.

When the club is officially formed we shall be pleased to supply further details of officers elected and reports of our activities. Any further information may be obtained by communicating with R. Pinfold, 33, St. James Street, Daventry, Northants.

SWINDON AND DISTRICT SHORT-WAVE SOCIETY

AT the meeting of this society on January 20th the reconstructed transmitter was tested on fone, the call sign being 2CLY. Members are "swatting" on Morse ready for a full call. D. T. Bolfin has taken his Morse test and the members are looking forward to a full call for the society's use. Five-metre receivers are being got ready for field days, and there is much activity among the A.A. members.

Hon. Sec., W. C. Barnes, 7, Surrey Road, Swindon.

THE KINGSTON AND DISTRICT AMATEUR RADIO SOCIETY

THE above Society have held two very successful meetings during January. On Wednesday, January 5th, at The Three Fishes Hotel, a large gathering of short-wave enthusiasts listened to an interesting lecture and demonstration given by Messrs. Premier Supply Stores, of their amplifiers and transmitters. Another interesting evening was spent on Wednesday, January 19th, when G8IP and G8HY debated that vexed question, "Which is best, C/W or fone?" Messrs. Radio Reproducers are staging a demonstration of their 5-metre superheterodyne receiver and other apparatus at the next meeting, February 2nd. There will also be a meeting on Wednesday, February 16th. Both meetings commence at 8 p.m., and are held at The Three Fishes Hotel, Richmond Road, Kingston. Visitors are heartily welcomed. Full particulars of the Society from the Hon. Secretary, Mr. Donald N. Biggs (G6BI), Eastrop, 44, Pooley Green Road, Egham, Surrey.

(*Continued on page* 588)

Practical Television

February 5th, 1938. Vol. 3. No. 86.

Indirect Viewing

ONE of the objections sometimes levelled against the indirect viewing of televis on pictures, that is showing them as mirror reflections as distinct from an image built up on the screen of a cathode-ray tube, is that there are double images present when a back silvered mirror is employed. This is due to the thickness of the glass used, and many schemes have been suggested for the purpose of making front silvered mirrors which are not expensive. One of these ideas is to deposit a silver film in any suitable manner on a protective film which forms a coating on a moulding of glass, or other material, which can be worked to a high degree of accuracy and polished. The exposed silver surface, as soon as it is formed, can be fixed, for example, by cement to the blank or section on which the mirror surface is required. When the cement has hardened the moulding member may be forcibly removed, and in this way leave an accurat finished silver film on the desired section.

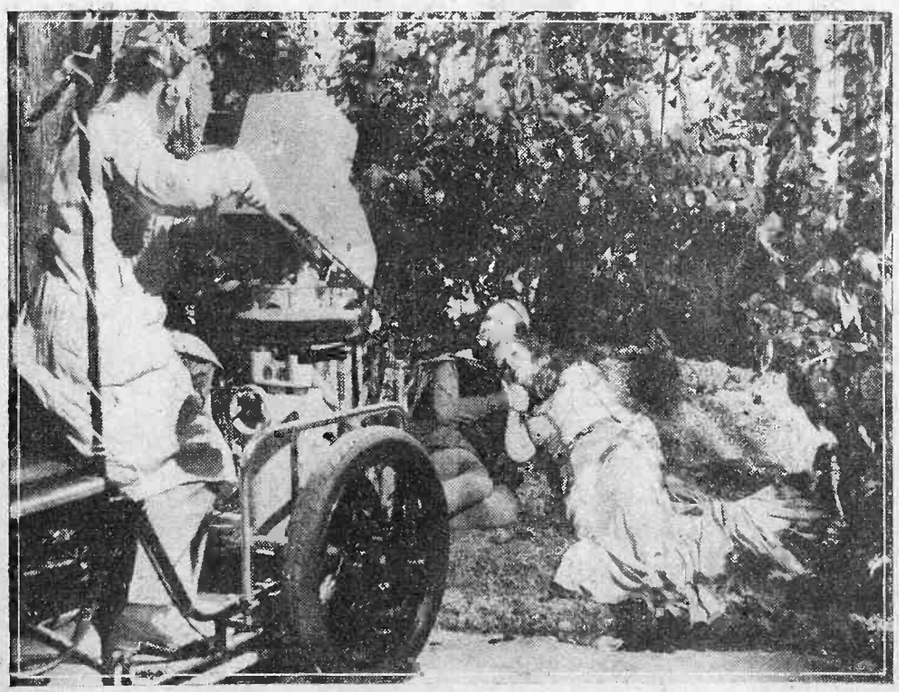
New Television Technique

LAST week the television programmes included an operatic broadcast from the second act of Wagner's "Tristan and Isolde," in which a new television technique was introduced. Taking a leaf out of the notebook of the film producer, the cast was "dubbed," actors performing before the television camera carrying out their parts in mime, and unseen singers supplying the necessary vocal backgrounds. The result was admirable and, due to the elaborate scenic effects provided in the studios and outside in the grounds of the Alexandra Palace, the performance had many points of interest and value which were not equalled by the most elaborate stage performance. The accompanying illustration shows the television camera penetrating the wood for the love scene which is seen in progress with Oriel Ross as Isolde and Basil Bartlett as Tristan. The singing parts for these two characters were performed by Isobel Baillie and John Wright, respectively. It will be noted that real shrubbery was used for the scenic effects in the studio, and if television programmes progress on the lines now being explored, with the addition of cinema scenes interpolated to produce backgrounds and scenes which are not capable of being effectively built in the studio, the scope which is offered will be as wide as that now available to the most comprehensive film studio. We look forward to more broadcasts on the lines of this performance, perhaps taking one of the big films—if rights can be obtained—to popularise the sale of television receivers.

An Important Part

THE recognition of television as a means for disseminating knowledge was made at an important meeting held recently. This was in connection with an Engineering Public Relations Committee, representing fourteen different institutions, which has been formed with the idea of presenting to the public, in suitable form, information concerning the science and practice of engineering and its services to the public. Lord Stonehaven who presided at a recent gathering said that there was a strong feeling that little had been done to show what the community owed to engineers in everything that went to make up their daily lives. However, it should not be difficult to present the committee's message to a generation so mechanically minded as the present one, and to guide their ideas on sound and practical lines. In the plans now being formulated it was hoped to have the co-operation of the B.B.C., and television would play an important part in the spreading of knowledge. The combination of sight and sound signals, especially now that big screens were becoming a practical proposition, would give an ideal method of appealing to an enormous audience from one central platform—public address in every sense of the word.

THE FIRST OPERA TO BE TELEVISED.



The television camera in action taking the love scene in "Tristan and Isolde," with Oriel Ross as Isolde, and Basil Bartlett as Tristan.

The Next Derby

IF negotiations now being undertaken by the B.B.C. prove successful, then the 1938 Derby race will go down to history as the first to be televised on a high-definition rating. Six years ago the race was seen in London, by a three-zone transmission, in a cinema, the screen size being 10ft. by 8ft., with a total of ninety lines vertically scanned at 12½ pictures per second. Judged on the standards then operating, the experiment undertaken by the Baird Company was an outstanding success, but with the improved O.B. methods now in use the pictures radiated should be of first-class quality, provided the radio link between Alexandra Palace and the vans on the course does not pick up any electrical interference *en route*. Field tests have already been undertaken, and these have led the B.B.C. to state that from the technical point of view there is every reason to hope for a successful transmission. Permission has now been asked of the local authority for space to accommodate the mobile vans, and assuming that this is forthcoming, then the Epsom Grand Stand Association will be asked to give permission to undertake the experiment. The only difficult point to settle seems to be the possible obstruction of view of people in the grand stand, assuming that the finish of the race is to be shown, and it is hoped that an amicable settlement will be arrived at, for the news value to television would be enormous.

Television Screens

THE promise of large-screen television for theatre and cinema use has made engineers turn their attention to the screen material itself, to find whether it is satisfactory for the needs of projected television pictures. When talking films replaced the silent ones, cinema screens had to be redesigned to allow the sound from the loudspeakers accommodated behind the screen to pass right through and give ample volume in every part of the building. Nowadays, there is no complaint concerning the degree of brilliance found with pictures shown in modern cinemas, but in regard to television it is not yet known whether the standard cinema screen will prove wholly satisfactory. In any case, patents are now being taken out for special television projection screens, and one of the latest of these is from America. According to report it is built up from a very fine woven artificial satin which has been prepared by impregnating it with a solution of uranium and thorium. This arrangement is said to result in a clear, bright projected television picture owing to the incandescent effect produced by the chemical treatment.

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Lectures on Radio from W1XAL

SIR,—It occurred to me that many readers may not be aware of the very interesting and instructive radio course at present being broadcast by W1XAL on 49.67 metres, 6,040 kc/s, at 7.30 p.m., E.S.T. each Monday evening, i.e., 12.30 a.m. Tuesday, G.M.T.

The instructor for the course is Mr. C. D. Belcher, formerly U.S. Radio Inspector at Boston.

The course, entitled "Modern Radio Theory and Practice," is divided into four sections, each section being subdivided into eight lectures. Section one is now completed and a summary of the other three sections is as follows:—

Section 2 is devoted to power supplies, and radiotelegraph and radiotelephone transmitters, together with crystal control.

Section 3 covers all forms of receivers, from the simplest to the complicated superheterodyne, and super-regenerative, including automatic volume control.

Section 4 deals chiefly with the newer developments in radio. Television, direction finding, automatic frequency control are covered, as also are modern antennas and cathode-ray tubes.

All letters concerning these lectures should be addressed to Radio Station W1XAL, University Club, Boston, Mass., U.S.A.—W. PEARSON (Ulverston, Lancs.).

Station EA9AH

SIR,—With reference to Mr. H. L. Kershaw's query in the issue of January 22nd regarding the above station.

I received as recently as December 28th a Q.S.L. card from the above station (together with literature relative to the Spanish situation) in response to my report to him of October 22nd, 1937.

The querist should take into full consideration the difficulties due to the present situation in Spain; also he must be "swamped out" with reports from U.S.A., etc., as the station is hardly DX here. My cover bore a British stamp overprinted "Morocco Agencies," so that difficulties may even arise from this in connection with international reply coupons. I feel confident that patience will be rewarded shortly with a Q.S.L. card.

I give below the QRA from his Q.S.L. card: Fernando Diaz Gomez, Apartado 124, Tetuan, Marruecos Espanol.—F. W. HILL (Bellingham, S.E.6).

SIR,—In reply to a letter from H. L. Kershaw, Oldbury, B'ham., which appeared in a recent issue of PRACTICAL AND AMATEUR WIRELESS, I wish to inform you that I have just received a Q.S.L. card from Radio EA9AH, bearing the postmark "British Post Office, Tetuan, 15-1-38." I reported reception on 6-11-37, and did not enclose a reply coupon.

EA9AH states: "We are now regularly on the air at 9.30 p.m. and at 12.15 a.m. (G.M.T.) broadcasting war news in English and Spanish."—A. WHYTE (Raphoe, Co. Donegal, Ireland).

A Good S.W. Log

SIR,—I append a log of amateur C.W. transmissions heard on the 7,000-7,300 kc/s band, and would like to see published other logs taken on this band. In a period of five weeks, with a listening time of about two hours per day, the following calls were heard: 350 U.S.A. W1-9, including W5EPZ, GJK, HD, IN; W6OVV, KEV and W7BS, together with Canadian VE1-3. K4EKN; K5AG, AM; K6KHX; HH2LD; PY2CC, 2LD; YV1AC, 4AX; VP6RB; CM7AB, 2AO, 2OP ZL2BV, 2NT, 3FP; FA3QV, 8GT, 8PW; CN1CR, 8AR, and SU1AM.

Thus, all continents except Asia have been heard. In the same period the best 14 m/c stations were VS7GJ (25-watt 'phone) and VK6KB. The receiver was a very ordinary 0—v—1 with a 33ft. horizontal indoor aerial, about 8ft. high.—S. G. ABBOTT (Everton).

RADIO CLUBS AND SOCIETIES

(Continued from page 586)

TOTTENHAM SHORT-WAVE CLUB

THIS Club will be holding three further Visitors' Evenings on February 24th, 25th and 26th. All persons interested in radio will be welcomed. Complimentary tickets will be available from February 4th on receipt of a stamped envelope.

Persons requiring further information of this Club's activities should write to the Secretary, Edwin Jones, 60, Walmer Terrace, Firs Lane, Palmers Green, N.13.

THE SOUTHALL RADIO SOCIETY

ON January 11th, Mr. E. Cholot, of Messrs. Lissen, Ltd., who attracted the best attendance of 1937, paid a return visit and was again rewarded with a big audience.

On January 18th Mr. S. R. Wilkins, of the Automatic Coil Winding Co., was the speaker, and he had a number of Avo instruments with him which he demonstrated. The automatic overload cut-out on the new Avometer attracted a good deal of attention, while the £9 9s. oscillator came in for a number of favourable comments. Hon Sec., H. F. Reeve, 26, Green Drive, Southall.

PROPOSED GLOUCESTER RADIO SOCIETY

IN view of the increasing number of short-wave radio enthusiasts in this locality, it is felt that a club for such enthusiasts in Gloucester would be appreciated.

To further this object, an inaugural meeting is being called on Thursday evening, February 3rd. Further details regarding this proposed Society may be obtained by communicating with E. Geoffrey Lewis, 30, Kitchener Avenue, Gloucester.

EDGWARE SHORT-WAVE SOCIETY

A MEETING of the above Society will be held every Wednesday as from February 2nd, at Edgware Constitutional Club Hall, opposite the Ritz Cinema, at 8 p.m., when new members will be welcome. A lecture will be given on our transmitter (2DDK) by the Hon. Sec., Mr. George Yale. Mr. Thorogood, our Chairman, has promised an electric clock to the member who first receives a full transmitting licence. Mr. Frank Bell, a well-known radio amateur, has been elected on the committee. All inquiries to the Hon. Sec., Mr. G. Yale, 40, Raeburn Road, Edgware.

THE BRITISH LONG-DISTANCE LISTENERS' CLUB

Measuring Set Performance

A POINT which does not often come into prominence but which was raised by a keen member recently, concerns the measuring of the performance of modern wireless receivers. This member points out that a car manufacturer can tell you the acceleration rate, braking efficiency and other details of the car, but he cannot find similar details regarding wireless receivers. It must be remembered, however, that the average car advertisement does not give the details mentioned above, although every manufacturer can supply them on request. Similarly, all the manufacturers of good quality radio apparatus can give the details of its performance when a request is made for them. There are not many details which are required and which are not stated. For instance, most receivers are now quoted to give a certain output, and the number of valves and the number of separate stages are also generally given. The amplification of the set is not often stated, but may be measured. Similarly, the H.T. and L.T. consumption is seldom given in normal specifications, and in the case of a mains receiver the mains consumption is often omitted. For the benefit of those members who are anxious to ascertain these facts in relation to their own apparatus the methods adopted are as follows: a signal from a signal generator is injected into the aerial circuit, the voltage of which is measured. The output is then similarly measured and thus the overall gain of the set may easily be calculated. By injecting a variable signal, such as from constant-frequency records or from accurately calibrated oscillators, the output may be measured and the frequency response shown in the form of a graph. Selectivity may be similarly measured, and the consumption in the case of a mains receiver may be ascertained by connecting a watt-meter in the mains leads. In a battery receiver, of course, a milliammeter in the H.T. negative lead will show the H.T. consumption, and an ammeter in the L.T. circuit will show the L.T. consumption.

Accumulator Indicators

Although not a very common occurrence, it is sometimes found that non-technical users of a receiver may cause damage due to lack of understanding of one or two points. A member who is a commercial traveller, for instance, has written regarding his battery set, which now needs a new accumulator owing to the fact that his wife switches the set on and fails to keep account of the hours of use. The result is that the accumulator becomes discharged, and she turns up the reaction to make good the loss of signal strength, and keeps the set going until signals are practically inaudible. Over a period of time such abuse of the accumulator has resulted in a need for replacement, and he asks for some advice with a view to preventing a recurrence of this trouble. It is now possible to obtain accumulators in which an indicator is fitted to show the state of the battery, and these will be of the greatest help in preventing misuse. The Exide and the Oldham batteries are available with similar indicators, the Exide having a pointer, and the Oldham a moving arm which uncovers indicating discs as shown in the accompanying illustration. Of course, to be fully effective the accumulator must be placed in such a position that the indicator is fully visible at all times, and by leaving instructions that the battery is to be taken for re-charging when the pointer shows nearly empty the trouble mentioned may be avoided.

Home Recording

We are still receiving requests for details concerning the making of records at home, and we must again emphasise that this is not such a simple job as appears on the face of it—that is, if good records are to

This is one of the Oldham accumulators fitted with a discharge indicator.

be made. Any rough-and-ready assembly may be used to make a record, but the quality and life of the disc will not be very good. For instance, by using an old 12in. record and by linking the ordinary pick-up to the cutting pick-up (or by using two pick-ups linked together), the sound grooves on the record will guide the cutting head. An ordinary steel needle may be used for cutting, but again, obviously, this will not give the same fidelity or clean cut which is obtained with a diamond or sapphire needle. Furthermore, although the aluminium blank will give quite a presentable record for test purposes, where permanency or good quality is required, one of the composition discs should be used with trailing needles and weight-adjusted pick-up. With a good tracking device, good blanks and a suitable amplifier, records may be be made at home equal in every respect to the commercial discs, but a little experience will be necessary before this desirable end is attained, and the discs will have to be used with care.

Two Channels or Half-wave?

From time to time peculiarities in short-wave signals crop up which are not easily explained. For instance, although the frequency of HIN, Trujillo City (Dominican Republic), is usually given as 6.24 mc/s (48.04 metres) the broadcast has been picked up equally well on 12.49 mc/s (24.02 metres), and it is not quite clear whether the station is transmitting on two distinct channels or whether this is a question of a powerful second harmonic. The call makes the last letter clear (N as in Nebraska) in order to avoid confusion with HIL, another station in the Dominican capital. The interval signal is three-note chimes, and occasionally the wail of a siren at the beginning of a broadcast. It should also be noted that on 48.78 metres (6.15 mc/s) similar chimes may be heard from HI5N, Radio Difusora Comercial, situated at Santiago de los Cabelleros (Dominican Republic).

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.

BM.GBG4 (W.C.1).—Sorry, but we must ask for your full name and address before dealing with the matters raised.

J. B. C. (Giffnock).—We have not designed a superhet round the parts mentioned in your letter and are thus unable to supply a blueprint.

D. E. S. (Bristol).—The sounds could have come from the laminations of the transformer or from movement of the actual windings. Tighten the locking bolts, or pour Chatterton's Compound over the core to prevent movement of the laminations. If the windings are loose you may eventually expect a breakdown due to the windings fracturing.

R. S. (S.E.24).—We regret that we are unable to supply a blueprint for the set in question.

H. H. (Rye).—There is no standard adopted by manufacturers and it would be necessary to examine the unit. Alternatively, the makers may be able to supply the necessary information.

H. B. (Bedford).—Inductance, resistance and capacity are needed, and there are many different designs. We refer you to the articles on transmitting which we have published from time to time.

A. S. (Manchester).—The H.F. Unit described in our issue dated January 25th, 1936, should be suitable, but we have no alternative unit which we could recommend.

J. S. (Halifax).—The parts may be obtained from Messrs. Peto-Scott. Designs of suitable coils will be found in our latest book, "Coils, Chokes and Transformers."

J. F. C. (Frimley).—The Telc-Cent receiver described in our issue dated January 30th, 1937, used the coil unit you refer to. It is not, however, strictly all-wave, and it would be very difficult, as well as expensive, to make a set to tune to all wavelengths from 5 to 2,000 without a gap. The coils in the Corona are identical.

W. B. (Belfast).—You should find a friend who is also interested and learn the code together. Alternatively, tune to some of the amateur short-wave stations and endeavour to pick up the signals, after learning the individual letter signs.

W. H. B. (Milnthorpe).—Your eliminator may be causing the trouble. We suggest you try the set with a good dry battery and make quite certain that there is no fault in the circuit.

N. B. R. (Moseley).—Messrs. Peto-Scott, B.T.S. or N.T.S. could supply a suitable set, and a similar type of apparatus is also available from the Premier Supply Stores. These firms advertise the items in each issue of this paper.

J. D. (Halifax).—There is no fear of the mains set affecting the set upstairs. The fading is probably due to the absorption effects resulting from the tuning of one set, or if you use reaction you may be oscillating and this will affect the other set.

J. L. (Woodford).—Unfortunately, manufacturers have not standardised coil connections and thus we cannot give you the details for your coils. You should write to the makers of the set from which they were taken in order to obtain the necessary data.

J. T. (Mundesley).—The issue in question is still available, price 4d., from this office.

G. T. (Brent Green).—There is no book published which gives the data you require. We suggest you follow our short-wave Log each week, in conjunction with a table such as will be found in *World-Radio*.

S. G. M. (Portslade-by-Sea).—We cannot insert your request in our editorial columns, and suggest you take a small advertisement for the purpose.

C. B. S. (Glasgow).—It is essential to know the cause of the hum before you can cure it. It may be due to the outside mains cables, in which case the aerial would have to be modified. If arriving via the mains from some machinery, mains suppressors would have to be used, and so on.

Practical and Amateur Wireless BLUEPRINT SERVICE

These Blueprints are drawn full size.

Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless ..	..	4d. Post Paid
Amateur Wireless ..	..	4d. ,, ,,
Practical Mechanics	..	7½d. ,, ,,
Wireless Magazine	...	1/3 ,, ,,

The Index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, PM to *Practical Mechanics*, W.M to *Wireless Magazine.*

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS	Date of Issue.	No. of Blueprint
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	—	PW36B
The Signet Two	20.8.36	PW70
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D, (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans)) ..	*June* '35	PM1
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 (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	20.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
The "Rapido" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW4
Fury Four (2SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	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 "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW70
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	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)	—	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 (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
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)	24.7.37	PW45

QUERIES and ENQUIRIES

Improving a Loudspeaker

"Having just bought a new M.C. speaker I have a good permanent magnet model lying idle and wish to use this as the basis of experiments in the design of speakers. I wonder if you could give me any indication of the best lines upon which to work, with a view to making this into a model which will be even better than the new one I have bought."—C. C. (Leicester).

THERE are many directions in which you can carry your experiments and if you are only doing this out of interest you can try anything which comes to your mind. If, however, your experiments are definitely with a view to making the speaker as near perfect as possible, the best lines of attack are in the material and design of the cone surround or support, in the material and shape of the cone, and in the coupling transformer. The latter may prove of greater importance in the final design than material alterations in the cone, etc., and this should be the first line of attack. The weight of the speech-coil and cone should be kept as low as possible, and if possible there should be no restoring force in the spider or cone surround—in other words, the cone should be as nearly a free floating mass as possible.

Accumulator Tests

"I am experiencing some trouble with my set which I cannot locate, and I wonder if the following details will help you to assist me. The set is a five-valve battery superhet of my own making, and works very well for about two evenings. The performance then drops off and it is almost impossible to obtain any volume. I have tried all the valves and parts in other sets, and the accumulator seems quite in order as it still reads 2 volts. Can you suggest what is wrong?"—T. B. C. (Perth).

THE most likely cause is that the accumulator has been damaged or is too small to supply the filament current required by your set. When you state that it still reads 2 volts, how have you tested it? It should be borne in mind that to test this battery you must not first disconnect it from the set, but should make your test with the valves switched on. You will probably find that on open-circuit—that is, with the accumulator disconnected from the receiver—a reading of two volts will be obtained, but if you test it with the valves switched on, the voltage will be very low indeed. We therefore suggest that you take the battery to a good accumulator service station and have it examined, as it may need fresh acid or may even be in need of complete replacement.

Tuning Indicators

"I am a newcomer to radio, and am rather puzzled as to the use and method of working of the tuning indicators which are now fitted on modern sets. What are these for? Surely you can hear when you are tuned to a station and do not need any indicator to tell you when you are on the right spot. I should be glad if you could clear up this matter for me."—Y. N. A. (Chippenham).

THE indicator is used with superhet receivers in which the tuning is so sharp that if not correctly tuned distortion will arise due to the cutting of the side-bands. The modern superhet employs a circuit known as automatic volume control and this operates on the H.F. and I.F. valves and keeps down the volume of high-powered stations and increases the amplification for weak stations, thus avoiding overloading and giving good signal strength. Consequently, when tuned exactly to a high-powered station the amplification would be reduced, and as the tuning control is turned past the correct tuning point the A.V.C. action would come into force and the volume would come up to that obtained at the correct setting, but the signal would be distorted, owing to the fact that it was not correctly tuned. Thus, the ear is not a true guide to the correct tuning point and the tuning indicator, operating from the A.V.C. circuit does give a true indication. It also enables a set to be tuned with a volume control turned to "quiet" and thus avoids inter-station noises, and when the set is correctly tuned as shown by the indicator, the volume control may be turned up to the required level with the knowledge that the signal will be free from tuning distortion.

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.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Dial Drive

"My set has a peculiar form of dial which I cannot explain in a letter, but it is driven by a cord which is wound round several pulleys, a large drum on the dial and eventually round a small bobbin on the spindle. I find that this is slipping and the drive is very unsatisfactory. Is there any way of tightening up the cord without replacing it, as I am afraid I could not wind it round all the various parts without dismantling everything and I do not feel capable of doing this."—C. I. F. (Croydon).

IF the driving cord is ordinary fish-line or similar undressed material it would probably be sufficient to damp it in order to obtain the necessary tightening. In the case of a dressed material (which may be waterproof), the best plan would be to rub powdered resin on the cord to obtain the necessary friction, although we think that the only satisfactory cure will be to have the cord replaced. If you are unable to do the work, no doubt a good local dealer would undertake it for you.

Reducing Controls

"I have drawn up a receiver circuit as shown on the accompanying sheet but it appears to me that my difficulty is going to be in controlling the set in view of the very large number of controls which will appear on the panel. I want every scope in the set and do not wish to do away with too many of these, and I wonder if you could mark those which could safely be replaced by fixed components without seriously affecting the efficiency of the set."—V. E. (Barrow).

THE receiver is certainly comprehensive, but your difficulty may be overcome in quite a simple manner. Firstly, the on/off switch may be controlled by the H.F. volume control spindle, obtaining for the purpose one of the combined components. The detector grid circuit trimmer may be mounted also on the main tuning spindle, using the Uni-gang or a similar ganged condenser. The L.F. tone control may be replaced by a fixed resistor when you have found the value which gives you the desired results, although, if you feel that a variable component is desirable it could be mounted at the rear of the chassis across the speaker terminals. The aerial series condenser could also be mounted at the rear as this will only need adjustment on certain ranges and it would not be inconvenient to have it out of the way as mentioned. The radio-gram switch and H.F. switch could also be ganged, using the Bulgin S.80B type of switch, which is operated by a rod through the dolly, and any number of these may be placed on the chassis and operated by a single knob. We think these suggestions will enable you to overcome your difficulty regarding the number of panel controls.

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

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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SOUTHERN RADIO'S Guaranteed Wireless Bargains; post paid.

PLESSEY 3-valve Battery Sets, complete in sealed cartons with three Mazda valves, moving coil speaker, Pertrix batteries and accumulator, in exquisite walnut cabinet; 57/6.

GARRARD Record Changers, A.C. 200-250 volts, changes eight 10- or 12-inch records; £6 (complete sealed cartons); universal A.C./D.C. model, £7/10.

GARRARD A.C. Radiogram Units, with pick-up and all accessories, in sealed cartons; 42/-.

TELSEN (1937-38) Components, iron-core coils W.349 (Midget size), 3/6. W.477 (triple ganged, for band-pass or straight circuits), 14/6; W.476 (triple ganged superhet), 14/6; W.478 (twin ganged), 9/-; all ganged coils complete on bases, with switch; I.F. transformer coils, 4/6; dual range coils, 2/9; with aerial series condenser, W.76, 3/9.

TELSEN A.C./D.C. Multimeters, 5-range (tests anything radio or electrical), 8/6; loudspeaker units, 2/6, Ace (P.O.) microphones, complete with transformer ready for use with any receiver, 4/6; headphones, 4,000 ohms, 3/- pair.

VALVES.—Full range for American receivers, 6/- each.

MORSE Tappers, complete radio-telegraph set (flasher, buzzer and tapper), with batteries, bulb, code, 3/-.

BARGAIN Parcels of Assorted Components, including coil, resistances, condensers, chokes, wire, circuits, etc., value 21/-; 5/- per parcel.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1; and 46, Lisle St., London, W.C.1. All mails orders to

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Euston 3775.

ALL goods previously advertised are standard lines, still available. Post card for list free.

VAUXHALL UTILITIES, 163a, Strand, W.C.2. Over Denny's the Booksellers. (Temple Bar 9338.)

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25 ONLY FOR SALE.—3-valve kits with valves and diagram, 12/6; 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation. —Universal Radio Co., 221, City Road, London, E.C.1.

ALL lines previously advertised still available.—Radio Clearance, 63, High Holborn, W.C.1. Telephone Number, Holborn 4631.

HEADPHONES.—Brown, Ericsson, G.E.C., B.T.H. Standard Telephones, Nesper, Western Electric Sterling, etc., 2,000 ohms, 2s. 6d.; 4,000, 5s. Postage 6d. **SPECIAL.** Ericsson, 4,000 ohms, as new, 7s. 6d. Telefunken, lightweight, adjustable, 7s. 6d. **CRYSTAL SETS**—Burne-Jones. Complete, Guaranteed, 5s. 6d. Ditto, double circuit, 8s. Sensitive permanent detectors, 1s. 6d. Crystal Detectors, complete, 1s. Crystals with silver cat's-whisker, 6d. Postage 1½d.—Post Radio, 2, Copenhagen Street, London, N.1.

S.T.900 Specified kits, including valves and 10 coils, £4/19/6. A.C. Versions, £8/15/0. S.T. 800 Authors Kit B, £2/10/0. S.T.700 Kit'A, £1/10/0. Servwell Wireless Supplies, 64, Prestbury Road, London, E.7.

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BANKRUPT BARGAINS.—All brand new goods Decca AW5. A.C. 5v. superhets, all-wave, listed 12½ gns., 1938, £5 17s. 6d. Decca model 55 5v. A.C./D.C. portables, listed 1938 9 gns., for 5 gns. Decca 2-band 1937 6v. A.C. superhets £4 17s. 6d. Burgoyne 1937 5v. superhet table model radiogram, £7 10s. Decca 5v. superhet battery, 1937, £4 18s. 6d. Decca 1937 3v. battery, 77s. 6d. Brunswick 1938, 13½ gns. 6v. 4-band A.C. superhets, 7 gns. Full stock all types of valves. Components, speakers, etc.—Butlin, 6, Stanford Avenue, Brighton.

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BUY VALVES DIRECT.—Fully guaranteed. 2-volt, H2, L2, 2s. 3d.; Power, 3s.; Screen-grids, 4s. 9d.; Pentodes, 5s. 6d. Mains, General Purpose, 4s. 6d.; Power, 6s.; Screen-grids and Pentodes, 6s. 6d.; Rectifiers, 4s. 6d. Over 150 types available—Battery, A.C. and A.C./D.C. Mains, and American. Postage 3d. one valve, 4d. two, 6d. three and over. Cash with order.—Luminous Electric Appliances Ltd. (Dept. 9), Phœnix Works, Tyburn Road, Birmingham.

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SITUATIONS VACANT

WANTED—ambitious young men to prepare for well-paid posts in TELEVISION, the great career of the future.—Apply for free booklet from BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 18P, Stratford Place, W.1.

MISCELLANEOUS

AMATEURS! Bargain parcel 25/-. Lists.—Melrose, 7, Balfour Street, North Berwick.

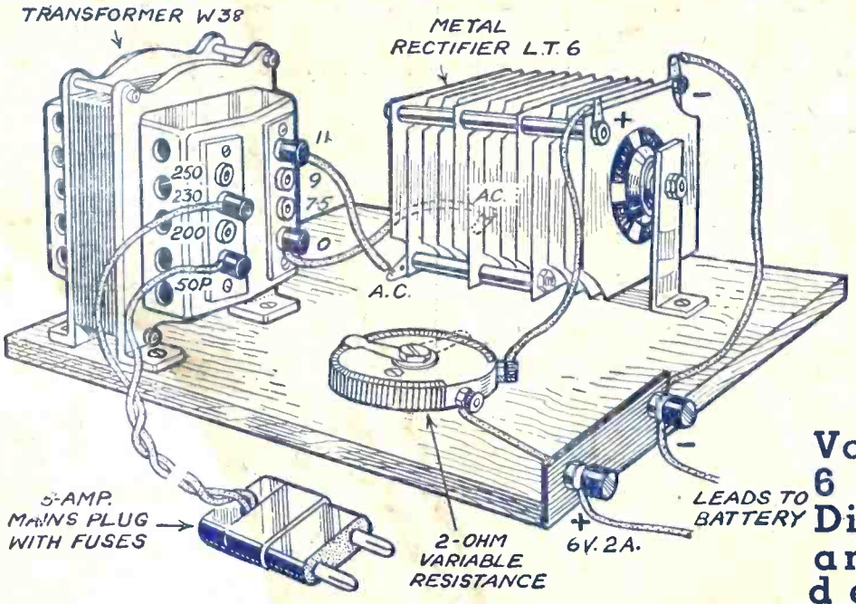
OUR 1937-8 Catalogue contains much information on Transformer Design. Post Free.—Lumen Electric Coy., 1A, Scarisbrick Avenue, Liverpool, 21.

FOR SALE.—Vitesse All-wave Battery Superhet Chassis, with valves, £3.—Warburton, 41, Leith Walk, Leith.

REVOLUTIONARY, unorthodox principles and detector circuits clearly explained. Book 1/1d.—D'Arcy Ford, Gandy Street, Exeter.

ADVERTISEMENT INDEX

CHARGING METHODS FOR CAR BATTERIES



Constructional details (above) for a simple and easily made charger, using standard components. The slider is connected to the right-hand terminal.

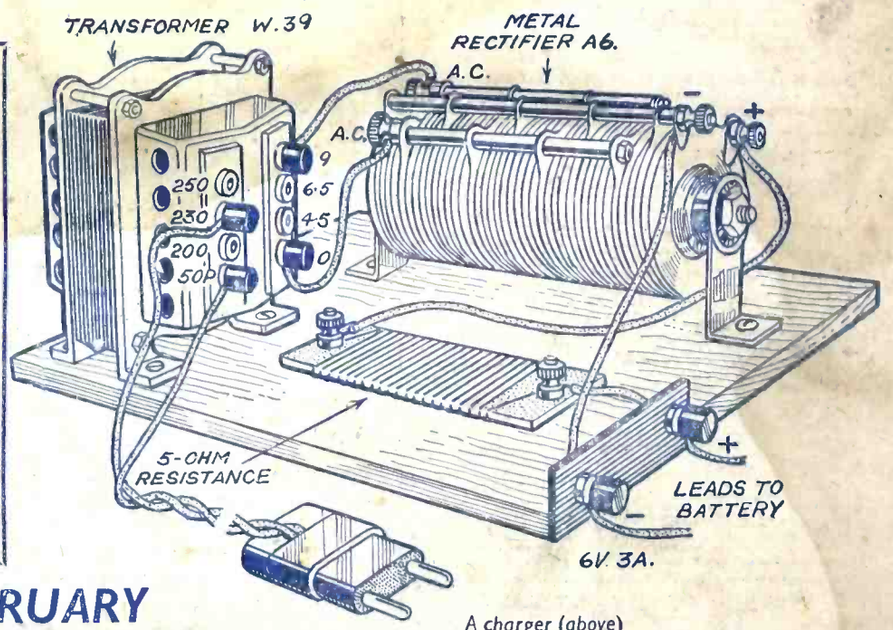
The method (on right) of testing an accumulator by means of a hydrometer. A reading of about 1.300 should be obtained when the battery is fully charged.

Various methods of Charging 6 or 12-volt Car Batteries at Different Rates from A.C. and D.C. Mains are described in this month's PRACTICAL MECHANICS.

Other Contents Include

How the "Lie Detector" and other recording instruments work.
Making a daylight enlarger.
The world of science in 1937 reviewed.
Building a 1 c.c. engine.
Harnessing the mains.
Conjurer's escaping tricks, and magic of knots.
Making the "Practical Mechanics" short-wave 3.
Scophony Television.
Model railways, aeroplanes, etc.

Profusely illustrated with photographs, diagrams and plans.



A charger (above) employing an A.6 rectifier and intended for an output of 3 amps. The home-made resistance should be supported on pillars to permit of air circulation round it.

THE FEBRUARY

PRACTICAL MECHANICS

THE MAGAZINE OF MODERN MARVELS

6D.

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FREE 1/- BLUEPRINT INSIDE!

Practical and Amateur Wireless

3D EVERY WEDNESDAY

Edited by F.J. CAMM

A GEORGE NEWNES Publication

Vol. 11. No. 282.
February 12th, 1938.

AND PRACTICAL TELEVISION

Building F.J. CAMM'S "ACME" All-Wave 4

QUALITY ON THE SHORT WAVES

See page 597

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. XI. No. 282. February 12th, 1938.

ROUND *the* WORLD *of* WIRELESS

The Acme 4-Valver

IN this issue the constructor will find details of Mr. F. J. Camm's latest receiver, together with a free full-size blueprint. This receiver represents the latest in modern receiver design, embracing all-wave tuning with such devices as variable selectivity, H.F. gain control, tone control, etc. In response to the many hundreds of requests for a large output from a battery receiver, this new model has been provided with a Class B stage and this should satisfy the most critical listener who is restricted to the use of batteries for his H.T. supply. Again we have utilised the latest type of B.T.S. all-wave tuning arrangement, specifying that the chassis is supplied with the coils and switching already mounted and connected, thus removing one of the greatest difficulties which beset the home-constructor who wishes to make a really efficient all-wave set. The photographs will show the neat and orderly arrangement adopted for the receiver, and the theoretical circuit on page 608 will enable those who are accustomed to read this type of diagram to see at a glance all the interesting points in the circuit. The remaining essential details will be found on other pages and we have no hesitation in placing this set before our readers as the most up-to-date and efficient of the long line of receivers which has been produced in our laboratories.

R.M.A. Director to Resign

IT is announced that Mr. D. Grant Strachan, the well-known director of the Radio Manufacturers Association, has expressed a desire to resign during this year. Mr. Strachan has carried out his duties to the utmost satisfaction of everyone acquainted with the R.M.A. and his loss will be keenly felt.

Cairo Radio Station

PLANS are now ready for the building of a new broadcast station at Cairo. It is stated that this will be of the order of 100 kW and the necessary credit has been passed by the Egyptian Parliament. The station is to operate on the medium-wave band and is designed solely to afford an improved day-time broadcast service in Egypt.

Television-telephone

AS a result of the experiments carried out by the German Post Office, it is announced that a public television-telephone service is shortly to be opened between Berlin, Leipzig, Munich and Nurnberg. Readers will remember that with this system it is possible to call a distant subscriber and during the conversation both speakers are visible to one another, microphones and loudspeakers being used for the conversation.

Irish S.W. Station

CONTRACTS have been placed for the building of an experimental short-wave transmitter at Moydrum near Athlone.

ON OTHER PAGES

It is anticipated that a power of 2 kW will be employed, and the station is to be built by Standard Telephones and Cables, Ltd.

Italian Broadcasts

ALL programmes for Italian Communities abroad, as well as other items and news between 7.20 and midnight, are broadcast by the Rome II medium-wave station on 245 metres in addition to the short-wave relays from 2RO. The special programme for Arabian countries (6\21 p.m.) and the news in Rumanian (7.21 p.m.) and in Serbian (7.55 p.m.) are also broadcast by the Bari I medium-wave station on 283.3 metres.

Baird at B.I.F.

BAIRD TELEVISION, LTD., are showing a comprehensive range of television receivers and equipment on their Stand at this year's British Industries Fair (Olympia Section). The sets include models T.11, T.12 and the latest model T.14. Demonstrations are given daily by actual radio reception of the B.B.C. signals.

French National Transmitter

THE high-power long-wave French station at Bourges will be ready for service by the end of April next. The wavelength to be used is 1,648 metres, as in the case of the present Radio-Paris transmitter which the new station is replacing.

New Japanese Station

A NEW high-power transmitter is projected for Japan, the provisional power being stated to be in the neighbourhood of 150 kW. No wavelength has yet been set aside, but it is anticipated that a medium wavelength will be chosen, and to complete the chain of stations some new short-wave transmitters may also be built. At present there are seven 10 kW and twenty 3 kW stations in this country.

Smallest Transmitter

THE National Broadcasting Corporation of America claim to have built the smallest practical transmitter in existence. This is built into a 3in. cube, uses a wavelength of 1 metre and a power of 1/10th of a watt.

Ultra-ultra-short

PROFESSOR ESSAU, of Jena, claims to have built apparatus capable of generating a radiated wave of only 4.9 millimetres which holds the record as the shortest radio wavelength which has yet been used.

Singapore Naval Base

ADDRESSES by Sir Shenton Thomas, Governor of the Straits Settlements, and Colonel J. J. Llewellin, Civil Lord of the Admiralty, at the opening of the new graving dock, which forms part of the official inauguration of the Singapore Naval Base, will be broadcast on February 14th. The ceremony, which takes place in Singapore about 10.30 a.m. (British time), will be broadcast from the local transmitter and simultaneously from the Empire transmitters at Daventry.

ROUND the WORLD of WIRELESS (Continued)

R.M.A.'s New Chief

MAJOR L. H. PETER, chief electrical engineer of the Westinghouse Company, was recently elected chairman of the Radio Manufacturers Association for 1938. According to Major Peter, it will not be long before television gets a move on.

Germany's Wireless Licences

IT is officially stated that the total number of wireless licences in Germany during January was 9,087,454, an increase over December of 291,487.

A Touch-tuned Receiver

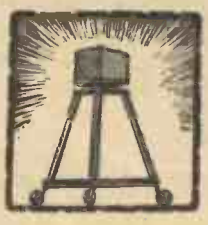
ACCORDING to a recent report, Miss Helen Keller, well known for her mastery over blindness, has presented to the American Foundation for the Blind, in New York City, a new type of touch-tuned wireless receiver. The set is provided with a number of knobs, each bearing the Braille symbol for the name of a station. On pressing the appropriate knob, the station required is automatically tuned in.

Hungarian Songs from Budapest

HUNGARIAN radio from Budapest will provide an interesting programme specially for relay to British listeners on February 13th. It is described as a programme of old Hungarian songs with tarogato. This is an old Hungarian national instrument, the use of which can be traced back to the beginning of the seventeenth century. It was originally a wooden trumpet and on it the Kurutsen played their melancholy airs and battle songs.

"Theatre Time" on Monday

A SECTION of the B.B.C. Northern Orchestra will continue the "Theatre Time" programme of lighter music on February 14th, in the Northern programme, under the baton of H. Foster Clark.



The Fleet Street Choir

IT is reported that this well-known choir has embarked on another foreign tour, this time through Czechoslovakia, Yugoslavia, Bulgaria, Romania, Hungary, and Poland. The choir, which has been chosen as a missionary of culture by the British Council, left London on January 29th and returns during the first week in March.

INTERESTING and TOPICAL NEWS and NOTES

The singers have broadcasting engagements in Zagreb, Cracow, and Sofia; and while in Bucharest they will give a private performance in the Palace, at the special request of King Carol.

Judy Shirley, the popular singing commere of the "Monday at Seven" broadcast programmes.

Organ Recital

ON February 14th, Henry Croudson will give another recital at the organ of the Manchester Paramount Theatre. His recital, which will be broadcast in the National programme, will include two of his own arrangements—"Tune Parade" and "Fifty Years Back"—and also Eric Coates' "Three Bears" and Sibelius' "Finlandia."

Bryan Michie's Return

BRYAN MICHIE will make his first return to B.B.C. programmes on March 5th. In the National programme on that evening he is to compère—as usual—one of the popular radio shows in which Reginald Foort at the B.B.C. Theatre Organ, Styx Gibling, drummer of the B.B.C Variety Orchestra, Phil Park and George Melachrino will take part.

Communal Sets for India

WE are informed that over one hundred special receiving sets have been ordered by the Indian Stores Department for various villages, to complete the rural broadcasting scheme in Delhi Province. The receivers will be fitted with automatic time-switches which make the receivers active and inactive at the opening and closing of the transmission.

Theatre Variety

A VARIETY bill will come from the Aston Hippodrome on February 15th. Among the acts there during the week are Macari's Accordeon Band, Harry Hemsley, the Troy Sisters and Sidney Wilson.

After Dinner Cabaret

IN the Regional programme on February 14th listeners will hear another of David Porter's "After Dinner" programmes. This time Violet Carson, the Three Semis, Taylor Frame and the Cabaret Kings will continue to cheer the post-prandial mind with new material and tested favourites.

The Arcadian Follies

UNDER the title "Northern Concert Party on Tour," the Arcadian Follies, already well known to listeners, will occupy thirty minutes of the Regional programme on February 18th. The strong cast will be headed by the favourite Lancashire comedian, Harry Korris. This broadcast will come from the Grand Theatre, Doncaster, and the Follies will be under the direction of Ernest Binns.

Dance Cabaret from Bournemouth

DANCE CABARET will be broadcast from the Royal Bath Hotel Ballroom, Bournemouth, on February 9th. The artists include Billy Bissett and his Canadians, with the Canadian Capers and Alice Mann.

SOLVE THIS!

PROBLEM No. 282.

Atkins built a one-valve amplifier unit to add to his three-valver in order to obtain more volume, but when connected results were very poor, signals being distorted. He checked the voltages applied to the additional valve and found these in order and had the valve tested. It proved to be up to standard, and he therefore decided that it was being overloaded, and accordingly fitted a volume control in the additional unit, but still this did not improve matters. What was the cause of his trouble? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2, and should be marked Problem No. 282 in the top left-hand corner. Post your entries to reach this office not later than the first post on Monday, February 14th, 1938.

Solution to Problem No. 281.

When Jaggers added the additional valve in parallel with his existing valve he was not increasing the acceptance of the stage, and thus both valves would be overloaded. If he had connected the additional valve in a push-pull circuit he would have halved the signal applied to the valve and thus overcome his difficulty.

The following three readers successfully solved Problem No. 280 and books have accordingly been forwarded to them: R. Baker, 17, Sladedale Road, S.E.18; R. Maybury, 123, Northumberland Street, Whelley, Wigan; G. E. Ford, Ingleside, 23, Spur Road, Orpington, Kent.

More Transceiver Notes

The Experimenters Here Give Further Circuits and Details Concerning a Topic that has Aroused Considerable Interest Among a Large Number of Readers

WE'VE started something. Indeed we have. You will remember that in the issue dated January 15th we reproduced a simple transmitter circuit sent in by reader Thomas. We gave brief and main details as given in Mr. Thomas' letter to us, but were unable to include every particular in our article due to lack of space. At the same time, however, we said that we would undertake to forward the full specification to bona fide readers who were interested in the transmitting side.

A Difficulty

Little did we know that our postbag for days after publication of the article would be crammed full of letters from those who insisted on keeping us to our word; little did we realise that similar letters would continue to pour in for weeks. What could we do? It was obviously an impossibility to reply fully to every letter received, especially since many of them included several queries on allied subjects. At the same time we had made a promise, and we had to fulfil it. That is why duplicated letters had to be sent to our correspondents. They were long letters, too, because a good deal of information had to be given. So if any of you feel that our replies should have been more "individual" and personal, you will now understand that they could not have been. There are 24 hours in a day, and you cannot alter that fact.

Several of our correspondents asked that we should give them the address of Mr. Thomas so that they could communicate with him direct. But we have no doubt that he, like ourselves, has work to do; and he could hardly be expected to engage a clerical staff to handle all the correspondence. Our offer must therefore be withdrawn forthwith, but in the meantime we will give further details of simple transmitting circuits. We shall still appreciate your letters, as we have always done. But please keep them short. Sorry, but if we do not make a stipulation of this kind, we shall all suffer from nervous breakdown.

England's Youngest "Hams"?

It is amazing how much interest centres on the subject of transmitting; it is equally amazing to find how many of our regular readers are holders of A.A. licences. The record so far is held by Messrs. Cockerill and Cross, of Doncaster—2AMQ to you. H. W. Cross is 14 and F. G. Cockerill is 15. They have held their A.A. licence since last September, and have obviously made good use of their time during the past four months. No, they have not written to ask for information, but to supply some. Enclosed with their interesting letter was the circuit shown in Fig. 1, which they claim to be original.

It is for a simple one-valve transceiver that they have been using with success. We congratulate these young gentlemen on their enthusiasm and knowledge of radio. In addition to this simple transceiver they have built a ten-watt transmitter. If they are keen enough to do such good work while restricted to the use of a "dummy" aerial, what will they do when they obtain their "full" licence? Work all continents, we hope.

Circuit Details

With regard to the circuit reproduced, they write: "The coils, consisting of a common grid coil, the reaction coil and

by The Experimenters

tank coil, were wound on a former of 2in. in diameter. All windings were of gauge 22 or thereabouts. L.1 consists of 12 turns, L.2 of 9 turns, and L.3 of 15 turns.

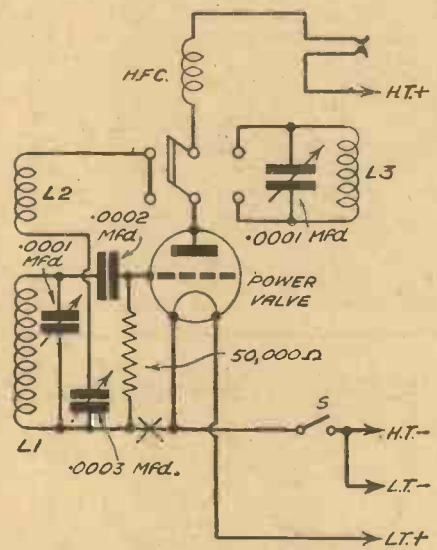


Fig. 1.—A simple but efficient one-valve transceiver circuit referred to in the text.

"The transceiver was operated very successfully on 40 metres. Using the transmitter in regular use at 2AMQ along with the transceiver, very good contact was maintained between two adjacent rooms of the house. The TX side of the transceiver was used for C.W. and speech at various times. Speech was quite good except that it was, naturally, undermodulated. The TX keeps very steady on its frequency; it is, however, rather difficult to adjust to resonance. The valve used is an ordinary battery-operated power valve."

Other details given are that the jack marked J can be used for inserting 'phones, meter or key in circuit, and that a switch is connected across the microphone transformer, inserted at X, so that the secondary can be short-circuited when receiving. Our young friends add that they are now making the transmitter illustrated by the circuit we published three weeks ago, with a view to using a high-power triode and a power pack for operation.

Five Shillings Now!

Another letter concerning Mr. Thomas's circuit was received from reader J. Walker, of Manchester, 10—alias 2DCF. He has had a similar circuit in use for some time, but his cost only 5s., because he used second-hand parts. Despite the saving that can often be made in this way, we strongly recommend readers to use new parts of the best quality that can be obtained. Reason: If you use components of which you are in the least doubtful, results might be thoroughly disappointing without your knowing why. Nevertheless, do not think that we are deprecating Mr. Walker's efforts; far from it. He writes: "I can 'knock up' 5 watts with 150 volts H.T. Can any reader beat that?" Well, can any reader?

As a matter of fact, we suspect that our correspondent is falling into a common error concerning his "5 watts." It is one thing for a valve to *dissipate* 5 watts, and quite another for that power to be efficiently employed. Besides, even to dissipate 5 watts it would be necessary for the valve to pass about 33 mA at 150 volts, without allowing for any voltage drop in the anode and filament circuits. The rated dissipation of the well-known PX4, with an H.T. voltage of 200, is just 5 watts. At any rate, Mr. Walker, we have never heard of anyone building a transmitter for less than 5s. and we laud your efforts.

Please Remember

Breaking in, for a moment, we want to reiterate our previous remarks concerning the use of a transmitter or radiating device without first obtaining the appropriate licence. It is a serious offence, and rightly so. We do not wish to discourage anybody, but we should not like to see one of our readers in Court! Even if the

(Continued overleaf.)

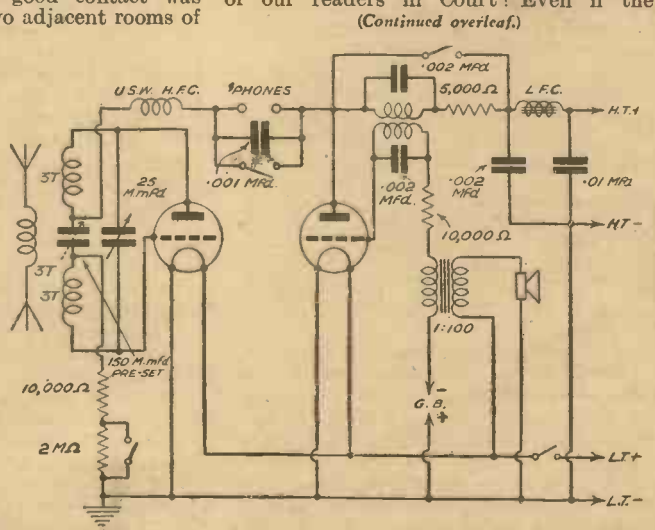


Fig. 2.—Theoretical circuit for a two-valve transceiver intended for 5-metre use.

MORE TRANSCEIVER NOTES

(*Continued from previous page.*)

TX is not connected to an outside aerial, an A.A. licence should be obtained before the set is used in any way.

The prime requirement in connection with the issue of the licence for "dummy" aerial is that signals must not be radiated to any point outside the experimenter's own private premises. To obtain a licence you must give ample proof that you are a "competent" person, and that you wish to carry out experiments of a specific nature. Licences are not granted too freely, but there are few serious restrictions in the way of the bona fide experimenter. We appreciate the fact that most of those who have written to us on the subject of transmission have either given proof that they have at least an A.A. licence or proffered their assurance that they would not attempt to use any form of transmitting gear before the granting of such licence.

A Two-valve Transceiver

Now it is time that we gave some details in respect of our own tests with transceivers. One circuit that we have found very satisfactory is reproduced in Fig. 2. It is not original, and bears a close resemblance to a circuit developed by the Eddystone people. It is intended for 5-metre use and operates as a super-regenerative receiver or as a two-valve transmitter with anode-circuit modulation. The first valve is a small power valve which acts as detector for reception or oscillator for transmission. The second valve should be a high-mu power valve (such as Cossor 220PA, or Osram L.P.2), and serves for quenching during reception and for modulating when the circuit is used as a transmitter.

It will be seen that there are three on-off switches, all of which are "opened" for reception. In that case, the circuit is that of a standard ultra-short-wave super-regen. or quench receiver. For transmitting, the 2-megohm grid leak is short-circuited, leaving only the 10,000-ohm leak in use. In addition, the 'phone terminals are short-circuited and the secondary or reaction winding of the quench coil is by-passed.

The microphone transformer—a standard 1 : 100 ratio component is indicated—feeds into the grid circuit of the second valve, and the energising current for the microphone is obtained from the normal L.T. supply. Most of the standard microphones and transformers can be used satisfactorily, but if you propose to follow up initial experimental work it will be worth while to buy good-class components in the first place.

Coils, Chokes, etc.

All three coils are of self-supporting copper tube and are standard 5-metre components. They should be mounted end to end, separated by about ½in., with the aerial coil in the centre. It will be understood that they must be mounted close to the valve holder and to the 25 mmfd. tuning condenser, for leads only a few inches long would entirely upset tuning. An extension spindle and slow-motion drive should be provided for the tuning condenser due to the fact that both sides are "live" and that delicate tuning is essential on the 60 Mc/s band.

The three switches could well be of the baseboard-mounting Q.M.B. pattern, as mentioned a fortnight ago, each being close to the components to which it is connected. Both quench-coil windings are provided on the Eddystone No. 958 quench coil, which is recommended. As regards the low-frequency choke, this should be rated at about 20 henries when carrying 30 mA. All of the other parts are of normal pattern, but should be of reputable make; well-known names that come to mind are Eddystone, British Television Supplies, Raymart, and Bulgin, any of whom can supply all of the principal components. Alternatively, a full set of parts could be obtained to your own specification from Peto-Scott.

It should just be pointed out that although a dipole type of aerial is indicated in Fig. 2, this may be used only by holders of a "full" transmitting licence. For A.A. work a "dummy" aerial should be employed, or the set simply left free of any aerial system. In the latter case, take great care that the radiation is not sufficient to extend beyond your own house, and lightly screen the coils if necessary. This is because an appreciable radiation is sometimes obtained on the ultra-shorts from the coils themselves. A simple form of "dummy" aerial that can be used consists simply of a S.W. H.F. choke, 100-ohm resistor and .0001-mfd. condenser wired in series. A "load" of this kind connected between the ends of the aerial winding will generally prevent over-radiation.

We still invite your letters, whilst transmitters who have evolved simple and effective transmitter circuits would be doing fellow readers a good turn by passing on such details as they consider most interesting. Now it's time to QRT. 73's.

Important Broadcasts of the Week

***NATIONAL* (261.1 m. and 1,500 m.)**

Wednesday, February 9th.—Symphony Concert, from the Queen's Hall, London.
Thursday, February 10th.—Variety programme.
Friday, February 11th.—British Film Music: orchestral programme.
Saturday, February 12th.—A running commentary on the International Rugby Football Match, Ireland v. England, from Lansdowne Road, Dublin.

***REGIONAL* (342.1 m.)**

Wednesday, February 9th.—Mail Coach, feature programme.
Thursday, February 10th.—Film Musical: Top Hat.
Friday, February 11th.—The Maid of Bath, a dramatic feature by Sherard Powell.
Saturday, February 12th.—Marigold, a comedy by L. Allen Harker and F. R. Pryor.

***MIDLAND* (296.2 m.)**

Wednesday, February 9th.—Band programme.
Thursday, February 10th.—The Microphone at Large: a visit to Uttaxeter.
Friday, February 11th.—Orchestral programme.
Saturday, February 12th.—Orchestral and choral programme, from the Town Hall, Stoke-on-Trent.

***NORTHERN* (449.1 m.)**

Wednesday, February 9th.—Band programme.
Thursday, February 10th.—First Time Here, newcomers to the Northern microphone.
Friday, February 11th.—Lake District Scenes: Observations by Chiang Yee and R. H. Lamb.
Saturday, February 12th.—A running commentary on the second half of the Rugby League Football Match, Swinton v. Broughton, from Swinton Rugby Ground.

***WEST OF ENGLAND* (285.7 m.)**

Wednesday, February 9th.—Dance Cabaret, from the Royal Bath Hotel Ballroom, Bournemouth.
Thursday, February 10th.—Choral programme.
Friday, February 11th.—The Maid of Bath, a dramatic feature by Sherard Powell.
Saturday, February 12th.—Sports Special: a feature for fans.

***WELSH* (373.1 m.)**

Wednesday, February 9th.—The Changing Face of South Wales: How the Schools and Local Government Services are affected—a discussion.
Thursday, February 10th.—Orchestral concert.
Friday, February 11th.—Cross Section: from the Popular Café, Canon Street, Aberdare.
Saturday, February 12th.—A light programme from Bangor.

***SCOTTISH* (391.1 m.)**

Wednesday, February 9th.—Scots Songs with Orchestra.
Thursday, February 10th.—Orchestral concert from the Usher Hall, Edinburgh.
Friday, February 11th.—Gaelic Concert.
Saturday, February 12th.—Marigold, a comedy by L. Allen Harker and F. R. Pryor.

***NORTHERN IRELAND* (307.1 m.)**

Wednesday, February 9th.—Country Concert, from Irvinestown, County Fermanagh.
Thursday, February 10th.—Orchestral programme.
Friday, February 11th.—Fire! feature programme.
Saturday, February 12th.—Orchestral programme.

"THE DUENNA"

Costume and period pieces have been surprisingly successful in television. On February 14th and 18th, in the afternoon and evening programmes respectively, Stephen Thomas will present the sixty-minute version of Sheridan's "The Duenna." This essentially comic opera was first produced in 1775, with music by Thomas Linley, the dramatist's father-in-law. In 1924 it was revived by Sir Nigel Playfair at the Lyric Theatre, Hammersmith, with a revised musical setting by Alfred Reynolds, and this is the version which will be performed in the studios. "The Duenna" has an eighteenth-century Spanish setting. It is a tale of intrigue in which the Duenna, an elderly and repulsive chaperone, is foisted on a rich suitor, leaving the heroine to marry the man of her choice.

Quality on the Short Waves

The Selection of a Receiver or Circuit for Use on the Higher-powered Short-wave Broadcast Band with a View to Obtaining High Quality

By W. J. DELANEY

THE majority of receivers used for short-wave work are of the simple experimental type or superhet all-wave sets, and thus the main requirement in the choice of design will have been station-getting or range. It is often assumed—quite erroneously, that quality can only be obtained from the local B.B.C. stations on the medium waves, and many listeners have had a special set built for the purpose of doing justice to the programmes from these stations. This type of receiver is often referred to as a "Local Station Quality Set." It is, however, quite a simple matter to obtain just as good a musical quality from short-wave stations, and in the case of the B.B.C. Television programme it is possible to obtain even better quality than from the medium-wave station, on account of the fact that a much wider frequency channel is available for the transmission. Without going into technicalities this may be simplified into the statement that on the medium waves the frequency width which is allowed to enable all the stations to be accommodated in the band from 200 to 500 metres is obviously restricted and this means that the musical frequencies cannot go below a certain value, whilst at the upper end of the scale there is a similar curtailment. Fortunately, the apparatus available for the receiver and the ordinary type of loudspeaker does not permit of better results than can be obtained on the medium waves and there is thus little objection to this restriction of frequencies.

A Problem of Acoustics

Many listeners have experimented in quality reproduction and have found that in the average living-room the increase which can be obtained in "top" is often lost by absorption due to the presence of a large amount of "cloth" in the room—that is, heavy curtains, armchairs, settees and similar objects. A simple test will prove the truth of this statement. Adjust the receiver to a given broadcast programme, and take out of the room even one or two chairs, and you will find that the music seems very much louder, simply because the higher frequencies then become noticeable and give to the music a penetrating effect. It is also possible to observe this fact merely by adjusting the tone control, when one is fitted, leaving the volume control at a given setting. If, therefore, the highest quality is desirable, some precautions must first be taken to enable the advantages to be made audible, and if this is done it will be found that the ultra-short-wave television sound programmes, as well as the items transmitted by some of the more powerful short-wave stations will provide very high quality reproduction, such as to justify these modifications.

Circuit Design

It is obvious, therefore, that a receiver for this purpose will, first of all, have to be capable of a fairly long range of reception in order to obtain sufficient volume from the distant stations, but a superhet circuit should not be adopted for the purpose, in spite of the fact that this is selective and of high power. The great drawback to such a receiver is that it brings in all the background interference arising from motor traffic and other electrical apparatus, and to remove this a tone control would also remove musical frequencies and thus cancel the desired effect. Our short-wave quality set must, therefore, be designed with a minimum of H.F. amplification, embodying just sufficient to give a fair choice of programmes. In this respect, of course, we

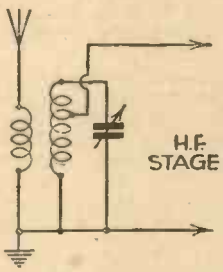


Fig. 1.—A type of aerial tuner which may be used in place of the aperiodic tuner shown below.

follow the same principles as on the medium waves, taking as a motto "Little and Good," rather than a wide selection at indifferent quality. The circuit will, therefore, have to incorporate only one H.F. stage, and this means that a fair amount of L.F. amplification will have to be incorporated in order to provide suitable volume from those programmes which we are able to pick up. A suitable circuit which develops from these requirements is a single H.F. stage, detector and two L.F. stages, making the output stage in the form of a push-pull arrangement, and for the mains user the result will obviously be capable of really good volume and with a suitable choice of components it should be capable of competing very favourably with the medium-wave quality set.

The battery user, owing to the restriction imposed by the cost of H.T. battery replacements, will have to forgo the push-pull circuit in most cases, but a pentode should not be employed to obtain the desired volume, rather cutting down the desired output in the interests of quality than relying upon a tone control filter with this type of valve. Of course, if an H.T. battery eliminator may be employed, the push-pull circuit may be retained, but care should be taken to use an H.T. unit which will deliver sufficient current for the valves in use.

Final Selection

To embody the arrangement decided upon should not now be a difficult matter, and there are very few points left for discussion. Flat tuning will obviously be needed to retain the full compass of the transmission, and with a simple circuit of the type referred to this is a very simple matter. No endeavour should be made to sharpen tuning to cut out adjacent stations, and in most cases this will not be necessary. Use good coils, air-spaced and without solid formers for preference, with a single circuit aerial tuner or a really reliable H.F. choke in the first circuit, and with a tapped tuned-anode coil between H.F. and detector stage. If an H.F. transformer is employed in this position, use a coil with a really large primary winding, to provide the desired flatness of tuning, and if reaction is employed, keep this at a minimum unless it is essential to use it for special purposes, such as may be met with on occasions. All standard components are so far needed and the H.F. stage may be either a modern H.F. pentode or good S.G. valve, the former for preference. By utilising a variable-mu valve a pre-detector volume control may be incorporated where the receiver is used in close proximity to the B.B.C. television transmitter, although special care will have to be taken to keep inter-circuit wiring at a minimum in order to enable the set to be used for the low wavelength employed for this transmission. Between the detector and the first L.F. stage resistance-capacity coupling should be used, and the push-pull transformer should be resistance fed, with a fairly large capacity coupling condenser. If, for economical reasons the push-pull circuit is not adopted, all R.C. coupling should be employed. Use

(Continued on page 622)

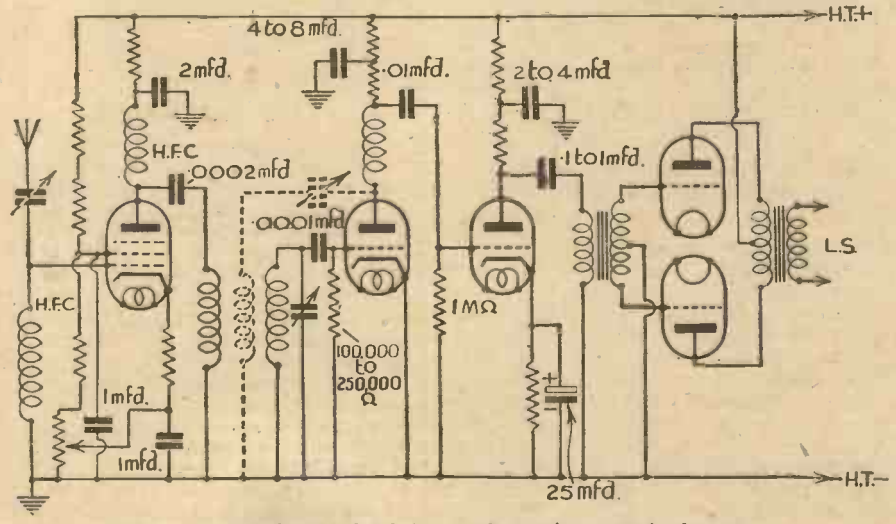


Fig. 2.—Principal circuit details for a quality set for use on the short waves.

Technical Fundamentals—3

In this Third Article of the Series, H.F. Resistance and Parallel Resonance are Dealt With

THE earnest amateur who is keen to "get down" to the technicalities of radio will find that H.F. circuit resistance is rather a bogy. Where D.C. circuits are concerned, the calculation of resistance is a comparatively simple matter and, apart from considerations of temperature rise (which, again, can be allowed for without much difficulty), there are no complications due to resistance changing with circuit operating conditions.

The effective resistance of an H.F. radio circuit, however, is a value that does not lend itself at all readily to accurate calculation. As a matter of fact, it is usually better to rely upon measurement. The value of the resistance is dependent upon quite a large number of contributory factors, and is one that varies with changes of frequency.

Among the factors that make up the total effective H.F. resistance are: (1) resistance of the conductors; (2) dielectric losses, including those arising in coils; (3) eddy current losses (in coil cans, H.F. iron cores, chassis plates, etc.); (4) losses introduced by energy absorption of another (coupled) circuit, if any; (5) losses caused by the "shunt damping" of components connected across the circuit; and (6) in open oscillatory circuits there will also be radiation losses.

The resistance of the conductors (wire resistance) will be greater for H.F. currents than for D.C., due to the fact that whereas D.C. distributes itself uniformly through the cross-section of the conductor an H.F. current tends to concentrate on the outer surface of the wire, the depth of penetration decreasing with increase of frequency. In the case of stranded wire with parallel strands, the current will tend to concentrate on the outer strands. This peculiarity of H.F. currents is taken into special account when "Litz" wire is used. This is a stranded wire with individually insulated strands and the latter are interwoven in such a way that no one strand is entirely outside or inside.

The resistance of the conductors, the dielectric losses and the eddy current losses increase with increase of frequency. The energy absorption of a coupled circuit offers a complex problem as the tuning in this circuit may greatly affect the issue.

On the whole, however, it can be anticipated that under normal conditions the H.F. resistance value of any receiver circuit will go up with increase of frequency.

Parallel Resonance

In the case of resonance that we have previously dealt with, the e.m.f. operates internally in the circuit, and as far as this e.m.f. is concerned L and C are in series.

Fig. 5 illustrates a case where the e.m.f., E, is applied externally, and one in which, as far as E is concerned, L and C are in parallel. To avoid confusion we will refer to either of the wires that run from E to the LC combination as "feed line."

The first technical point to note is that the feed line current will split into two parts at the junction of L and C, one part taking the L path and the other the C path.

The current in the C branch will be practically 90° ahead of E in phase. If the value of ωL is large compared to the resistance of the coil (the circumstance we are most interested in) the current in the L branch will lag behind E by an angle not very far off 90°. The phasing conditions complicate the issue somewhat, but in the type of case with which we are concerned the two component currents into which the feed current splits will be very nearly 180° out of phase with each other. If the frequency of E is close to the resonant frequency of the LC combination, the branch component currents will be considerably greater in value than the feed line current. This idea of a current "splitting" into components larger than itself is not ridiculous, providing that certain phase conditions apply. Actually, the feed line current value will be nearly equal to the difference between the values of the L and C branch currents.

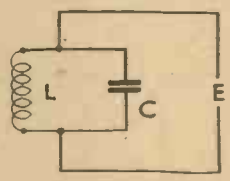


Fig. 5.—An external voltage applied to a tuned circuit as met with in standard radio circuits.

Let us concentrate now upon the case where the frequency of E is equal to the resonant frequency of the LC combination.

ωL will be equal to $1/\omega C$, as we know.

If it were not for complications introduced by the fact that the resistances in the L and C branches, respectively, are not normally equal, it would be safe to say that in the resonant condition the two branch currents would be equal. However, in the usual practical radio case the two branch currents will be very nearly equal, and also very nearly 180° out of phase with each other. The feed current will be a minimum, and because E is able to force only a very small current along the feed lines this can mean only one thing—the LC combination must be putting up a very high opposition, acting effectively in series with E.

This opposition is equivalent to a resistance of

$$\frac{L}{CR} \text{ ohms, approximately}$$

This is usually called "dynamic resistance."

From the fact of ωL being equal to $1/\omega C$, it can be shown that

$$\frac{L}{CR} = \frac{\omega^2 L^2}{R}$$

and the alternative formula will be frequently met. Incidentally, the obvious close connection of ω^2L^2/R with circuit magnification ($\omega L/R$) is worth noting.

Any difficulty in understanding just how the dynamic resistance is set up will probably be eased by consideration of the following points:—

(1) Internally in the closed LC circuit the two reactive voltages balance out just as in the ordinary series resonant case. As a consequence, current *circulating inside* the LC circuit can be comparatively large.

(2) As far as E is affected, the reactive voltages of L and C, respectively, are voltages operating in parallel.

(3) The two reactive voltages (acting in parallel) are very nearly 180° out of phase with E, i.e., practically in dead opposition to E, and therefore, severely limiting the value of current that can be developed in the feed lines by the applied voltage.

If the applied frequency is raised above the resonant frequency the current component in C will increase, and that in L will decrease. The LC combination now behaves effectively as a capacity.

If the applied frequency is reduced below the resonant frequency the LC combination will, in effect, be equivalent to an inductance.

Thus we have the interesting fact that if the applied frequency were to start below resonance, and were increased to a value above resonance, the LC combination will start as an effective inductance, become equivalent to a high resistance (at resonance), and will finish up as an effective capacity.

Practical Applications of Parallel Resonance

The Rejector. The simplest form of "aerial rejector wave trap," consists of a coil and condenser in parallel, the LC combination being placed in series with the aerial circuit. The rejector circuit is tuned to resonance at the frequency of a particular interfering signal, and the high dynamic resistance that it introduces into the aerial circuit at this frequency will tend to reduce the amplitude of the interfering oscillations.

Tuned Anode. In this case the dynamic resistance of a tuned LC combination is utilised to form the "load" resistance of an H.F. valve amplifier circuit.

Choke Resonance. There is the possibility that an experimenter will meet examples of undesirable parallel resonance effects. Suppose that he is using an inductance coil as a high-frequency choke, perhaps in the anode circuit of a valve. The requirements are not only that the impedance of the choke shall be high at all the frequency values that have to be handled, but also that abrupt changes of impedance, with change of frequency, shall not occur to any marked degree. The choke has inductance and self-capacity and must, therefore, have a resonant frequency (perhaps several, with section winding). If the resonant frequency happens to come within the range of operating frequencies, then what we have learned about L and C in parallel indicates that there will be erratic behaviour of the choke over at least a small part of the frequency range.

ON YOUR WAVELENGTH

By Thermion

My Social Round

IT is fortunate that the daily round, the exacting task of journalism, is punctuated here and there by a leavening aspect in the form of social functions where members of the trade hobnob with members of the Press when it is necessary to limn with the spotlight of publicity some new set, some new invention, or some particular aspect of broadcasting. It falls to my lot on many occasions to represent this journal at such functions, for active and dynamic though your Editor is he has not yet succeeded in devising a means of being in two places at once. He therefore sends me as a poor substitute. I say this because I have no opportunity of saying that I am a better substitute ! I like to go to such functions, however, for on the principle that Hitler may read the Italian humorous papers so that he can laugh like the Duce, I, too, may laugh with and at those whom I may lampoon in my weekly screed. Knowing the propensity of journalists for sailing back to their offices and reporting the proceedings, or such parts of it as they consider will whet the appetite of their readers, it is a deplorable rule that such proceedings may not be reported. Thus, the speakers can let themselves go minus the restraint of the average postprandial speaker whose qualification is that he should say something to please his audience. One of the functions which I usually attend is the Radio Industry's luncheon to which only members of the Industry are invited. On my last visit the speaker was Mr. D. S. Richards, who is the honorary secretary of the Listeners' League, but on this occasion they waived their usual rule and permitted journalists to comment on his speech. I now break the Gordian knot of silence and comment on some of the aspects of Mr. Richards's speech.

The Listeners' League, as you may know, is a body which by constitutional means seeks to obtain improvement in British broadcast programmes. It feels, as I feel, that any body or corporation which is without effective opposition cannot give of its best, however hard it tries. The opposition is the refining furnace, and as I have said so many times before, whilst the B.B.C. and the Post Office enjoy a monopoly they can ignore criticism and give the public what they think it ought to have instead of what the public wants. Mr. Richards spoke of B.B.C. apathy, and I was with him all along the line when he suggested that the programmes were in need of improvement. He said that we were so accustomed to considering the B.B.C. programmes the best in the world that we seldom stop to consider whether they were the best programmes in the world. I am quite sure they are not, and alternatively, if they are there is no reason why we should so smugly consider that they are not capable of further improvement.

The fact that so many listeners switch over to the Continent on Sundays indicates what public opinion thinks of the B.B.C. Sunday programmes, and I agree with Mr. Richards that there is considerable room for further improvement. I can, however, see the other point of view. According to Mr. Richards the membership of the Listeners' League is 40,000, and the B.B.C. might successfully argue that this is a very small proportion of the 5,000,000 or so listeners and that, therefore, this 40,000 is really a disgruntled and noisy minority. Alternatively, they could argue that if this 40,000 does not represent by any means the entire percentage of dissatisfied listeners it does at least indicate that the average listener is apathetic and does not care two hoots what sort of programme material he gets. Another point which Mr. Richards overlooked is this. The B.B.C. has no means of knowing how many listeners are listening-in to its programmes. Their correspondence cannot help them in this respect, therefore it does not matter to the B.B.C. what programme they put out. You can take it or leave it.

Perhaps one day someone will contrive a device which will measure the rate of absorption of the power radiated from the B.B.C.'s aerials, and thus by a simple calculation the B.B.C. will know how many people are listening in. It can be argued that some day someone will operate a set which exactly absorbs the last remaining bit of power in the ether radiated from the B.B.C. aerials ; obviously you cannot go on picking power out of the air without eventually absorbing all of it !

The B.B.C., therefore, is in a fortunate position at the moment, a position, I would add, of which every editor is envious. An editor knows within a copy the effect of a particular policy upon his circulation. If the readers do not like the policy they stop taking the paper, and so most wise editors are concerned to give their readers what they want. If the B.B.C. could have this information by means of some device which could measure the amount of free power left floating about in the ether they, too, would adjust their programmes according to the desires of the majority of the public.

Mr. Richards made some good points in support of the case for an effective opposition, and I am sure that the Listeners' League is doing good work as the only official watchdog of listeners' interests.

Bottled Television

IN last week's issue I dealt with some remarks of one of the cinema journals and the comparison they made between films and television. They consider that television is like an ordinary sound broadcast in that once the broadcast is over it has passed forever. They have overlooked the fact that it is now possible by means of the Marconi-Stille system to store ordinary sound broadcast and that much use is made of this system ; and secondly, that it is quite possible to make a gramophone disc recording, not only of sound broadcasts but of television broadcasts also. In fact, a few years ago television records were on the market ; thus, if a play were broadcast and/or televised it will be possible to rebroadcast it in the future without having to restage it. You can copy broadcast programmes in the same way as you can

copy cinema films and ordinary gramophone discs. Our friends the cinema and the theatre and the gramophone companies should remember that the methods they employ are specially adaptable to recording and duplicating broadcast performances either of sound or of vision.

Club Journals

I RECENTLY commented that very few wireless clubs produced club journals. I have received one or two excellent duplicated club journals, and one which I particularly like is "The Bulletin" of the Ilford and District Radio Society, No. 2 of which they have sent to me. It contains humour, list of members, technical articles and other club matter, and is well presented.

Correspondence

TO keep my mind off crooners and jazz, readers have sent me the following letters :

W. S., of Kilkenny, writes :—

"I have enjoyed your jokes so much that I thought this one might be worth sending along. I live in a very out-of-the-way place and until recently ours was the only set here. However, a neighbour, a farmer, bought a small three-valve set, and while fixing it one day we started to talk about mains sets. The farmer had heard one working and was disgusted at the amount of crackling and noise, but he had his own ideas about the reason for it : 'These big sets,' he said, 'are so powerful that they are able to suck in all the interference that is floating around within a mile of the aerial.' The same man had changed a high-tension plug, and wanted to know if it would be all right. I asked him which one it was, and he said, 'The aerial one'! Thanks to PRACTICAL AND AMATEUR WIRELESS, I am not quite as bad as that."

Holding the Signal

THE following amusing letter reaches me from N. W., of Darlington :

"As a regular reader of PRACTICAL AND AMATEUR WIRELESS, I would like to add my contribution to your attack on crooners. Although I detest them, I still support the dance bands, if listening to them can be called support. Many dance bands have in their personnel a very good vocalist who really can sing. Also, I would like to say a little about dealers. Readers are continually complaining about having to wait weeks for components, but what about the firms who supply quickly? I myself know of one firm at least who send by return. This firm delivers the goods in 36 hours from the time of posting the order. Inquiries are dealt with in the same manner.

"Here's a joke for you. During Christmas I was in the company of three or four men, and the subject turned to radio. None of these worthies knew a thing about the subject, and one asked : 'Why is it Radio-Luxembourg begins to weaken towards noon?' Before I had time to speak, another member replied : 'Well, if you tune in early and get a good hold on the station before other people do, you can hold it all day ; if you don't do this you will only get poor signals.'"

Notes from the Test Bench

A Soldering Hint

IT was recently necessary to re-solder a connection in a very small meter which had been sent in by a reader for inspection, and it was necessary to adopt a dodge which does not seem to be well known, although it has been used in workshops for some considerable time. The ordinary soldering iron is too large to enable such work to be done, and yet if a very small iron is employed (unless of the electric type) it cools too quickly. To overcome the former difficulty a length of copper wire should be wrapped round the copper bit and led out in the form of an extension. This will conduct the heat and act as a small bit and will be found very useful on occasions.

A Temporary Baffle

WHEN testing individual chassis and speakers it is often found that the quality of the output cannot be accurately judged unless the speaker is mounted on a baffle. With the speaker standing on the bench the lack of bass response often prevents a bad hum from being noticed, and thus a set may be tested and passed as O.K. whereas it will really give hum and poor reproduction. To obviate this difficulty and to avoid making or mounting a baffle, a good tip is to stand the speaker in the corner of the room at an angle, with the cone pointing to the corner formed by the floor and two adjacent walls. It will be found that this provides a very good baffle effect and is very little inferior to the usual type of radio cabinet.

All-wave Tuning

IN a short-wave receiver it is found that there is no need, for the by-pass condenser which is usually joined between the anode of the detector valve and the earth line. In some all-wave receivers designed by amateurs—and which are really modifications of standard broadcast apparatus—it has been found that a very common fault is to leave in circuit this by-pass condenser, or to retain a reaction condenser of the differential type. It should therefore be borne in mind that the anode by-pass must be removed for short waves, and if a differential condenser is fitted it should be re-wired as a straight component to avoid this difficulty.

No Traffic Lights!

IT is often interesting to hear how some non-technical people interpret theoretical diagrams. I do not know what this amateur had in mind but this is the case : "A friend of mine asked me to go and look at a simple one-valve set he had made. I had given this chap a very simple circuit because he knows nothing about wireless. When I arrived I found that the connecting wire had huge humps in it in places. When I asked him why this was, he said that on the diagram that I had given him I had put a semicircle where two wires crossed."

Radio Times and the Time Signal

I HAVE had a spate of letters from readers challenging the statement so often made in PRACTICAL AND AMATEUR WIRELESS that it is the *last* of the six pips which indicates the time, and the *first* of the strokes of Big Ben. This is obvious, as if the first pip indicated the time there would be no need for the other five pips. Yet, strange though it may seem, no less a journal than the *Radio Times* published a statement that it was the first of the six pips and the last of the strokes of Big Ben. Hence my big post questioning the accuracy of our statement. Needless to say, PRACTICAL AND AMATEUR WIRELESS is correct and the *Radio Times* is wrong. No doubt several readers heard the correction made by the B.B.C. over the air.

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of well-known Manufacture

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- Garrard Motor and Pick-up.
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SPECIFICATION of this marvellous instrument includes a 5-valve A.C. Superhet receiver chassis, 3 watts undistorted output. Combined on-off Volume Control and Wavechange switch. Special clock-face tuning dial. Separate tone control. 3-gang condenser. Screened coils. Mains energised speaker. For A.C. Mains 200-250 volts, 50 cycles. GARRARD Model A.C.4 GRAMOPHONE MOTOR with special tracking device. Automatic start and stop. GARRARD PICK-UP. A beautiful cabinet of tasteful modern design houses this self-contained instrument. A lift-up lid with special stays for retaining at the open position gives easy access to all controls. Overall dimensions 3 ft. high, 2 ft. 8 ins. wide, 16 ins. deep.

Deposit 11/6, *and* 18 *monthly payments of* 12/-. Your present set taken in Part Exchange.

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4-Valve ALL-WAVE
BATTERY CLASS "B" CHASSIS

LIST VALUE £7 : 0 : 0 **Bargain £3:19:6**

Complete with ALL VALVES

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Or with matched Speaker £4 19 6 *cash, or* 5/- *down and* 15 *monthly payments of* 7/11.

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LIST £2 : 12 : 6 **BARGAIN 39/6**

Or 2/6 *Down and* 10 *monthly payments of* 4/-.

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S.G.3 CHASSIS
with knobs & escutcheon, less valves **19/6**

LIST VALUE 60/- **BARGAIN**

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- Latest Screened Grid H.F. Detector and Pentode output circuit.
- Screened coils. Only 9 m.a. H.T. consumption. Illuminated and Wavelength Calibrated Dial. Wave-range 200-2,100 metres.

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Carriage Paid.

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Comprising all parts for Receiver, including exclusively specified Peto-Scott Chassis-Component assembly with station-name dial and Varley Transformer, less valves, Cabinet and Speaker.

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THESE ARE THE ITEMS IN KIT "1"
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	£	s.	d.
1 Peto-Scott ready-drilled enamelled metal chassis, with 2 Broadcast and Short-wave coils, H.F. and Short-wave chokes, two trimmers, rotary type low capacity switch, slow-motion drive, and full vision station name dial and three brackets, all mounted and ready wired, complete with condenser distance pieces, insulating washers, knobs and escutcheon	1	12	6
1 New type 2-gang 2 x .0005 mfd. condenser	0	7	6
1 Varley Class "B" Input transformer, type DP.41	0	11	6
1 .0003 mfd. reaction condenser	0	1	6
1 .0001 mfd. differential reaction condenser	0	1	6
1 B.T.S. All-wave H.F. choke	0	1	9
1 50,000 ohms potentiometer with 3-point switch	0	3	0
1 25,000 ohms potentiometer	0	2	6
1 Microfuse 200 m.a. fuse and holder	0	1	6
1 Belling Lee socket strip	0	0	9
3 1-watt resistances to specified values	0	1	0
4 1-watt resistances to specified values	0	1	8
3 Electrolytic condensers, 8 mfd. (2), 2 mfd.	0	6	0
9 Tubular condenser to specified values	0	4	6
2 7-pin chassis mounting valveholders	0	1	0
2 4-pin chassis mounting valveholders	0	0	10
8 Plugs and spades	0	1	0
Wire, flex, nuts, bolts and washers	0	2	6
Kit "1" Cash or C.O.D. Carriage Paid	£4	0	0
1 Set of specified valves	1	17	9
or add 3/- *to Kit "1" deposit and* 3/3 *to each monthly payment*			
1 W.B. Junior 38.J. Speaker	£1	12	6
Or 2/6 *down and* 11 *monthly payments of* 3/-			
Peto-Scott Walnut Cabinet	0	19	6
Carriage 2/6 *extra, or add* 1/6 *to Deposit and* 1/11 *to each monthly payment.*			

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As for Kit "1," but including 4 British Matched valves. Cash or C.O.D. Carriage Paid £5 1 0

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1938 ALL-WAVE 5-valve A.C. SUPERHET CHASSIS
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List Value 8 *Gns.* **BARGAIN £4:17:6**

COMPLETE WITH 5 VALVES, KNOBS & ESCUTCHEON

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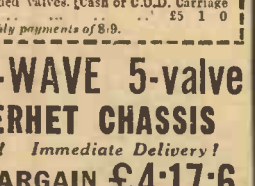

- 3 wavebands: 18-50, 200-550, 900-2,000 metres. A.V.C. bandpass on all bands. Input to triode hexode detector oscillator, V.M. H.F. pentode, double-diode-triode 2nd detector triode resistance capacity stage coupled to high-slope output pentode. Output 3 watts. Combined on-off switch and volume control. Separate tone control. 4-position wave-change and gramo-switch. Illuminated rectangular full-vision slow-motion dial, 80-1 and 9-1 reductions, scale engraved station names and wavelengths. Overall dimensions: 10in. high, 11in. wide, 8½in. deep.

For A.C. mains 200/250 volts, 40/80 cycles. Fully tested and guaranteed.

7/6 *down secures; balance 15 monthly payments of* 7/11.

ORDER NOW TO AVOID DISAPPOINTMENT.

If required with matched moving-coil speaker add 27/6 *to Cash Price, or* 7/6 *down and* 17 *monthly payments of* 8/9.

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Tapped for SCREEN, DET. and POWER. Output 25 m.A. at 150 volts.

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TRICKLE CHARGER, 2-v. 1-amp., metal rectifier. 10/6.

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—*New* 4-valve BANDSPREAD—
Battery SHORT-WAVE KIT

List Price £4 . 17 . 6 **BARGAIN 42/-**

VALVES FREE

A PERIODIC H.F. reacting detector, resistance and transformer L.F. Stages, Pentode Output. Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Efficient low-loss reaction condenser. Air-spaced bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 calibrated scales.

KIT "1" comprises every part for assembly including 3 6-pin coils, wiring, and assembly instructions. Cash or C.O.D. Carr. Pd. 42/-, or 2/6 down and 12 monthly payments of 4/-. 4 MATCHED VALVES FREE.

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3-IN-1 SHORT-WAVE KIT.
ADAPTS or converts your battery set for short-wave reception, or may be used as one-valve Short-wave Receiver. Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Air-spaced bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 scales calibrated. Complete Kit with 3 coils. 12-94 metres and all instructions. List value 41/3. BARGAIN 25/-, or 2/6 down and 11 monthly payments of 2/9. Matched valve FREE.

2-VALVE BANDSPREAD SHORT-WAVE KIT.
12-94 metres. Amazing performance. Amazing value. Complete Kit. List 59/6. BARGAIN 32/6, or 2/6 down and 12 monthly payments of 3/1. Two matched valves FREE.

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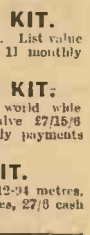
Q.P.P. output providing quality reproduction on gramo. and microphone. Dimensions: 7in. long, 5in. deep, 7½in. high. For use with ordinary H.T. battery 125-150 volts. With 3 valves, fully tested. List Value £4/4/0. BARGAIN. Cash or C.O.D., £2/15/0, or 4/6 down and 12 monthly payments of 4/9.



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HEADPHONES. New lightweight, super quality, ideal for short-wave work and testing, 3/6. Post Cd. **VALVES.** Give your set a tonic. Fit a new set of valves. Huge purchases enable us to offer at greatly reduced prices. Long and efficient service guaranteed. **Battery Types:** Det., L.F. and H.F., 2/9. Power 3/6. S.G., V.M., H.F., and Pentodes, 6/-. **Mains Type:** A.C./H.L., 5/-. All A.C. S.G., A.C. V.S., Pentodes and H.F. Pentodes, 7/-. Octodes and Hexodes, 9/-. D.H. Full Wave Rectifiers, 350-0-350, 120 m/a., 5/-. Postage extra.

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February 12th, 1938. Vol. 3. No. 87.

AERIALS FOR TELEVISION

The Principles and Constructional Details of Aerials Suitable for Ultra-short-wave Reception are Given in this Article.

THE aerial is the first link in the chain of the television receiver, and so it is essential to make it as efficient as possible in order to obtain the maximum input signal, as this may mean a saving of one or two valves in the receiver itself. The first thing to remember about the aerial, in fact about any aerial, is that it must be erected as high and as far away from surrounding objects and sources of interference as possible. The ultra-short waves, such as are used for television, are affected to a much greater extent by surrounding objects than the lower frequencies used for ordinary broadcasting, since they travel in straight lines and are not usually reflected by the ionised layers in the upper atmosphere. Metal objects, in particular the metal framework of buildings, screen the aerial or reflect the waves back so that they cancel out or reduce the signal at the aerial. Interference is also much more objectionable as it appears as white spots on the screen giving a snowstorm effect which completely spoils the picture, while it may only appear as a faint crackle in the speaker. Cars cause a large amount of interference on the ultra-short waves, so that it is advisable to mount the aerial as far from any main road as possible.

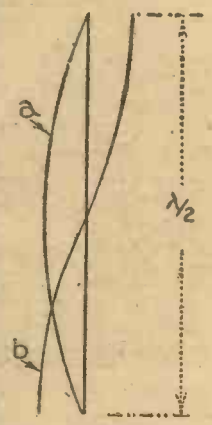


Fig. 1.—Showing the distribution of (a) current and (b) voltage in a half-wave aerial.

All television aerials must be mounted vertically, as the transmitting aerial is vertical, the transmitted waveform being vertically polarised, but at long distances, when the signal has been reflected, or when the receiver is to be operated in the shadow of a hill, the wavefront may have become tilted, and so it may be advantageous to tilt the aerial, so that it may still be parallel to the wavefront. In the first case, the tilt may be in any direction, depending on the number and angle of the reflections, but in the second case, the top of the aerial will have to be tilted away from Alexandra Palace.

Three Main Types

Not including complicated arrays, there are three main types of aerials in use for television reception, and all consist of a vertical wire or tube which is half-wave at the vision frequency. The vision wavelength is 6.66 metres, so that a half-wavelength is 3.33 metres in air, but the velocity of the wave is slower in copper than in air; therefore, from the well-known formula that Velocity is equal to Frequency times Wavelength, it is obvious that if the frequency is constant at 45 Mc/per second the wavelength must be less in copper than in air. The distributed capacity also causes a decrease in velocity, so that the wavelength is usually taken as being approximately 95 per cent. of that in air; that is, about 11ft. 0½in.

As most of the figures in connection with ultra-short-wave aerials vary according to the materials of which they are constructed and their location, it is advisable to make up an experimental adjustable dipole, for use in determining the exact lengths to use, but it must be remembered that the thinner the wire, the more it slows the wave down, but at the same time, the L/C ratio decreases, and so the selectivity goes up. Thus in order to have sufficient band-width for good definition and to give adequate input on sound, the same aerial is invariably used for both vision and sound; it is advisable to use tube for the aerial, or at least a fairly heavy gauge of wire. Amateurs who possess a camera tripod can use two of the legs, lengthened if necessary, as the two sections of a split dipole, thus facilitating adjustments. A suitable one was described on the "Readers' Wrinkles," page in the issue of November 14th, 1936.

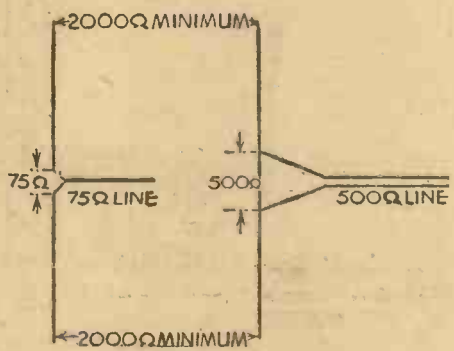


Fig. 2—Showing the connections for (a) low-impedance and (b) high-impedance feeders to a centre fed aerial.

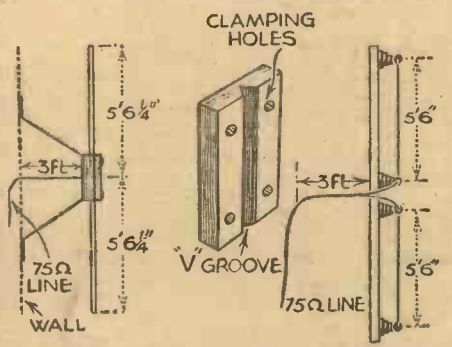


Fig. 3—Shows the construction of a practical split dipole using tube, and details of the clamping block.

Fig. 4—The construction of a practical split dipole using wire.

The impedance of a continuous half-wavelength of wire is about 75 ohms at the centre and rises to upwards of 2,000 ohms at the ends, depending on the gauge of wire used. If this wire is split in the middle, the impedance between the inner ends is therefore approximately 75 ohms.

Balanced Feeders

Fig. 1 shows the distribution of current and voltage in a half-wavelength aerial, and it at once becomes obvious that it may be either current-fed by connecting to its centre, or voltage-fed by connecting to either end. The simplest method of connecting the aerial to the set is to split it and connect a length of 75-ohm balanced feeder (such as the Belling-Lee) to the inner ends (Fig. 2). If it is desired to use a higher impedance line—say, 500 or 600 ohms—the aerial is not split, but the feeders are tapped on to it at points equal distances either side of the centre, so that it is terminated in its correct impedance. For those who want to make up a high-impedance line, or a matching transformer, the formula is $Z=276 \log \frac{D}{d}$ where Z is the required impedance, D is the spacing, and d is the diameter of the wire. Figs. 3 and 4 show two practical methods of constructing split dipoles, by using tube or wire. The first type consists of two quarter-wavelengths of copper or brass tube, ⅜in. to ⅝in. diameter, mounted end to end in a wooden clamp suitably weather-proofed. Wood is quite satisfactory as an insulator here, as the centre of the aerial is a node as far as voltage is concerned (Fig. 1). In fact, when the continuous type of aerial is used (Fig. 2) it is quite satisfactory to use a metal clamp in the middle and not have any insulation at all.

The aerial shown in Fig. 4 consists of two quarter-wavelengths of wire mounted on stand-off insulators on a piece of wood about 12ft. long. This aerial has the advantage that it is cheaper to construct and can be mounted by its end if necessary, but it must be remembered that the feeder should not hang down directly behind it, but should be taken about 3ft. horizontally away from it before being allowed to drop, as otherwise it unbalances the aerial. The best quality stand-off insulators should be used at the ends, as these are anti-nodes for voltage (Fig. 1), and the wire should be as heavy a gauge as possible in order to keep the band-width up.

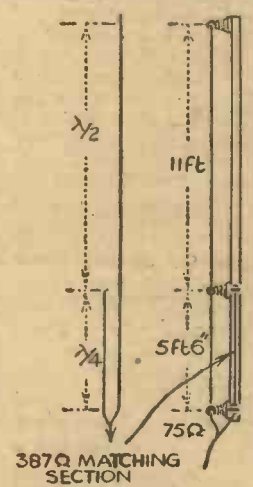


Fig. 5.—The method of end-feeding a half-wave aerial, and (right) a practical arrangement of the aerial.

Matching Transformer

As with transmitting aerials, it is possible to end-feed the aerial, using a quarter-wavelength matching transformer as the impedance of the end is over 2,000 ohms,

(Continued at foot of next page)

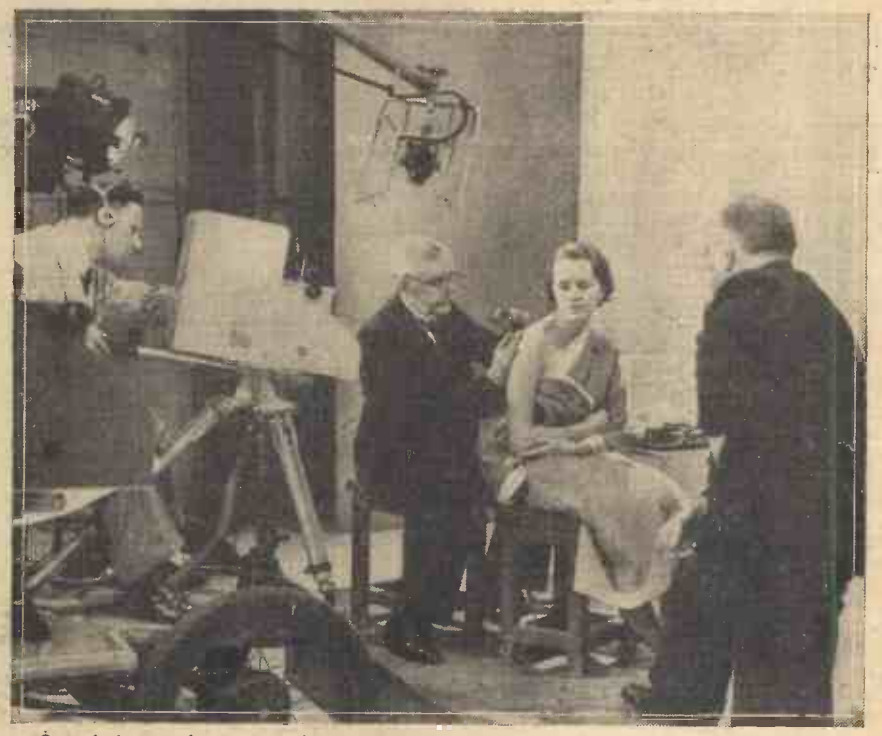
TELEVIEWS

Marked Improvement

IT is conceded on every side that television has made remarkable progress, both in the technical sense and in its popularity. This has been brought about mainly by a better understanding of the problems to be solved at the transmitting end rather than improvements in the receiving sets themselves. The results seen on present-day sets are of a high enough standard to warrant immediate purchase, especially now that there has been official R.M.A. assurance that any preconceived ideas of early obsolescence are entirely wrong. Undoubtedly, the best way to judge results is to install a receiver in the home and view the pictures for several days under conditions conducive to a proper appreciation of the results given with a modern high-definition service. Public demonstrations certainly show what can be achieved, but if jostled in crowds or standing for some time gazing at the picture screen, a person is apt to lose patience and get quite a wrong idea of what can be seen or heard. Those who look in should not be bothered with stories of how difficult and cramped are the conditions under which the transmissions are undertaken at Alexandra Palace (conditions which will be improved as soon as the extent of the Goverment's monetary grant is known) but rather made to appreciate how good are the results seen, for in this way a real live industry will be built up for this country.

A Trial Process

IMPORTANT steps are now being taken in France with a view to determining the best system for adoption in order to provide the public with a satisfactory high-definition television service. In order to carry out the investigation in a thorough manner four different systems are being given a trial. In each case 50 frames interlaced to give 25 pictures per second are used, but the degree of picture definition is in one case 375 lines, in another 450, while the remaining two use 455 lines. Positive and negative picture signal modulation at the transmitting end are both used, while the D.C. component is present to give the correct measure of mean illumination in the received picture. How long this four-fold trial will take place has not been stated officially, but in readiness for the final decision coaxial cable distribution is being undertaken by the French Post Office so as to link up the Paris station with provincial stations at the first opportunity. It is a matter for regret that unanimity in the degree of picture definition cannot be arrived at between the leading nations developing television services. Britain has 405; Germany 441; and now France may choose one of three others. If the standards could be made the same it would encourage experimenters to make serious attempts at long-distance ultra-short-wave reception to see if Continental picture signals could be received and resolved into intelligible images on standard receivers, or possibly used in conjunction with a pre-amplifier. Before the art is much older it may be possible to secure agreement on this point, and so widen the choice of programme material if reception can be undertaken.



One of the new features in television is a series of demonstrations of craftsmanship, and our illustration shows Mr. Burchett, a well-known London tattoo artist, tattooing a lady's shoulder during a recent television broadcast at Alexandra Palace.

Electron Multiplier Improvements

THE commercial value of electron multipliers, especially as applied for use in conjunction with photo-electrically operated devices, is assuming an increasing degree of importance. This, no doubt, accounts for the considerable amount of research which is being directed towards their development, and improvements in performance and patent records bear testimony to the efforts of engineers in this direction. For example, it has been found that the number of secondary electrons produced by any given primary electron is increased if the latter is constrained to strike against the target electrode at an angle, so as to make a glancing contact instead of impacting at right angles. An electron multiplier has therefore been developed which makes use of this principle, the effective degree of amplification being thereby increased for a given number of multiplying stages. In the case of the reciprocating form of electron multiplier, improvements have been effected in its detailed working by paying special attention to the synchronising of the external oscillating potentials and the time of flight of the electrons between the photo-sensitive electrodes.

Avoiding Leakage

It has now been ascertained that steps must be taken to avoid every trace of insulation leakage, otherwise this will be instrumental in generating unwanted noise in the output circuit of the apparatus when the usual high voltages are applied to the separate multiplying stages in the form of grids or reflector surfaces. Then, again, it has been shown that the value of the output resistance employed is a function of the total frequency band it is required to accommodate under service conditions, and also the maximum value of the current which has to flow in the output circuit.

Avoiding Heating

As a rule this current is limited by the cell makers, otherwise the device can be seriously damaged. Finally, precautions must be taken to prevent the incidence of any sudden very bright illumination on the cathode, as this brings about excessive heating at the multiplying stages, and is liable to cause a measure of instability.

PRACTICAL TELEVISION

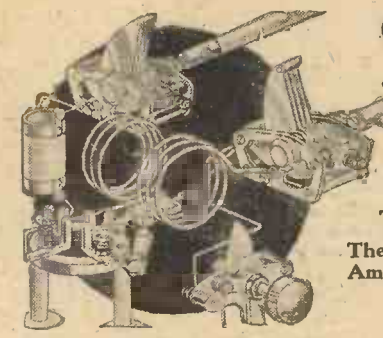
(Continued from previous page)

thus making the aerial three-quarters of a wavelength long (Fig. 5). Owing to the large variations possible in the impedance of the end, it is necessary to take an approximate value for it, and make final adjustments on test. The formula for the impedance of the transformer is: $Z_T = \sqrt{Z_A Z_L}$ where Z_T is the transformer impedance, Z_A is the end impedance of the aerial, and Z_L is the impedance of the feeder. Assuming Z_A is 2,000 ohms, and Z_L is 75 ohms, then Z_T is approximately 387 ohms. In the formula $Z=276 \log d/d$, Z is 387 ohms, and using 16-gauge wire d=.064in. D, the spacing, becomes approximately 1.63in.

The easiest method of constructing an aerial of this type is to make it of wire, and mount it on a pole, as in Fig. 5. The remarks made about insulators, and the gauge of wire, in connection with Fig. 4 apply equally here.

Using a Reflector

The signal picked up by any of these aerials can be easily doubled by the use of a reflector. This simply consists of a continuous half-wavelength of wire or tube placed one-quarter of a wavelength behind the aerial, that is to say, on the side away from Alexandra Palace, so that the reflector, the aerial and the Palace are in line. This may sound a difficult adjustment, but the reflector may be as much as 15 degrees out of line either way without any noticeable difference, and in many cases it should be possible to move the reflector round to locate the position of maximum signal strength.



Short Wave Section

THE AURORA AND S.W. RECEPTION

The Recent Aurora has Focused a Considerable Amount of Attention on the Question of Sun-spots as They are Related to Radio Reception.

By FRANK PRESTON.

THE remarkable phenomenon of the aurora borealis or northern lights that was observed by people all over this country and in many parts of Europe on January 25th has a special significance for short-wave workers. Peculiar electro-magnetic action between the sun and the earth is responsible for this natural "firework display," and it is only reasonable that such forces should affect radio reception. Those who were listening on short waves during the evening of January 25th found that reception rapidly became worse as the evening advanced and that reception of American stations became virtually impossible regardless of the sensitivity of the receiver.

Directional Effect

Commercial stations that are normally able to maintain a perfect and regular service between the two continents were unable to continue with their work for a few hours. Surprisingly enough, however, short-wave communication between this country and stations to the south-west was not affected to anything like the same extent. No doubt many research workers were enabled to carry out a variety of valuable experimental work, the results of which will not be generally known for some time. Amateur experimenters who appreciated that conditions were unusually abnormal were also able to make a number of interesting tests. Those who missed this opportunity might have another soon after these words are in print, for it is considered likely that there will be a repetition of the phenomenon between February 20th and 22nd.

Astronomers tell us that it is not unusual for sun-spots—which are generally closely associated with the aurora borealis—to disappear and then to reappear after about four weeks, the time taken for the sun to revolve. In the present case it is stated that the aurora is associated rather with magnetic storms than with a particular sun-spot.

Sun-spots

Many readers have no doubt heard and read about the so-called "sun-spot" cycle, for this has been found to have a profound effect on radio transmission and reception, particularly on short waves. Sun-spots are said by astronomers to be huge craters or hollows in the surface of the sun, caused by what can be described as whirlwinds of extremely hot vapours. In addition to causing the physical effect of making large holes in the sun's surface they create magnetic "storms" which, in turn, produce static and different kinds of screens that affect the transmission of wireless waves.

Eleven-year Cycle

Sun-spots are constantly being produced, but in many cases their effect is so slight as to be almost negligible from the radio experimenter's point of view. It has been found, however, that what is generally referred to as sun-spot activity varies in extent in a roughly periodic fashion. For example, prolonged tests have shown that a period of about eleven years elapses between consequent periods of maximum sun-spot activity. This means, in effect, that once every eleven years short-wave reception conditions become least favourable. Between those periods, conditions gradually improve and then fall off. Actually, it is not possible as yet to predict with accuracy the times at which reception will be at its best and at its worst, but approximate estimates can be made.

Those readers who have taken an interest in radio reception during the past twenty years will remember that conditions were extremely good in 1922; by 1927 they were comparatively poor; they improved until 1932-33, to fall off again during recent years. These facts agree very closely with astronomical observations, which show that maximum sun-spot activity occurred in 1917 and 1928, minimum activity being recorded about 1922 and 1933.

According to the eleven-year cycle theory, maximum sun-spot activity combined with poor reception conditions should again be observed about 1939. In this case, however, the observers at Greenwich Observatory anticipate that the period of maximum sun-spot activity will be during the early months of this year, and that the activity will diminish as the year progresses. From this it appears that any definite time cycle has not yet been established, and probably does not exist.

A pair of large Sun-spots, as seen through a powerful astronomical telescope, about to disappear due to rotation of the Sun.

Dr. J. J. Nassau, director of the Warner and Swasey Observatory, is shown here making a photograph of an unusual number of spots that appeared on the surface of the sun on Jan. 20. The group of spots, which constituted a disturbance of unusual size, was estimated to be 120,000 miles long and 60,000 miles wide.

Another fact that is brought to light by regular astronomical observation is that the maximum at one time might be greater than at another. For example, activity was higher in July and August of 1937 than it was at the previous maximum in 1928. Extreme activity might therefore be expected in the next few months.

Recent Conditions

A study of these cycles and periods of sun-spots helps to explain many of the apparently peculiar reception conditions that are frequently noticed. It will be remembered that short-wave reception conditions in this country were poor toward the end of last summer—coinciding with the high sun-spot activity at that time. And those who have kept a log during this winter will no doubt have found that reception has gradually become worse, especially during the latter part of January. Even during this period, however, there have been good days and good nights. In other words, long-distance short-wave reception has been much more erratic than usual. During the first week in January I was able to bring in Schenectady on 31.72 metres at fair speaker strength on a four-valve superhet every evening after about 10.30 p.m. Toward the end of the

(Continued overleaf)

SHORT-WAVE SECTION

(*Continued from previous page*)

week fading was more pronounced, and during the second week comfortable reception was out of the question. Since that time until the time of writing I have been unable to bring in that station at all until early morning, and even then signal strength has been poor, and fading very bad. When you read these notes you might find that several American short-wave broadcast stations can be well received; that is one of the fascinating sides to short-wave experiment.

Keep a Log

It will be of special interest to keep a log during the next few months, so that the effect of the predicted "sun-spot maximum" can be noted. The best method is to choose one or two "test" stations that have previously been well received. For preference, they should be in different directions from the receiving aerial, for it might be found that although American transmissions are badly received, those from Australia are better than average. The "test" stations should be distant ones, for those within a thousand miles or so might be only slightly affected, especially if they work on high power. To make the tests still more conclusive it would be a good plan to have a second set of "test" stations at a shorter range than 1,000 miles.

In any case, we shall be glad to learn of your results, and if sufficient readers send us logs, along with brief details of their sets and aerial systems, it might be possible to draw some valuable conclusions that can be passed along to all readers. Notes of this nature will be of greatest value when compiled by those who have had a fairly wide experience of short-wave work, but we shall be glad to have details from all readers who are interested.

Static

It has for long been considered that atmospherics were closely associated with sun-spots, as well as with other magnetic storms, but at the present time, despite poor reception conditions, static is by no means pronounced. In fact, the only serious effect has been that of a general "dead-ness" on the short-wave bands. Perhaps an explanation could be found in the fact that some kind of magnetic screen is formed between the sun and our planet. If that is the case we might eventually discover that it can be "pierced" by waves of a particular frequency. My own tests suggest that "absorption"—if that is what takes place—occurs on all wavelengths between about 17 and 50 metres, so we shall probably have to look to the ultra-short waves to overcome our difficulties.

Frequency and G.M.T.

In the past long-distance radio communication has been most easily established on the short waves, but at the time of the aurora only long waves could be employed with any degree of reliability. But as tremendously higher powers are required for long-wave working over distances in excess of 1,000 miles or so it is to be hoped that a means will be found of counteracting the restrictions imposed by the sun. We now know fairly accurately what wavelengths can be used most effectively at different times of the day and night (short waves only are referred to) so it does not appear to be unduly optimistic to hope that we shall eventually "discover" frequencies that can be used in face of sun-spot opposition. Those who have made a careful study of short-wave transmission can produce a map from which it can easily be determined how daylight and darkness are distributed between two distant points, and from a knowledge of that to calculate the most suitable frequency on which communication can most easily be maintained.

Professional research workers can help considerably, but the vast body of amateur experimenters can put new theories to the practical test and therefore do quite as much to further our knowledge of the effect of atmospheric conditions on transmission and reception. Here is an interesting field for study.

Needless to say, we shall be glad to receive reliable data from any reader who keeps such a log.

Leaves from a Short-wave Log

New Station in Dominican Republic

HID, Trujillo City, is the call of a newcomer heard on the ether between G.M.T. 01.30-03.00 almost nightly. The wavelength is 32.29 m. (9.29 mc/s).

A New Call from Ecuador

French listeners report the reception of a broadcast picked up between G.M.T. 02.45-03.15 from HC1ETC, Quito (Ecuador) in which an announcement was made that the transmission was relayed from the *Teatro Bolivar* in that city. The wavelength given out was 43 m. (6.976 mc/s).

Special Broadcasts for Dx-ers

On February 13, COGF, Matanzas (Cuba) on 25.41 m. (11.805 mc/s) will present a special radio programme for listeners overseas from G.M.T. 04.30-05.30. YSD, San Salvador on 38.02 m. (7.89 mc/s) will also be heard carrying out a similar transmission at G.M.T. 23.00.

COGF may be identified by its slogan: *La Voz de la Provincia, Emisore CMGF, Onda Larga y COGF, onda corta en Matanzas, Republica de Cuba.* Address: Transmisora COGF, Gral Betancourt, 51, Matanzas (Cuba). Interval signal: 5 chimes.

San José Alters the Schedule

TIRCC, San José (Costa Rica) on 45.8 m. (6.55 mc/s) advertises a new time schedule. On Tuesdays, Thursdays and Saturdays the studio is on the air from G.M.T. 23.00 until midnight; on Mondays from 01.00-03.00; on Fridays, from 02.00-03.00, and on Sundays from G.M.T. 16.00-17.00. The call is: *Radioemisora Catolica Costarricense*, and the interval signal consists of three notes repeated *ad lib.* followed by one chime. The distance from London to San José is approximately 5,430 miles.

Another Spanish Short-waver

On roughly 21 m. (14.285 mc/s) more war news bulletins in the Spanish and French languages, with an occasional English translation, may now be picked up on Sundays towards G.M.T. 16.00; they are broadcast by FET 5 Burgos (Spain) which on weekdays works on 40 m. (7.5 mc/s) from G.M.T. 19.00.

Madagascar's Revised Timetable

F1QA, Antananarivo (Madagascar), until further notice will be broadcasting according to the following time schedule: Daily (exc. Sundays and Mondays) from G.M.T. 08.00-08.45 with an extra transmission on Tuesdays, Thursdays, and Fridays from G.M.T. 15.00-16.30. On Saturday, F1QA is on the ether between G.M.T. 17.30-19.00, and on Sundays gives one broadcast from G.M.T. 07.30-09.00. The wavelength of 49.96 m. (6.005 mc/s), having been found most suitable, is to be retained. The programmes mainly consist of gramophone records (European and native music) with a few short topical talks, a news bulletin, and occasionally a relay of a café concert or orchestral performance from either the Hotel Fumaroli or from a local theatre in the capital. Call: *Ici station française de radiodiffusion Coloniale et Equatoriale a Tananarive (Madagascar).* The transmission opens with the playing of the once popular Ramona and closes down with La Marseillaise. Address: Hotel des Postes Place Colbert, Antananarivo (Madagascar).

Other French Colonial Stations

Radio "Boy Landry," a transmitter operated at Saigon (French Indo-China) by a firm dealing in radio equipment is reported to be broadcasting simultaneously on two channels, namely, 49.67 m. (6.04 mc/s) and 25.66 m. (11.69 mc/s). The times are as under: G.M.T. 06.15-07.15; 11.30-12.30 and 17.00-24.00. The broadcasts close down with the playing of the Marche Lorraine followed by the French National Anthem. On 31.49 m. (9.53 mc/s) FZR, also at Saigon, works daily from G.M.T. 11.00-12.30, and from 18.00-21.00. It is owned by M. Michel Robert, 98, rue d'Espagne, Saigon (French Indo-China). In Tong-King, the adjoining French possession, two stations have been opened at Hanoi, namely Hanoi (1) and Hanoi (2). The former operates alternately on 49.5 m. (6.06 mc/s); 31.45 m. (9.54 mc/s), and 25.3 m. (11.86 mc/s); the latter on 49.8 m. (6.022 mc/s); 31.55 m. (9.51 mc/s), and 25.21 m. (11.9 mc/s). Their time schedules are respectively, G.M.T. 12.00-13.30; 16.00-17.00; 18.30-22.00, and G.M.T. 10.00-11.30 and 12.00-22.00.

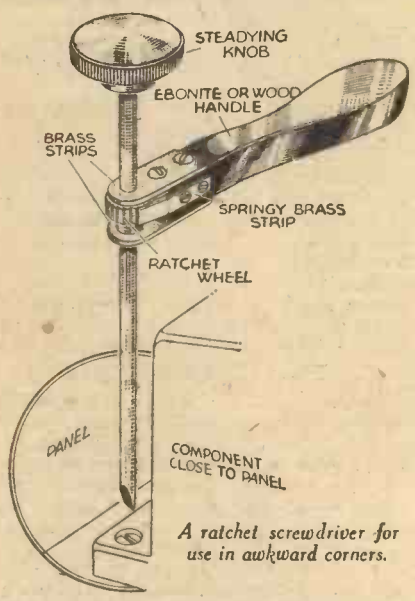
At Haiphong, the principal port in the same colony, a small transmitter has been erected which works on any of the following three channels, 48.8 m. (6.147 mc/s); 31.3m. (9.584 mc/s), and 25.6 m. (11.72 mc/s) daily from G.M.T. 09.00-12.30, and from 17.00-21.00.

A PAGE OF PRACTICAL HINTS

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

A Ratchet Screwdriver

THIS easily made screwdriver will be found very handy when fixing components in awkward corners. The accompanying sketch will make all the details

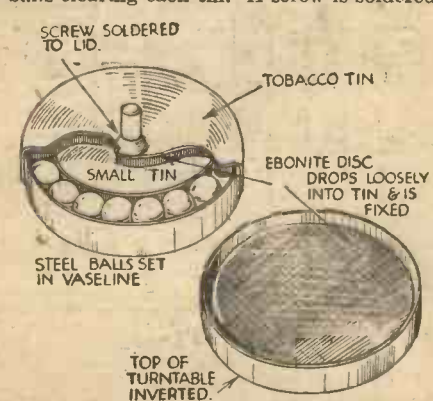


A ratchet screwdriver for use in awkward corners.

clear, but it may be mentioned that by loosening the set-screw of the ratchet-wheel and reversing the spindle, the screw driver may also be used for unscrewing.—A. W. GRAY (Leytonstone).

A Miniature Turntable

TO make the base for this miniature radio turntable a small circular tin is soldered into one of larger diameter in such a way as to leave a channel round the inside for the insertion of steel balls. The top is the lid of a tobacco tin with a disc of ebonite fastened inside, also leaving a channel all round the edge, thus allowing the tins to turn independently of each other while the ebonite disc turns on the steel balls clearing each tin. A screw is soldered



A miniature turntable made with two tins and some steel balls.

THAT DODGE OF YOURS!

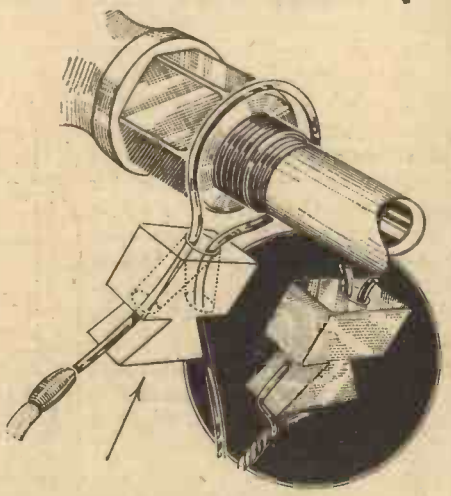
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

SPECIAL NOTICE
All wrinkles in future must be accompanied by the coupon cut from page 624

to the top for insertion into the receiver. The illustration shows the turntable in part section.—V. E. MELWORTH (Leigh).

An Adjustable Earthing Clip

HERE is a handy earthing device for overcoming the awkwardness sometimes to be met when establishing a temporary earth connection for test purposes. By using this device normally inaccessible gas or water pipes can quickly be commissioned. The cleat, as illustrated, is made out of solid brass, the overall dimensions being 1in. by 1in. by ⅜in. approx., whilst the holes—shown dotted—are ¼in.

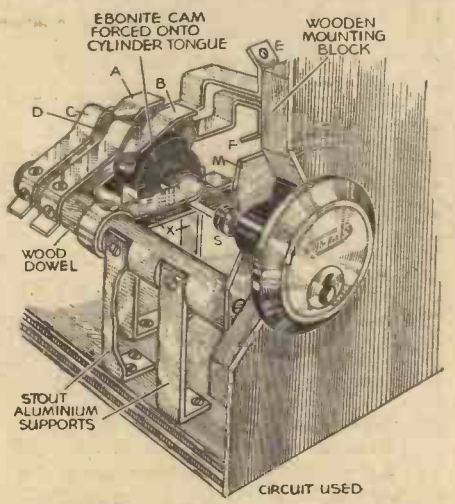


A handy earthing-clip for making temporary connections for experimental purposes.

in diameter. It will be seen that when the wire—16 S.W.G. bare copper—is threaded through the holes the cleat may then be forced along the wire as indicated by the arrow, the two ends being then quickly twisted together, as shown in the inset drawing. By reason of the small holes, pipes down to ¼in. and even less may be easily and efficiently adapted, and it is always advisable to loop the wire round the threaded portion of the pipe to obtain suitable "bite."—C. C. SMITHERS (Warrington).

A Useful D.P.D.T. Key Switch

THE accompanying illustration shows how I made use of an old cylinder latch by converting the movement into a D.P.D.T. key switch, for inclusion in that section of my receiver housing the rectifier equipment for charging the accumulator. The unit had first of all to be mounted on to the panel by incorporating a suitable distance piece, and I managed this by cutting a suitable size piece of common white-wood, drilling and fashioning the hole for the cylinder section of the lock, and finally securing to the front panel by a further



An old cylinder latch is used for making this D.P.D.T. switch.

piece of sheet brass "M"; the lock fixing screws had to be cut down a little, and the excess length compensated with packing washers, as shown.

The locking position of the switch was then assured by a doubled-over brass spring fixed as in the case of all the contact pieces "A, B, C, D" to a length of dowel wood, "E, F" being secured to the block of wood. The cam was obtained from the junk box, and by filing down two lengths of ebonite this cam was "wedged" on to the cylinder tongue. The maximum "throw" of the switch is governed by the two strips "X," and the contact lifting is effected by two 4BA brass screws let into the cam, one being visible in the illustration.—H. E. LONGWOOD (West Kirby).

"PRACTICAL & AMATEUR WIRELESS" BLUEPRINT NO. P.W. 83. PRICE—ONE SHILLING

F.J. Camm's "ACME" ALL-WAVE 4

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PRESENTED FREE WITH "PRACTICAL & AMATEUR WIRELESS" DATED FEB. 12TH 1938

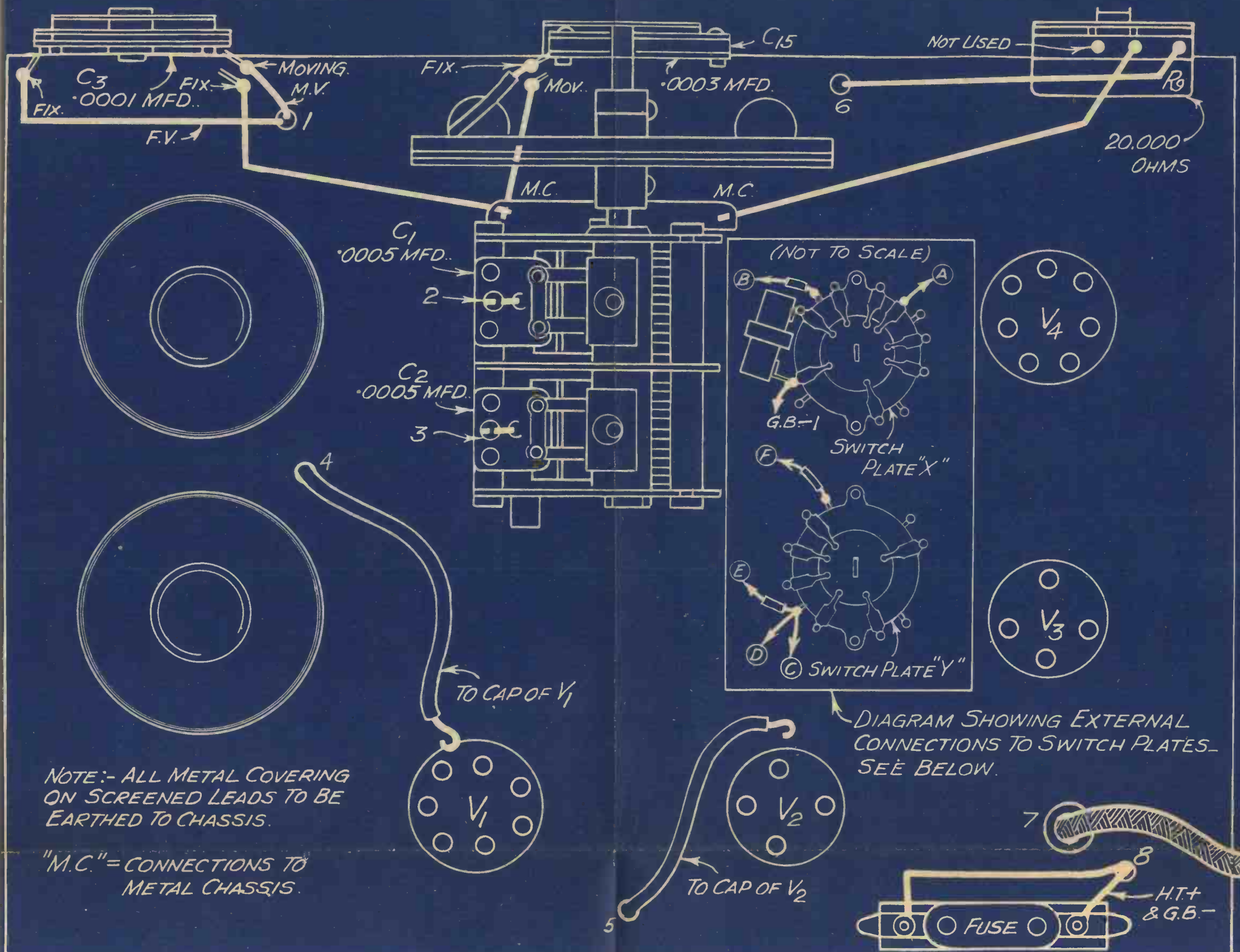
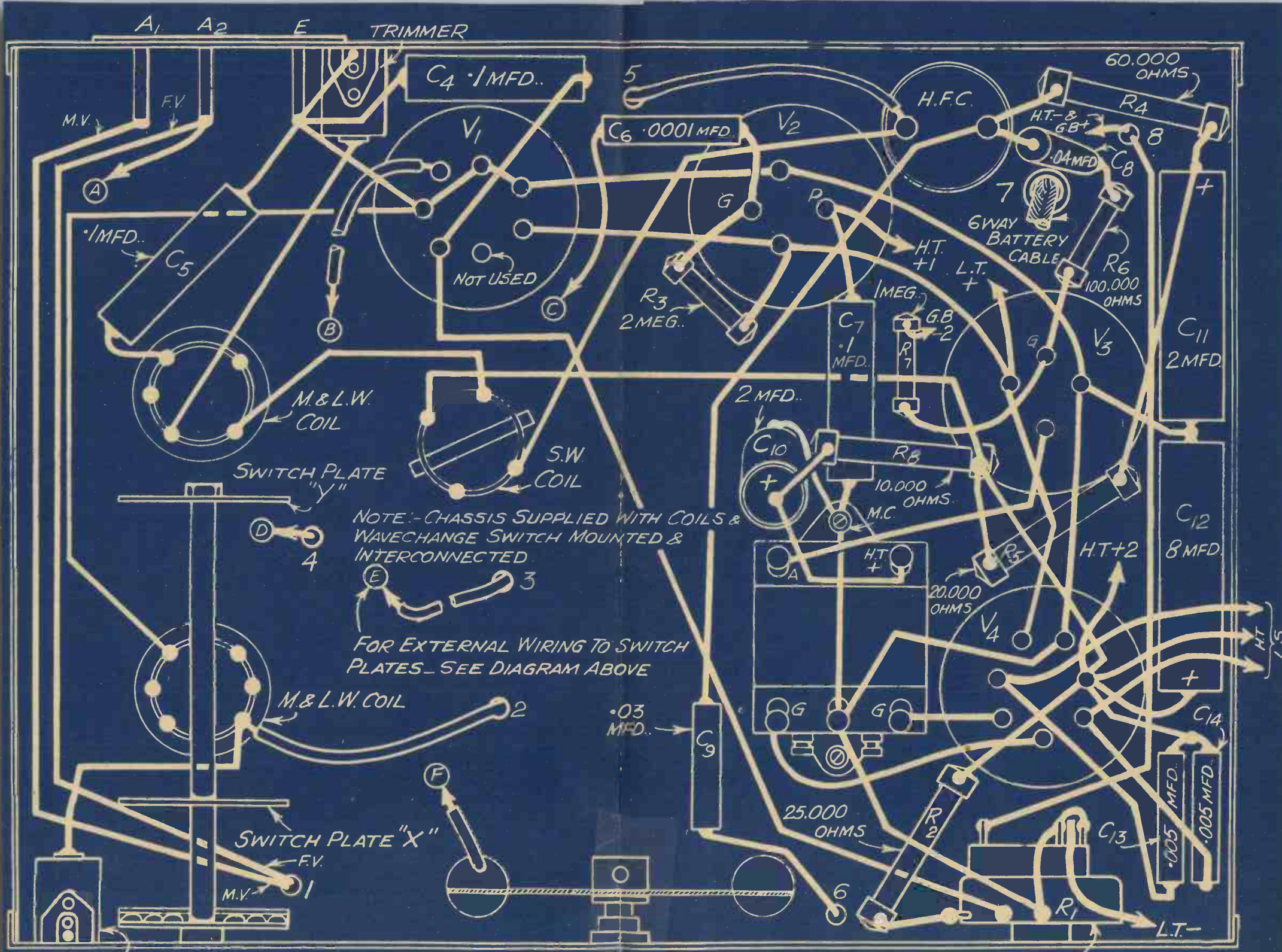
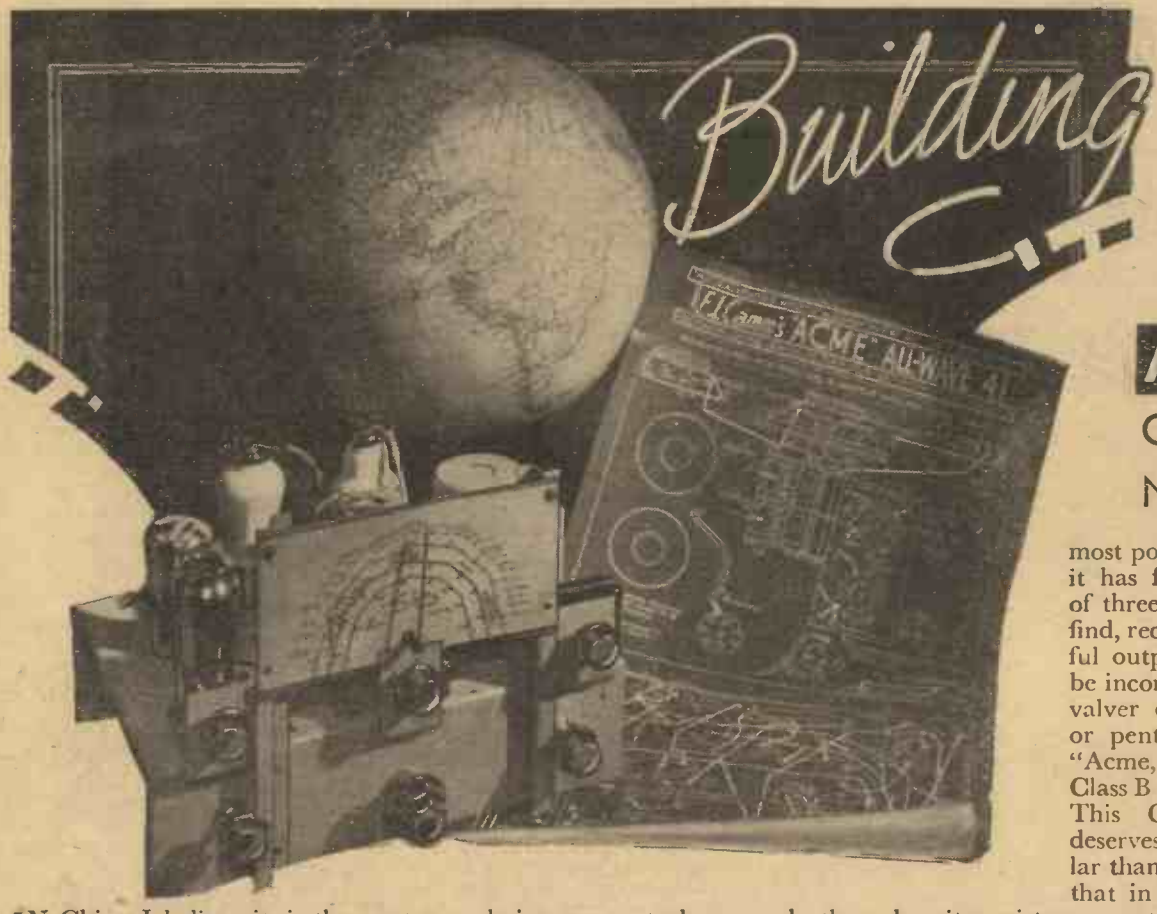


DIAGRAM SHOWING EXTERNAL CONNECTIONS TO SWITCH PLATES— SEE BELOW.

NOTE:- ALL METAL COVERING ON SCREENED LEADS TO BE EARTHED TO CHASSIS.

"M.C." = CONNECTIONS TO METAL CHASSIS.

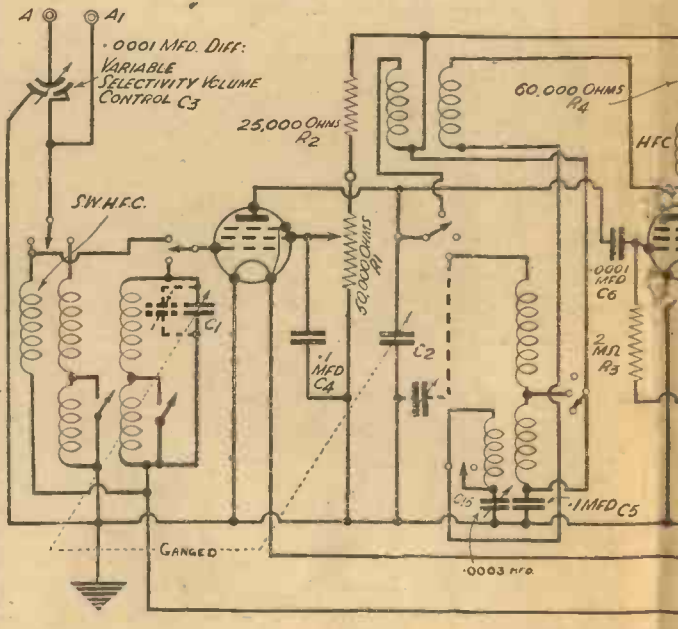

A1 A2 E TRIMMER
C4 ·1 MFD..
5
H.F.C.
60.000 OHMS
R4
H.T.- & G.B+
8
·04 MFD.
C8
M.V.
F.V.
V1
C6 ·0001 MFD.
V2
A
·1 MFD..
C5
G
P
7
6 WAY BATTERY CABLE
H.T. +1
L.T. +
R6 100.000 OHMS
NOT USED
R3 2 MEG..
1 MEG..
G.B 2
C7 ·1 MFD.
R7
V3
C11 2 MFD.
B
C
M.& L.W. COIL
S.W. COIL
2 MFD..
C10
R8
10.000 OHMS
M.C
SWITCH PLATE "Y"
D
4
NOTE:- CHASSIS SUPPLIED WITH COILS & WAVECHANGE SWITCH MOUNTED & INTERCONNECTED.
E
3
FOR EXTERNAL WIRING TO SWITCH PLATES- SEE DIAGRAM ABOVE
H.T. +
A
R5
H.T.+2
20.000 OHMS
V4
C12 8 MFD.
H.T. L.S.
M.& L.W. COIL
2
·03 MFD..
C9
G G
C14
F
·005 MFD.
·005 MFD.
25.000 OHMS
R2
C13
SWITCH PLATE "X"
F.V.
M.V.
1
6
R1
L.T.-
TRIMMER
COMB. VOL. CONT. & ON-OFF SW.. 50.000 OHMS



IN China I believe it is the custom when the scholars misbehave for the schoolmaster to receive the cane on the principle that if he had done his job efficiently it would be impossible for the scholars to misbehave. I am sure that there would be no opposition amongst the scholars of this country if such a system were introduced over here!

I am somewhat in the nature of a schoolmaster in that my readers would not fail to administer the cane to me if I failed to produce the designs for which they ask. Metaphorically speaking, I ask for the cane if my sets do not perform as claimed, in that you are at liberty if it does not do so to send the set to me for adjustment. No charge except carriage is made for this service. I hope I may be permitted not immodestly to say that of the many hundreds of thousands of my sets which have been built less than 500 over a long period of years have been returned to me for minor adjustments. In a few cases the sets have not worked at all, but in every case the defect has been due either to faulty components or faulty construction. None have been due to errors of design. I am the only designer ever to have made the rule that I would stand behind every set built according to my instructions and cheerfully help the reader out of his difficulty free of cost. So, like the Chinese schoolmaster, I expect to receive the cane if my receivers do not live up to my claims. They do; and if a few readers, through one reason or another, do not obtain those results, I do so for them, as many readers will testify. A great deal of experiment is made before one of my designs reaches publication stage. Every small point is investigated, checked, and where necessary amended until in the final result a receiver which satisfactorily fulfils the object in view sees the light of print.

Here, in the "Acme" All-Wave Four, you have a set which has been called for by many hundreds of readers during the last year. It tunes to the ranges which correspondence shows to be most popular, but this time it has four valves instead of three. Many readers, I find, require a more powerful output stage than can be incorporated in a three-valver even with Class B or pentode output. The "Acme," therefore, includes Class B in the output stage. This Class B output deserves to be more popular than it is. I am aware that in the early days of its existence certain troubles arose from its use, but it was the method of use which should have been blamed and not the system. Enough is known of Class B now for it to be incorporated in a way which eliminates the small defects which former experiments brought to light. It enables a



Theoretical circuit of the

.CAMM'S CME

AVE FOUR

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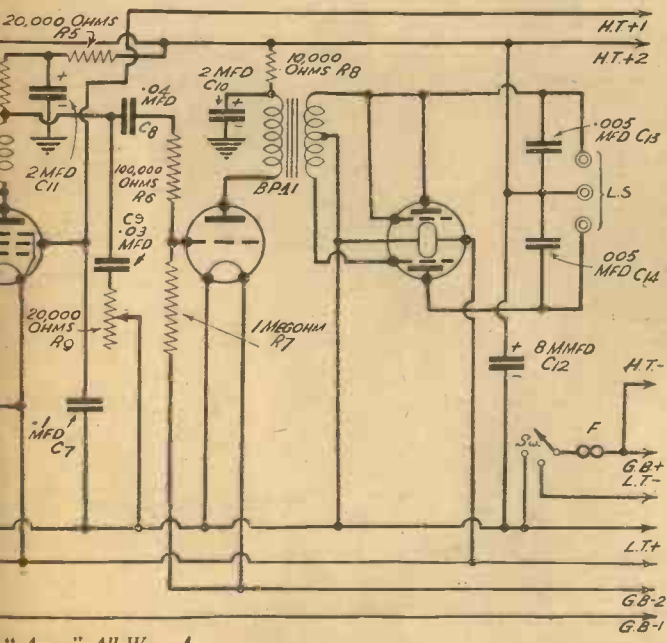
robust output, comparable to that obtainable from a mains set, to be obtained from batteries.

You will notice that the set has a professional appearance, for I have used a metal chassis in order to satisfy those readers who think that metallised wood does not provide a sufficiently well-finished base for a well-designed set. Previously I had avoided using metal, not because I did not believe in it, but because I wished to save readers the trouble of drilling metal. Fortunately, the chassis for the "Acme" is supplied ready drilled.

The Circuit

It is customary now to include in a circuit description many terms which mean, from the efficiency point of view, absolutely nothing. On the other hand there are many terms which may be employed, and indeed often are, simply to confuse the ordinary listener and give the effect of a powerful piece of apparatus. Variable selectivity, for instance, may mean practically anything, although in modern superhet receivers there are definite lines upon which such a device may be incorporated. If I were to describe the circuit of the "Acme" I could tell you that it incorporated variable selectivity, variable H.F. gain, pre-L.F. tone control and so on. These devices are actually incorporated in the set, although as will be seen from the diagram printed on this page they are actually quite standard ideas which have often been employed in home-constructor receivers.

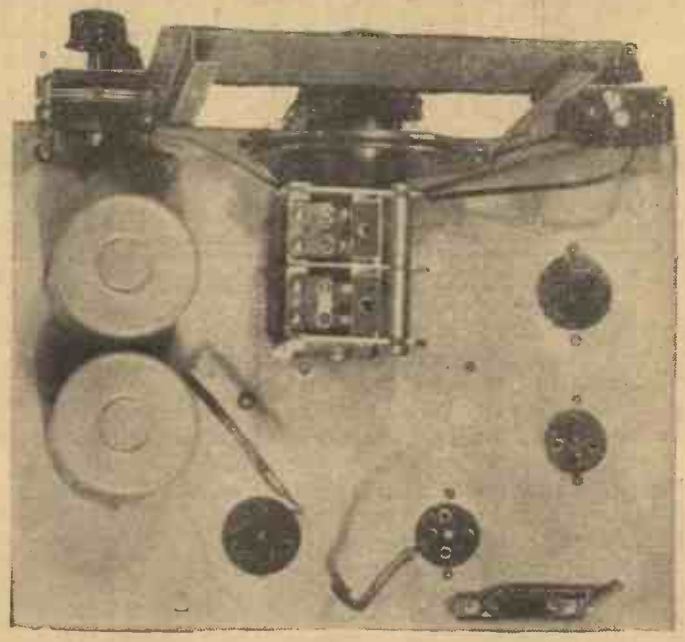
Taking the circuit in order you will find that the aerial may be connected either direct to the input circuit, or through a differential condenser. This enables the selectivity to be adjusted to suit conditions from time to time and will be found of the greatest value in obtaining maximum performance from the set. The first tuned circuit feeds an H.F. pentode which is provided with a fixed negative bias which also enables the selectivity and gain to be adjusted as desired, although the bias is not variable continuously in this particular model. The screen voltage for the H.F. valve is obtained from a potentiometer connected across the H.T. circuit and this enables the gain of the H.F. valve to be controlled as desired.



"Acme" All-Wave 4.

Detector and L.F. Stages

The next stage is a standard leaky-grid detector with reaction, and is fed from a tuned-anode circuit in the standard manner, the switching for this coil being controlled by a ganged switch which controls also the aerial circuit. A pentode is again used for the detector, and a tone control is connected across the detector stage in preference to a control of this type in the output circuit. This is a more logical position for a tone control as it enables the tone to be adjusted to the desired balance before the signal receives amplification, and the advantage of this is especially noticeable in a receiver employing a Class B output stage. Resistance-capacity coupling is employed between detector and 1st L.F. (driver) stage, and the standard Class B transformer is used to feed the output valve. Two fixed condensers will be found across the output circuit as a further tone adjustment and to remove a peculiar form of distortion which is often experienced with a Class B valve.



This plan view shows the clean top of chassis layout.

Building the Receiver

So much for the general design of the receiver, and in its practical interpretation I have again adopted the scheme used in a recent receiver described in these pages, and have arranged for the makers to supply the metal chassis not only ready drilled, but with the coils and all switching ready assembled and wired. Those who have previously built an all-wave receiver will appreciate the great advantage and labour-saving benefits of this arrangement. Further-

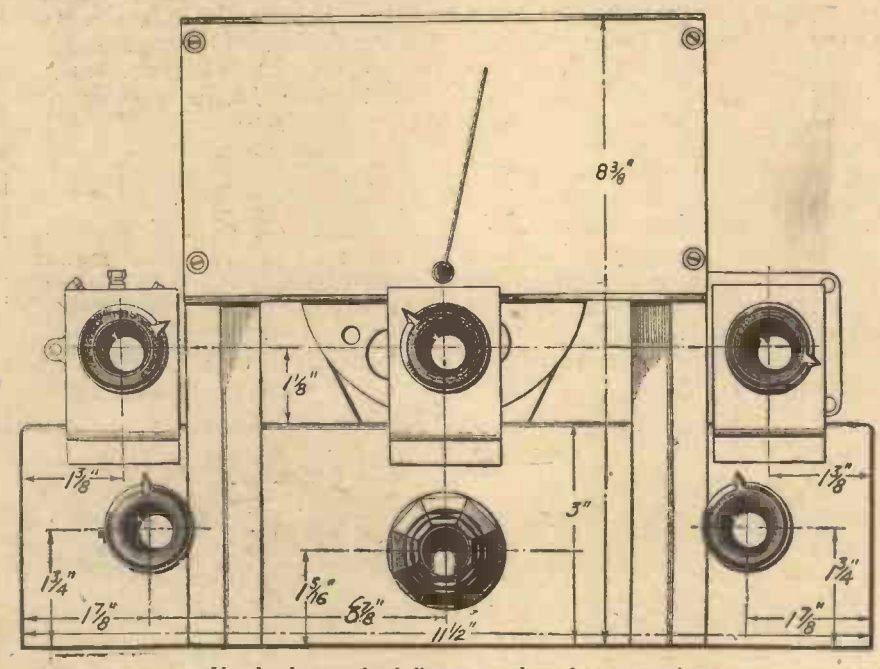
(Continued overleaf)

THE "ACME" ALL-WAVE 4

(Continued from previous page)

more, the makers will supply with the chassis a large type of dial engraved with all the most important stations on the long-, medium-, and short-waves, and this dial is 7in. by 4in. in size, thus providing very clear and easily read markings.

The accompanying illustrations will show that there are six controls, three of which are mounted on small brackets attached to the chassis, and these are, reading from left to right: top row—tone control, reaction, aerial selectivity; bottom row—H.F. gain and on-off switch combined, dual-ratio tuning control and wave-change switch. The tuning is accomplished by the usual double-knob, the larger section of which provides a direct drive and the smaller section a reduction gear. It will be noted incidentally that in this model the condenser spindle is controlled from the lower control spindle through a cord drive operating on a large drum attached to the condenser.



Use this diagram for drilling your cabinet front or panel.

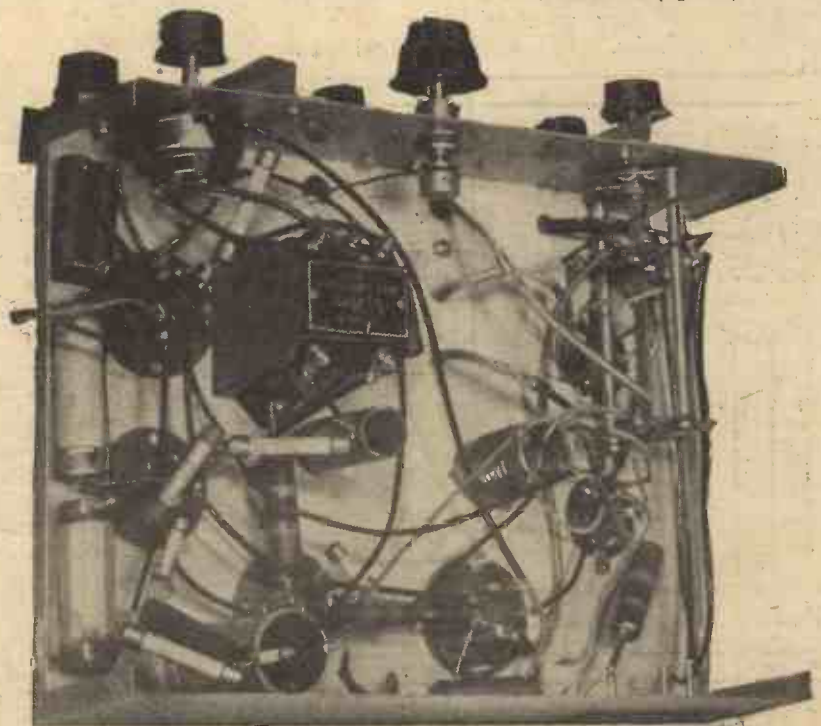
Assembling the Components

As the switch and coils are already mounted, there are only the valve-holders, transformer, terminal strip and gang condensers to be placed in position, with the four panel controls. It should be noted in the latter connection that the aerial condenser and the tone-control must be insulated from the brackets upon which they are mounted, and insulating bushes will be supplied with the brackets. The H.F. gain control has a "dead" spindle and accordingly it is not necessary to insulate this from the chassis. The transformer is bolted in position, and the valveholders and gang condenser are also held with small bolts. The remaining components are suspended in the wiring, using for connection the wire ends fitted to them. The small Microfuse holder at the rear of the chassis is also held by a single bolt, and it will thus be seen that the amount of work which has to be undertaken is extremely small. In the Blueprint which is presented with this issue it will be noted that on the underside of the chassis certain leads are indicated by thick double lines (similar to the connection to the cap of VI seen on the upper surface of the chassis), and these leads are enclosed in the standard metal screening material. This will be made clear from the photographic illustrations accompanying this article. The screening is ineffective unless it is connected to earth, and the best method of carrying out the earthing is to wrap a piece of bare connecting wire two or three times round the screening—after first scraping the screening wire slightly—and then to solder it neatly. An ordinary twisted connection may function for a short while, but if it is not soldered the wires will become dirty and corroded and poor connection will result, giving rise to noises or instability. A good plan when fitting these screening leads is to slip a short length of ordinary cycle valve rubber over the ends, pushing this back so that the loose ends of the screening material are prevented from coming into contact with the wire inside or any other bare metal which might result in a short-circuit. The earthing lead connected to the screening must then, of course, be joined to the nearest earth point, locking it beneath a holding-down bolt—one of those used for the gang condenser being the most convenient.

Wiring

All wiring should be carried out with tinned copper wire, preferably passed through pieces of insulated

(Continued on page 612)



An underside view to enable you to follow the method of mounting the various components.

BARGAINS BY PETO-SCOTT

SEND NOW FOR BARGAIN LIST

Send immediately for our big bargain list covering All-wave, Broadcast, Battery and Mains Receiver Chassis and complete Receivers, also Short-wave Adaptors and Receivers. Never before have you been able to buy such really amazing bargains. Complete list Post Free on request.

ACME ALL-WAVE 4 PILOT AUTHOR KITS Exact to Specification

KIT "A" Cash or C.O.D. Carriage Paid **£5:10:0** or 10/- DOWN

Comprising complete kit of first specified parts including Peto-Scott assembled chassis unit and Varley Transformer. Including all wire, screws, flex, etc., but less valves, batteries, cabinet and speaker.

Balance in 11 monthly payments of 10/-.

KITBITS Orders value over 10/- sent post charges paid. *Complete Detailed Price List on request.*

	£ s. d.
1 Peto-Scott Chassis as detailed below	1 12 6
1 Varley Input Transformer, type No. D.P.41	11 6
Set of 4 specified valves	1 17 9
1 W.B. Junior 38J Speaker	1 12 6
1 Peto-Scott Walnut Cabinet, Upright type 80	19 6

Carriage 2/6 extra.

PETO-SCOTT Ready drilled enamelled metal chassis, with 2 Broadcast and Short-Wave coils, H.F. and Short-Wave chokes, two trimmers, rotary type low capacity switch, slow motion Drive, and full vision station name dial and three brackets, all mounted and ready wired. Complete with condenser distance pieces, insulating washers, knobs and escutcheon. Cash or C.O.D. 32/6 or 2/6 down and 11 monthly payments of 3/-. *Carriage Paid* **32/6**

KIT "B" Cash or C.O.D. **£7:7:6**

or Deposit 12/6 and 12 monthly payments of 12/6.

Exactly as for Kit "A," but including set of specified valves, less batteries, speaker and cabinet.

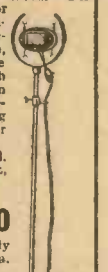
KIT "C" Exactly as Kit "A" but including specified valves and Peto-Scott specified cabinet, less speaker. Cash or C.O.D. Carriage paid £8:7:0, or 14/3 Deposit and 12 monthly payments of 14/4.

KIT "CS" Exactly as for Kit "C" but including fitted W.B. 38J Speaker as recommended. Cash or C.O.D. Carriage paid £9:19:6, or 16/6 Deposit and 12 monthly payments of 16/8.

HOME BROADCASTER

Transverse Current Carbon Microphone

For Dance Bands, Crooners, Home Broadcasting and Public Address Work. For A.C. or Battery amplifier, or attached to your radio receiver. High-fidelity reproduction. On-off switch, 30-1 microphone Transformer with bias battery in separate bakelite moulding for greater efficiency. Table Model. Overall height, 10¼ins.



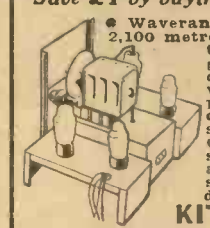
List Value £2:2:0 **OUR PRICE £1:1:0**

Cash or C.O.D. Carr. Paid or 2/6 down and 11 monthly payments of 2/-. 25ft. of heavy braided flex extra.

FLOOR STAND MODEL. With Telescopic Chromium-plated Stand, height 3ft. 6ins. closed, 6ft. extended. £2/2/0, or 2/6 down and 11 monthly payments of 4/-.

ALL-WAVE 4-VALVE BATTERY BANDPASS KIT

Save £1 by buying the Complete Kit.



● Waveranges 18-52, 200-550, 900-2,100 metres. ● The ideal Kit for the Constructor desiring greater selectivity than obtainable with a 3-valve circuit. ● Bandpass coils and 3-ganged condenser ensure better station separation. ● Additional audio stage increases volume and quality on distant stations. Station-named dial.

KIT "A" comprising complete Kit of parts, with ready-drilled chassis, easy-to-follow instructions and drawing, less valves.

List Value £5:0:0. **Our Price £3:19:6**

or 7/6 down and 11 monthly payments of 7/4.

KIT "B" As Kit "A," but including Valves. Cash or C.O.D. £5/6/6, or 9/9 down and 11 monthly payments of 9/9.

PILOT 8-in-1 Kit

Every Circuit a Winner —an ideal Experimenter's Outfit.

A unique idea for those interested in experimental work on the short waves, and in this latest Peto-Scott pastime we provide for the novice a simple, pleasant, and practical introduction to the tremendous thrill of world-wide short-wave listening and experimenting. Only Peto-Scott's technical skill and experience could have made this possible, for the Pilot 8-in-1 Kit contains every possible component, including coils for the alternative construction of 8 different super short-wave receivers, one after the other, offering unlimited experimental opportunities at the very minimum cost. The components supplied in this Kit enjoy the confidence of all leading technical journal designers, who specify them to ensure correct and accurate construction of their circuits.

Cash or C.O.D., £4/8/0, or 7/6 deposit and 11 monthly payments of 8/-. Set of 4 valves, £1/7/6, or add 2/9 to deposit and 2/6 to each monthly payment.

7/6 DOWN

1938 W.B. SPEAKERS

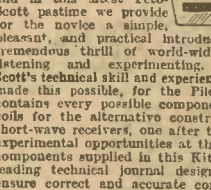
Model 38J

MODEL 38S. Amazing reproduction provided by new magnet and exponential moulded cone. Microlode matching device. Cash or C.O.D. Carr. Paid, £2/2/0. Or 2/6 down and 11 monthly payments of 4/-.

MODEL 38J. Matches any receiver as principal or extra speaker. Cash or C.O.D. Carriage Paid. £1/12/6. Or 2/6 down and 11 monthly Payments of 3/-.

2/6 DOWN

1-VALVE ALL-WAVE BATTERY RECEIVER



● Waveranges 18-52, 200-550, 900-2,000 metres. ● A unique All-wave single-valver combining extraordinary efficiency with low cost. ● Ideal for the experienced DX Fan and Novice alike. ● Stove enamelled steel chassis. ● Slow motion tuning. ● Air-spaced Tuning Condenser.

A unique All-Wave single-valver combining simplicity of assembly with extraordinary efficiency and low cost. Ready assembled tuning unit incorporates all windings and switching and needs only six simple connections for incorporation in the circuit.

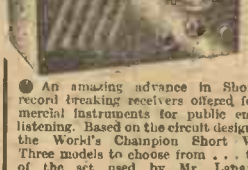
KIT "A" comprises all parts, including ready drilled steel panel and chassis, drawings and instructions, less valve and cabinet. *List value* £2/0/4. OUR PRICE £1/9/6, or 2/6 deposit and 11 monthly payments of 2/9.

2/6 DOWN

B.T.S. TROPHY

Record Breaking Short-Wave Receivers.

12 - 52 metres.



● An amazing advance in Short Wave technique . . . record breaking receivers offered for the first time as commercial instruments for public enjoyment of Short Wave listening. Based on the circuit design used by Mr. F. Lanaway, the World's Champion Short Wave Station "logger." Three models to choose from . . . the Trophy 2, a duplicate of the set used by Mr. Lanaway, who logged 247 stations on 12-52 metres. The Trophy 3 in two versions, A.C. Mains Model and Battery Model . . . designed for the reception of the World's Broadcasts on the Moving Coil Speaker incorporated. Supplied complete with all valves and two B.T.S. One-shot Inductors covering 12-52 metres, and housed in beautiful black crystalline finished steel cabinet.

7/6 DOWN

TROPHY 2 Supplied complete with 2 specially matched valves, lightweight headphones, and 2 One-shot Inductors. **£4:15:0**

or 7/6 deposit and 12 monthly payments of 8/3.

TROPHY 3 Battery Model Supplied complete with 3 matched valves, 2 B.T.S. One-shot Inductors and speaker, housed in cabinet as illustrated above, less Batteries. **£5:15:0**

or 9/6 deposit and 12 monthly payments of 9/11.

TROPHY 3 A.C. Model Supplied complete with valves and 2 B.T.S. One-shot Inductors housed in cabinet as illustrated, for A.C. Mains, 200/250 v., 40/100 cycles. **£6:6:0**

or 10/- deposit and 12 monthly payments of 10/9.

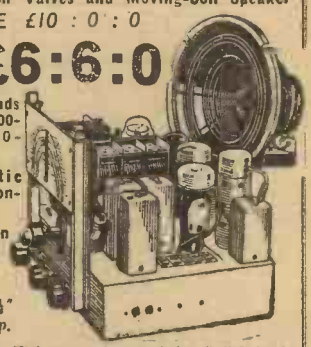
AMAZING CHASSIS BARGAINS

5-valve ALL-WAVE A.C. SUPERHET RADIO/GRAM CHASSIS

with 5 British Valves and Moving-Coil Speaker

LIST VALUE £10:0:0

OUR PRICE £6:6:0



● 3 Wavebands —18-50, 200-550, 900-2,000. ● Automatic volume control. ● Bandpass on all stages.

Dimensions: 10" *high;* 11½" *wide;* 8½" *deep.*

5 British Valves. High slope output pentode. Switch for 3 bands and gramo. Dial. Combined on-off switch and volume control. Separate tone control. A.C. Mains, 200-260 volts, 50-100 cycles. Output 3 watts. Complete with Valves and High-Fidelity Field-Energised Moving-coil Speaker illustrated. Cash or C.O.D. £6/6/0, or 7/6 down and 12 monthly payments of 8/9.

7/6 DOWN

Peto-Scott ALL-WAVE S.G.3 BATTERY CHASSIS

WITH ALL VALVES **BARGAIN 79/6**

● WAVEBANDS: 14-31, 28-62, 200-550, 900-2,100 metres. ● Slow-motion drive 8-1 and 100-1. ● Low-capacity switch. ● Air-plane dial (stations and wave-lengths) ● 12 months' guarantee.

Overall size: 9" high; 11¼" wide; 9" deep.

BRIEF SPECIFICATION: Provides reception from all parts of the world. Variable selectivity. Stove enamelled, steel chassis. Screened coils. Low H.T. consumption. Each chassis supplied complete with Screened Grid. Detector and Pentode output valves. Fully tested on all wavebands before despatch. Cash or C.O.D. Carr. Pd. £3/19/6, or 5/- down and 11 monthly payments of 7/6.

5/- DOWN

STRAIGHT 3 CHASSIS

LIST PRICE 45/- **29/6**

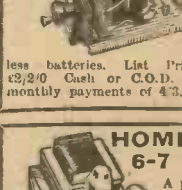
Detector reaction, followed by R.C.C. and triode super-power output stage. Dial calibrated degrees, 200-2,000 metres. Complete with 3 British valves, all-knobs and escutcheon. Cash price 29/6 or 2/6 down and 11 monthly payments of 2/9.

Complete Receiver

Above chassis in horizontal consolette cabinet, complete with valves and moving-coil speaker, less batteries. List Price £4/19/6. Bargain £2/2/0 Cash or C.O.D. or 2/6 down and 11 monthly payments of 4/3.

2/6 DOWN

HOME BROADCASTER'S 6-7 watt AMPLIFIER



A powerful, compact unit, suitable for any medium-sized hall for public speeches or small dances. A super-efficient general purpose amplifier to earn you extra money. 4 valves; Triode, Resistance Transformer-coupled to 2 triple Grid Power Amplifier Valves, in Push-Pull. Full Wave Rectifier. Tapped and Screened Mains Transformer. Electrolytic condensers. Volume Control. Mains consumption approx. 60 watts.

Tapped for A.C. Mains 200-250 volts, 40/100 cycles. Output 6-7 watts undistorted. Complete with Valves. Ready to connect to microphone or pick-up. Cash or C.O.D. **£3.10.0**

LIST VALUE £6:10:0 Or 5/- down and 11 monthly payments of 6/9.

5/- DOWN

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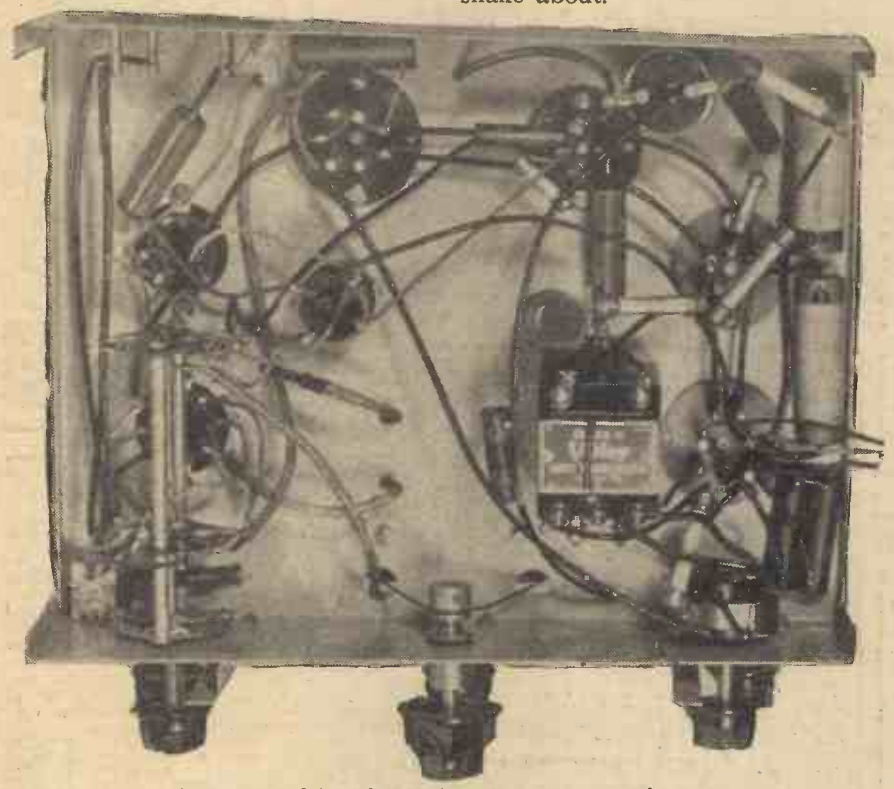
Cross P.O.'s and Register Currency.

THE "ACME" ALL-WAVE 4

(*Continued from page 610*)

sleeving cut off to length. Although terminals are available in the majority of cases, it is preferable to solder the connections as the receiver is used for short-wave work, as this will ensure a clear background. For the benefit of those who have not yet tried a receiver on the short waves it may be pointed out that imperfect connection generally results in a background of noises very similar to atmospherics, the severity of these noises depending upon the efficiency of the contact.



Another view of the underside of the chassis to assist in the wiring.

Rigidity Required

On the transformer, tags may be locked beneath the terminals and the necessary connections made to these tags. Cut off the wire ends of the resistors and fixed condensers, where necessary, to enable the components to fit neatly close up to the valveholders (V_3 and V_4) and to the transformer and H.F. gain control. The fixed condenser C_5 may also have one wire end clipped off to a length of about $\frac{1}{2}$in., so that it fits tightly between the earth terminal and the first coil. Remember that all leads and components in the receiver must be so fitted that they cannot move about, as this will result in difficulty in holding short-wave stations or in erratic tuning if the movement is excessive. This is especially important where the receiver is being fitted into a cabinet with a self-contained loudspeaker, as the sound waves from the speaker may cause sufficient vibration to cause loose wires and components to shake about.

SPECIFICATION FOR THE "ACME" 4-VALVE RECEIVER

One metal chassis fitted with coils, trimmers, S.W., H.F.C. and S.M. drive (Peto-Scott).
One 2-gang condenser, .0005 mfd. bar type (Polar).
One reaction condenser, "Dilecon" .0003 mfd. (J.B.).
One differential condenser, .0001 mfd. "Dilecon" (J.B.).
One all-wave H.F.C., H.F.15 (Bulgin).
One potentiometer with switch (3-pt.) 50,000 ohms Lab. type (Erie).
One potentiometer, 25,000 ohms, V.C.34 (Bulgin).
One Microfuse and holder, 200 mA (Microfuse).
One socket strip, A1, A2, E. (Belling and Lee).
One Class B input transformer, D.P.41 (Varley).

RESISTANCES

One 2 megohm, $\frac{1}{2}$-watt
One 25,000 ohms, 1-watt
One 60,000 ohms, 1-watt
One 1 megohm $\frac{1}{2}$-watt
One 20,000 ohms, 1-watt
One 100,000 ohms, $\frac{1}{2}$-watt
One 10,000 ohms, 1-watt
(Erie).

FIXED CONDENSERS

One 8 mfd. F.W., 150-volt
Two 2 mfd. F.W., 200-volt
Two .005 mfd. type 300
Two .0001 mfd. type 300
Three .1 mfd. type 250
One .04 mfd. type 300
One .03 mfd. type 300
(T.C.C.).

VALVEHOLDERS

Two 7-pin chassis standard
Two 4-pin chassis standard
(Clix).

VALVES

One Cossor 210 V.P.T. 7-pin.
One Cossor 210 S.P.T. 4-pin.
One Cossor 210 L.F. or 215 P.
One Cossor 220 B.
PLUGS: H.T.—, H.T.+1, H.T.+2, G.B.+, G.B.—1, G.B.—2 (Belling and Lee).
SPADES: L.T.—, L.T.+.
One speaker, Type 38-J (W.B.).
One H.T. battery, 120-volt
One bias battery, 9-volt
One 2-volt accumulator
(Exide).

NEXT WEEK:
Tuning and Operating Instructions.

An artist's impression of the completed receiver.

MARCONIPHONE BIG-SCREEN TELEVISION

LAST week the Marconiphone Company demonstrated the first all-British projection model large-screen television receiver available to the public. This demonstration coincided with the announcement by the Postmaster-General of longer hours for the television programmes and the retention of the present system of transmission for a further period of three years. The new receiver has a screen measuring 22in. by 18in. and the picture is projected on to the back of the screen from a mirror inclined at 45 deg. The picture is first produced by standard television apparatus on a miniature cathode-ray tube. the size of the picture being approximately 2in. by 2½in. A special f/1.5 fully-corrected projection lens is placed over the tube and projects the picture on to the mirror already mentioned. In clarity and definition the picture given is comparable in every way with the smaller television pictures and there are actually fewer controls to be operated in this new model receiver.

In addition to the television equipment the model incorporates a special 8-valve all-wave receiver tuning from 11 to 2,000 metres. The screen is automatically raised into position when the lid of the cabinet is raised, and a single-handed movement also closes the lid. The mains consumption of the model is 550 watts when used for television reception and 127 watts on radio. This receiver is intended primarily for clubs, hotels, etc., and for houses of the larger type, and the price is 200 guineas.

SUNDAY TELEVISION

THE addition of an hour's television programme on Sundays from 9.5 to 10.5 p.m., beginning on April 3rd next, was announced by Mr. Gerald Cock, B.B.C. Director of Television, in a talk broadcast in the National programme on Tuesday, February 1st. A second Sunday hour, he added, would follow as soon as possible. Weekday evening programmes would be extended an extra half-hour whenever possible, with a view to permanency.

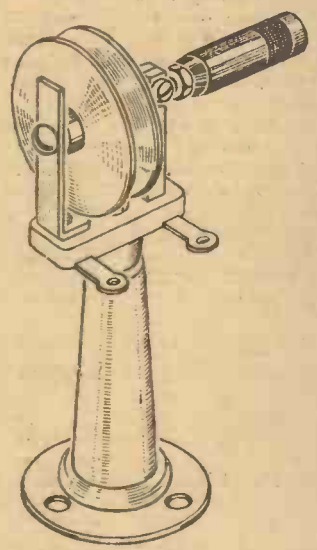
Reviewing the past year in television, and the position to-day, Mr. Cock said: "Only those who have been watching television in their homes for some time, can form an idea of what progress has been made, and not those who have dropped in casually to a viewing room, to take pot-luck with the programmes and the quality of reproduction. The home is the place for television, because in its present stage, I am sure, the programmes could not be designed for any other purpose; and they could certainly never be designed for large theatre screens and home screens simultaneously. That is why I am stressing the importance of home viewing in this talk. I think you will find, like Mr. Bernard Shaw, when he visited us, that the comparative smallness of the screen does not really matter if it is in your own sitting room.

"One should resist the temptation to compare television programmes too closely with what you see on the stage or films, because the impact of entertainment upon the individual at his own fireside is one thing, upon a mass audience, quite another. The excitement and charm of home television lies in its unique qualities of intimacy and immediacy."

THE LATEST COMPONENTS

Eddystone Neutraliser

THE accompanying illustration shows a new neutralising condenser produced by Messrs. Stratton, makers of the well-known Eddystone components. Although primarily intended for transmitting apparatus, this condenser may be found of the utmost use to the keen experimenter where very small changes in a small capacity are required. The range covered by this condenser is approximately from 1 to 8 mmfd. The supporting pillar is of frequentite and soldering lugs are provided for connection purposes. The supporting strip through which adjustment is made is split and provided with a locking screw so that a smooth adjustment may be made and the controlling rod locked in the desired position. The component is very sturdily made and the plate moves at a true right-angle, without any "wobble" which would render an accurate adjustment difficult. The total weight is 4 ozs, and the component is very good value at 6s. 6d. The catalogue number is 1088.



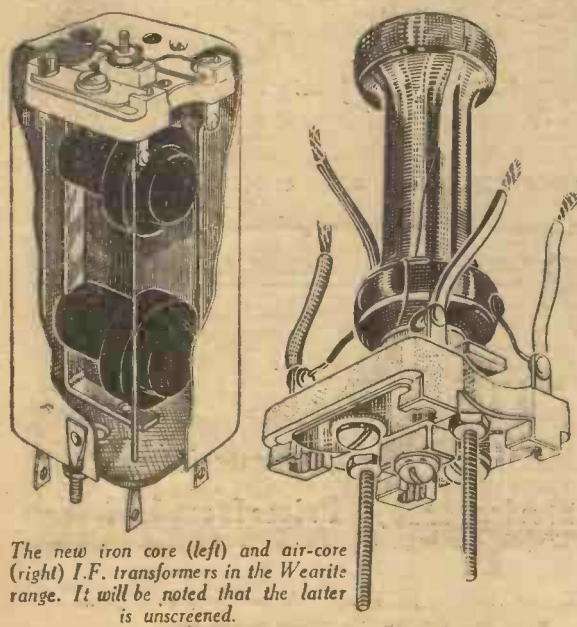
The new Eddystone neutralising condenser.

New Wearite I.F. Components

TWO new intermediate-frequency transformers have been produced by Messrs. Wright and Weaire and are illustrated herewith. These are designed for an intermediate frequency of 465 kc/s. and one is of the iron-core type, whilst the other is air-cored. The iron-core model is provided with a screening can, but the air-core model is not so provided. The prices are respectively 6s. 6d. and 4s. Where receivers with an I.F. of 110 kc/s are being used, the makers can supply the iron-core pattern adjusted for that frequency at the same price, namely 6s. 6d. The trimmers are of the standard mica-dielectric type and colour-coded connecting leads are fitted. Both components are mounted by means of two bolts, the screened model being preferably mounted above chassis, but the unscreened model should be mounted beneath the chassis with two clearance holes drilled in the chassis to enable the trimmers to be adjusted.

T.C.C. Electrolytic Condenser

A NEW dual wet electrolytic condenser is now available for the home-constructor in the T.C.C. range. This is similar to existing models, but the connections for the two sections are brought out to separate lugs on the bottom which renders it necessary to adopt different mounting methods for this type of component. A special clamping bracket is accordingly provided and may be bolted to the chassis (of either wood or metal) and two clearance holes for the lugs should also be made. The sample submitted to us was of the 8+16 mfd. type, the metal containing case being the common negative connection. The only criticism we can offer is that the two lugs are provided with identification washers which in this model are red and black (red for the 16-mfd section and black for the 8-mfd section) and there is thus a possibility that, should the marking on the case become defaced due to continued handling, etc., it might be thought on some future occasion that the tags are respectively positive and negative. We venture to make the suggestion that some other distinguishing colours would have been more suitable, although no doubt the makers have their own reason for using red and black. The condenser is also obtainable with two 8-mfd. units, and these condensers offer all the advantages of the electrolytic component with the advantage that, being of the wet type, they are very free from breakdown due to surges. The permissible ripple current is 120 mA in either section.



The new iron core (left) and air-core (right) I.F. transformers in the Wearite range. It will be noted that the latter is unscreened.

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.

D. H. (Hull).—Hum will be experienced whenever the grid circuit is broken—such as when taking out the coil. Are you using the set with batteries or with an eliminator?

G. G. M. (Bristol 3).—We regret that we cannot supply a blueprint of a battery amplifier to give the output you require.

D. J. B. (Rochester).—We suggest you build the Prefect S.W. Three. A blueprint may be obtained for 1s. and this gives an outline of every component (practical, not theoretical), and thus your difficulty will be removed.

C. N. A. (Omagh).—A coil must be wound round the magnet before the current is passed through it. You would probably find it preferable to send the magnet to a firm which specialises in speaker repairs. We do not think the short-circuit you refer to would have affected the magnet.

J. A. H. (W. 14).—We suggest you wait for a short time, when we hope to be able to issue a blueprint of the type you require. At present there is no print of a suitable nature in our list.

W. W. W. (Edmonton, N.9).—You could add the L.F. amplifier described in our issue dated February 6th, 1937.

F. E. B. (S.E.1).—You would no doubt find it difficult to make the conversion you refer to. Would it not be better to build a modern all-wave set?

M. P. (Queensferry) and G. R. (S.E.11).—Write direct to Beethoven Radio, Ltd., Chase Road, North Acton, N.W.10.

R. C. C. (Brighton 1).—Use three or four plates, with double the spacing previously used—that is, with two spacing washers instead of one between each plate.

H. H. (Preston, Lancs).—The set was designed by the late "Popular Wireless" and we have no details of the circuit. The makers may be able to assist you. Their address is: Mawneys Road, Romford, Essex.

J. B. H. (W.1).—The usual reason for screening the lead in question is that the lead can radiate; consequently other unscreened components may pick up the radiations and thus instability will result. If the lead is screened there is no need to screen anything else, as the radiation is prevented. In some cases, however, the lead is screened to prevent it from picking up signals and acting as a small aerial.

J. E. S. (N.W.10).—You need a special 2-1 transformer to connect between your set and the mains. The transformer must be capable of carrying the load of your set and a suitable component may be obtained from F. E. Heayberd, Finsbury Pavement, E.C.

J. M. P. (Tonbridge).—You will find an article on the subject on page 605 of this issue.

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PREMIER SUPPLY STORES

THE latest catalogue from this company (price 6d. includes in its 90 pages some of the most interesting details we have yet seen embodied in a book of this type. In it will be found practically every radio component from insulated staples to comprehensive superhet coil kits. It would be impossible to mention in a brief review all of the items listed, but they include not only standard proprietary lines, but hundreds of components which are manufactured by the Premier Company, amongst which special mention should be made of the short-wave components. Small half-tone illustrations are included on each page of every item, and the amateur transmitter has not been overlooked. Crystals, aerial equipment, and complete communication receivers will be found listed, as well as ready-made cabinets for housing either the simple receiver or the completed radiogram. The catalogue contains also 14 pages of valve data in which all of the principal American valve types are given in full, with base-connector diagrams, and in the technical data section there are two pages of transmitting data, instructions for making a multi-range test set, a 5-metre transmitter and other valuable circuit details. There is also a comprehensive index to the items listed.

QUARTZ CRYSTAL COMPANY

THE latest price list from this company is in the form of a 16-page booklet, which includes, in addition to the various types of mounted and unmounted crystal, many sundry items such as coils, chokes, condensers and other apparatus for the amateur transmitter. A number of American components will be found in the book, which may be obtained on application to the company at 63 and 71, Kingston Road, New Malden, Surrey.

VALVE CHARACTERISTICS—5

Further Details of the Electrode Assemblies of Modern Valves are Dealt With in this Fifth Article of the Series

THE screen-grid valve, although a tetrode, has otherwise nothing in common with its low-frequency counterpart. The filament, or cathode, is closely surrounded by the grid in common with general practice for valves of high slope; this assembly is in turn completely surrounded by a screen which has suitable openings, where necessary, to permit the electrons to pass to the anode. Take as an example the Cossor 220VS electrode assembly shown at Fig. 1. It will be seen that the screen assembly consists of two grids placed between the control grid and each anode, and joined together by solid sides. The bottom of this electrode terminates in a deep skirt effectively shielding the control-grid lead, base pin, etc., while the top is enclosed by a close mesh which prevents feed-back from the anode lead but allows heat to escape. The type chosen as an illustration is a particularly good example, as the thoroughness of the shielding is remarkable, although the design of the actual grid portion is perhaps more interesting. The most obvious type of grid would be like a ladder, or in other words, a series of alternate bars and spaces in a single plane; such a condition is met with in the circular type of screened valve, where the actual screen is in fact a straightforward grid. In the example shown in Fig. 1 each open-work section is a flat grid, so that there are in effect two grids, one immediately in front of the other, and by virtue of the spiral winding, one set of wires fall precisely in between the other set.

Staggered Grid

A moment's thought will clearly show that a grid staggered in this way will present the same appearance to the eye as would an ordinary grid, providing it is looked at fair and square, and for this reason the screening properties are unchanged (a capacity field being straight), but as the actual distance is increased between one wire and the next when staggered in this manner, plate current and slope are lower. This effect permits more wires for a given impedance, with consequent reduction of inter-electrode capacity.

The valve under discussion has an inter-electrode capacity of .001 micro microfarads which is, of course, one millionth of the capacity of a .001 mfd. condenser.

The anode is comparatively close to the other electrodes, which results in low screen current, but gives the badly dipping characteristic curve which is associated with the screened tetrode. There is considerable variation in the superficial appearance of this type of valve, but fundamentally they all consist of three sections, (a) the filament, or cathode, and control-grid assembly, (b) the anode and (c) the screening assembly which reduces the capacity between (a) and (b) to a negligible figure.

H.F. Pentode

The H.F. pentode is theoretically similar except that the suppressor grid is interposed between anode and screening grid. The effect of this grid was fully described in the last article, and by straightening out the characteristic curve it permits the valve to handle relatively large anode swings without danger of cross modulation. For the benefit of readers to whom this term is not familiar, it may be mentioned that cross modulation is a term used to describe a phenomenon in a screen-grid valve when, due to unwanted rectification,

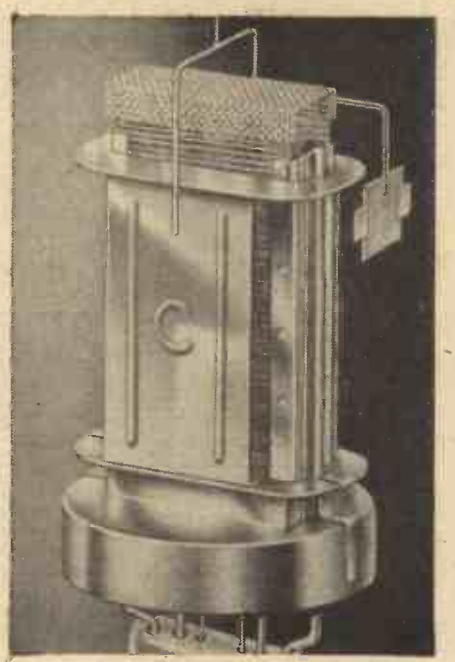

Fig. 1.—The electrode assembly of a typical battery screen grid valve, the Cossor 220VS.

the programme of one station becomes modulated on the carrier of the other station so that they cannot be separated by the following tuned circuits. In practice, the electrode assembly of the H.F. pentode is usually circular, although the Cossor battery pentodes are similar to their tetrode shown in Fig. 1, whereas their mains types are circular. The circular structure has the definite advantage, when applied to mains types, that the mean clearance between cathode and grid is greater, with consequently less danger of grid emission and better opportunities for heat radiation. True, the inter-electrode capacity may not be as low as it might be, but with the modern canned coil, and the tendency for reduced amplification in R.F. amplifiers, inter-electrode capacities could be much greater than they are, without proving a handicap.

It is interesting to note that the suppressor grid of an H.F. pentode is very much more open than in L.F. types. As an example, the writer has before him an assembly of a high slope H.F. pentode which has a suppressor grid 1¼ins. long, which comprises two uprights, and only five rungs spaced more than ⅛in. apart; open as this grid is, its effect on the valve's characteristics is far reaching. H.F. pentodes which handle relatively high anode currents have carbonised anodes, for the same purpose as the L.F. pentode which was described in the last article.

Frequency Changers

The next main group to be discussed is the frequency changer; two types will be described, the pentagrid and the triode hexode, as they are representative of those types in use to-day. Fig. 2 shows the parts of a Cossor 41MPG; the heater (1), is M-shaped, and fits into the cathode (2) which in turn fits into the oscillator grid (3). It will be seen that the clearance between the last two named electrodes is very small, in order that the oscillator section will have a high slope and maintain oscillation on low wavelengths. The electrode (4) is actually the oscillator anode, and as can be seen it is merely a suitably shaped piece of wire which allows the free passage of electrons to the main anode. This electrode is sometimes referred to as the "phantom grid"; this is a most misleading term, as the function of the electrode is that of a subsidiary anode.

The next electrode is the inner screen (5) which is connected internally to the outer screen (7), and between these two screens the modulator, or signal grid (6), is placed. It will be realised that by this

(Continued overleaf)

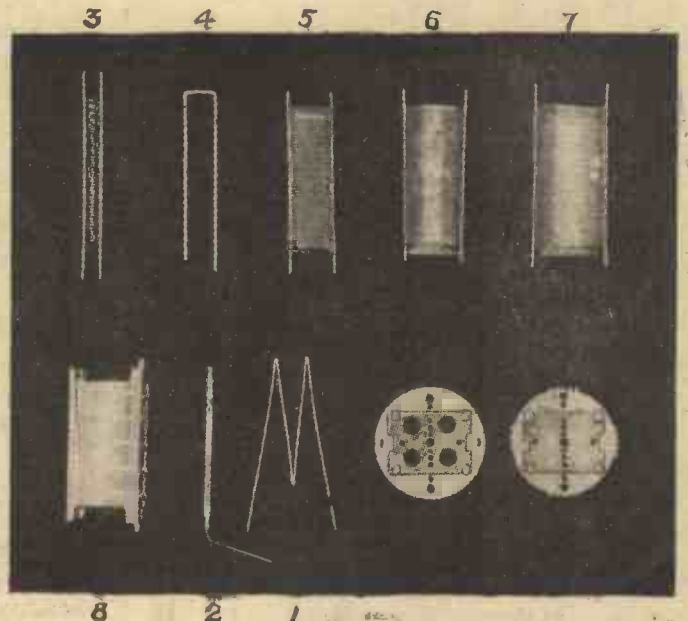

Fig. 2.—The electrodes of a pentagrid. The two discs are mica supports which hold the assembly rigidly in position.

VALVE CHARACTERISTICS

(*Continued from previous page*)

means the modulator grid is effectively screened from all other electrodes to prevent re-radiation of the oscillator frequency by the aerial; the whole assembly is now surrounded by the modulator anode (8). In order to preserve the isolation of the modulator grid it is connected to the top cap, all other connections being taken to the base in the usual manner.

The Pentagrid

The pentagrid has a high value of conversion conductance, is stable in working, and inherently free from oscillator harmonics; but it has one drawback, inasmuch as it is not satisfactory below about 20 metres unless it is excited by a separate oscillator. When working at lower wavelengths, it is therefore convenient to use a valve such as the triode hexode or triode pentode, the general structure of the former being shown at Fig. 3; the anode is cut away to show the grids. As already intimated this valve should be chosen for use at low wavelengths, the reason being twofold: (1) the oscillator and modulator sections being separate, both electronically and electrostatically, degenerative effects are negligible; and (2) the oscillator being a properly constituted triode with a high slope, oscillation is satisfactorily maintained at the high beat frequencies necessary when using any of the normal intermediate frequencies.

The valve shown in Fig. 3 is the Cossor 41STH (screened triode-hexode) and is sufficiently interesting to warrant its use as an example from an architectural point of view. Starting from the inside, there is the usual heater surrounded by the cathode, which runs the whole length of both the hexode and triode section; the latter is completed by the usual grid and anode, and does not call for special mention, except to draw attention to the cooling fin which is attached to the ends of the grid supports; it may be clearly seen in Fig. 3.

Passing to the hexode section, the cathode is immediately surrounded by the control grid, which has copper supports to conduct away the heat, and as a further refinement a small semi-tubular fin is attached to the extremities of these supports to radiate the heat which they collect. As a further refinement this fin has a form of carbon coating which, being black and roughsurfaced, greatly improves its efficiency as a radiator of heat.

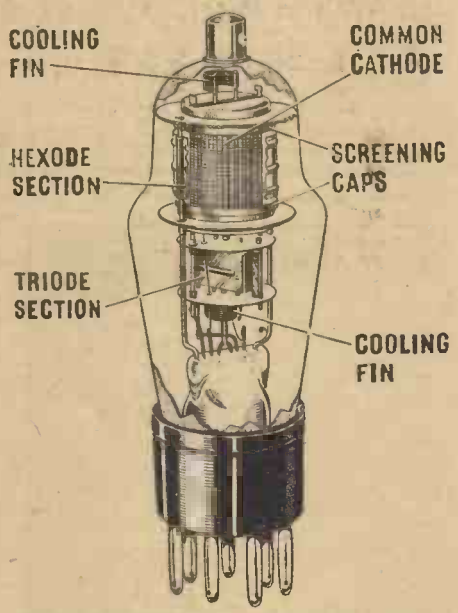

Fig. 3.—This illustration clearly shows the important features of the Cossor 41STH, an indirectly heated triode hexode.

Grid Connections

Immediately surrounding the control grid is the inner screening grid, which is connected to the screening caps at the top and bottom (see Fig. 3). The outer screening grid is similarly connected, and the control grid is placed between these two screening grids in exactly the same manner as in the pentagrid, and for the same purpose; the triode hexode differs, however, as it is connected internally to the triode grid. The structure is completed by the ribbed anode, which surrounds the hexode portion, and in common with the pentagrid the control (modulating) grid is connected to the top cap. To ensure rigidity and uniformity of characteristics, the whole assembly is locked by means of six mica discs, four of which can be clearly seen in Fig. 3, where it can also be seen that the top disc fits snugly into the top of the bulb further to support the structure.

As it is not proposed to deal with the construction of the more unusual valves, such as the gas discharge triode, the magnetron, split-anode pentode, and valves that differ only from those described above by the addition of one or more diodes, the only remaining type to be dealt with is the rectifier.

The Rectifier

Except in the indirectly-heated types, there are only two electrodes, the filament and the anode. The former is heavily coated to permit of prolific electron emission and is usually of strip, rather than wire formation; the anode is usually placed at a reasonable distance, except in A.C./D.C. types, and precautions are taken to prevent secondary emission and proton emission. The anode is usually carbonised, and provided with ventilating holes or fins, or both, to keep the anode as cool as possible. If the anode were made of bare metal, and of such small dimensions that it ran hot, the emission of protons could be so prolific that a premature break in the filament would occur; such troubles do not occur in modern rectifiers, which are, without doubt, the most reliable of all the valves in a mains receiver.

The Listening Barometer

LISTENERS will be interested to know that the work of the B.B.C. Listener Research Section on the Variety "Barometer" has entered upon its final and most difficult stage. This consists in deducing from the mass of material now available the significant facts with regard to Variety listening. Reports on three interim questionnaires submitted to listeners during the investigation have now been completed under the headings "How many listeners listen to broadcast dance music?"; "How many listeners can listen at 6.30 p.m.?" and the timing of Saturday Music Hall.

Dance Music

In the first instance, it appears that one listener in ten often dances to broadcast dance music; that two out of three never do; and that frequent dancing to this music is twice as common among women as among men, and more frequent among working class than among middle class listeners.

Answers to the 6.30 p.m. listening question show that two out of three listeners can hear programmes at this time on Fridays if they want to; that if Fridays and Saturdays were ruled out, there is little to choose between the other days of the week, though there is a slight preference for Wednesday and Thursday. This conclusion applies equally to men and women listeners of all classes.

Seventy-one per cent. of variety listeners prefer 8.0 to 9.0 p.m. on Saturdays and twenty-eight per cent. 9.20 to 10.20. Both the preference for and the convenience of 8.0 to 9.0 is greater among middle class than among working class listeners.

24,000 Forms

The Listener Research Section has had its work cut out in this, the biggest job it has yet tackled. Of the 47,000 listeners who replied to John Watt's appeal, 2,000 were selected to complete weekly forms, of which 90 per cent. were returned. During the three months of the "barometer," 24,000 forms, each covering 37 programmes, arrived for analysis in the Research Section.

This work entailed the studying of some 900,000 individual records. The forms in no sense aimed to arrive at listeners' taste in programmes, but were intended, purely and simply, to act as a box office barometer to show when and if people listened; for how long they listened; whether they heard the whole or part of a programme and whether they switched off before the end. Listeners were asked to state their sex, their age, the region in which they lived, and whether they were manual or clerical workers. These forms, with their close on a million reactions were sent to a counting firm, which, as is the case with census reports, reduced each of the million or so reactions to a hole stamped in a card. A mechanical sorting machine then dealt with the cards, and the results were re-translated into figures.

The Final Task

These figures reached the Listener Research Section, which is now engaged in the task of turning them into percentages. It is from the reconciling of the variables of day, hour, time, duration, wavelength, and type of programme that the final conclusions will be drawn.

Enormous enthusiasm has attended the venture from the listeners' end, and many letters have been received expressing pleasure in being chosen to co-operate. For its part, the B.B.C. is grateful for their help.

THE BRITISH LONG-DISTANCE LISTENERS' CLUB

Measuring Output

IN connection with the recent notes on measuring output there are two or three points which may be mentioned. Firstly, it is possible to obtain a severe shock when using the meter carelessly in an A.C. mains set. Secondly, it is sometimes difficult to connect the meter to the necessary output circuit owing to the method of wiring the set. It should be remembered also that in many cases an exceedingly large volume must be fed to the speaker in order to obtain a suitable reading on an A.C. meter. One method of overcoming the difficulty of connecting the meter to the speech coil is to use the ordinary parallel-fed output scheme, connecting the meter between earth (chassis) and the output anode through a 2 or 4 mfd. fixed condenser. This will leave one side of the meter "live" and will leave the operator open to shocks. A scheme which is now being adopted in certain service circles is to connect the meter through a step-up transformer of the universal matching type, connecting the *secondary* to the speech-coil winding on the speaker and the primary to the meter. This scheme allows the tappings on the secondary to be made use of in obtaining correct matching and thus avoids false readings which might result through an unbalance of the output stage. Furthermore, the meter is entirely isolated and no risks of shocks are present.

Artificial Aerials

An ever-increasing number of our members are obtaining A.A. licences, and it would appear that before long there will be quite a large proportion of our members actually on the air. In this connection, it would be interesting if members would write to us and give us details of their experiments with transmitters and artificial aerials, especially where experiments have actually been undertaken with regard to the latter, as distinct from the actual transmitter. Most amateurs use the standard A.A., but, no doubt, there are many alternative devices, some of which may be even more useful for experimental purposes than the customary network. No doubt, those who have been successful in obtaining their licence would be only too pleased to pass on any hints and tips which they have discovered for the benefit of other members, but it must be remembered that it is illegal to carry out any experiments in transmission until the licence has been obtained. For the benefit of new readers we may again mention that the A.A. licence costs 10s. per annum, and that no tests have to be passed. Certain technical details must, however, be entered on the application form, which is obtainable from the Engineer-in-Chief, Radio Section, G.P.O., Armour House, London, E.C.1. For the full licence a Morse test has to be passed, the applicant having to transmit and receive at a speed of 12 words per minute. The cost of the full licence is 30s. for the first year and £1 for every succeeding year, and the maximum power which can be used under this licence is 10 watts.

MOTOR-CAR AERIALS

Suggestions for Modern Car Fittings for Use with Car Radio Receivers

THE earlier types of aerial used with car radio receivers were generally designed to fit beneath the running board or inside the car, and as such were not capable of providing maximum efficiency. Apart from the screening effects which were noticed with this type of aerial, they are also liable to pick up interference from the electrical equipment of the car, and the aerial which is placed close to the roadway may also pick up interference from A.C. cables running beneath some main roads. The latest type of aerial is carried outside the car, on the roof, where it is clear of the engine and other electrical equipment, and owing to its unscreened position is capable of much better results.

Fig. 1. — The Beehive-type stand-off insulator.

This type of aerial may be constructed very simply from standard materials, and there is a further advantage that, where an all-wave radio set is fitted, a novel all-wave aerial arrangement may be used to give improved short-wave results. The aerial is supported clear of the roof of the car on standard stand-off insulators of the types illustrated in Fig. 1. These may be bolted or screwed to the car roof, and to ensure a waterproof joint two or three discs should be cut from an old outer cover or some thick rubber and placed between the bodywork and the base of the insulator. A standard B.A. thread projects from the top of these particular components and a lock-nut is provided so that various sections of metal may easily be attached.

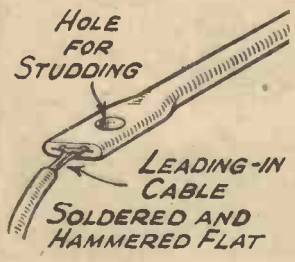

Fig. 3.—Ordinary tubing may be fitted to the insulator as shown here.

Aerial Materials

There are several interesting makeshifts which may be used for the aerial proper in place of the ideal material, which is plated copper tubing. This latter may be obtained from any good metal warehouse, and if the plated type is not readily procured, ordinary tubing may be used and enamelled to match the colourwork of the car. This will not impair the efficiency of the aerial, as the H.F. currents travel on the surface of the metal, and the prevention of corrosion is of the greatest importance so that a smooth surface is always preserved on the metal. To attach tubing the end is merely hammered flat and drilled to accommodate the bolt projecting from the insulator, locking it in position by the nut provided. The tube should, of course, be bent to follow the contour of the car roof, and if it is desired to run the aerial the entire length of the body, a central insulator should be used to keep the aerial rigid.

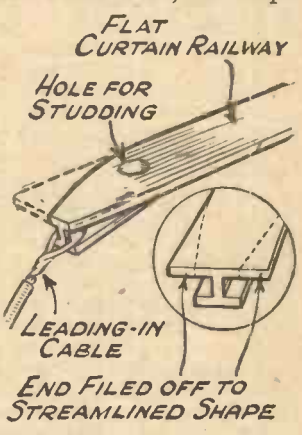

Fig. 5.—Curtain railway used as the aerial.

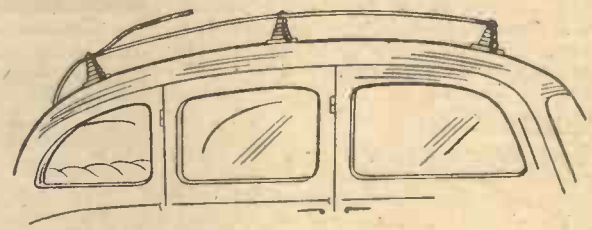

Fig. 2.—How to mount the aerial on the car roof.

The leading-in wire should be of the standard cable (stranded) and should be soldered into the tubing and led down through a hole in the roof, insulated tape being wrapped round for waterproofing purposes. A short length of the tubing, bent to any desired curve, provided that it is not too severe, may be attached to the leading-in end of the aerial to act as the short-wave pick-up, and experiments may be conducted to find suitable lengths.

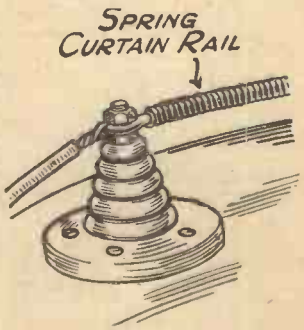

Fig. 4.—Spring curtain rail may be used in this manner.

In place of the tubing the spring curtain rail or solid tppe of curtain railway obtainable at the popular stores is a very useful makeshift and has the advantage of simplicity of fixing.

LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Logged on the 20 m. Band

SIR,—I wonder if any other readers of PRACTICAL AND AMATEUR WIRELESS noticed the good conditions which prevailed on the 20-metre amateur band on Saturday evening (January 29th). I logged the following stations between 5.30 p.m. and 7 p.m. on a battery 0-v-2 receiver at good loudspeaker strength, with a 25ft. indoor aerial :—

LA8C (Norway), SM5S (Stockholm), ES5D (Estonia), CT1QE (Portugal), ZT1F (Cape Town), CT2BC (Azores), W2IXY (New York ?), I1KN and I1IY (Italy), ZS6AG (Johannesburg), and E8SY, of an unknown locality.—C. R. BURGESS (Plumstead, London, S.E.).

A S.W. Log from North London

SIR,—I append a list of 14 and 28 mc/s. stations logged here during the last couple of months. The receiver used is an 0-v-pen.

28 mc/s: W6QG, W6NLS, W6GEI, W6LHN, W6DOB, W6DUC, W6NYA, W6BVX, W6HX, W6NIK, VU2CQ, ZU1D, W4DRZ, W4FT, W4EEV and ZU6P.

14 mc/s.: VE4OX, VE4EA, PK1RL, PK1BO, W7BPE, K7FNE, CN8AM, VE3HP, YN1AA, HC1FC, LU4DJD, SV1CA and W7EK.

All the above stations were logged during very short periods of listening.

During the past week I have received QSL cards from the following amateur stations: ST2BN, VS7GJ, W6BAM, W7EK, SV1CA, ZL1GX, HH1P and VK5WR.

I should be very pleased indeed to see published in PRACTICAL AND AMATEUR WIRELESS, at some future date, the circuit and lay-out of a two-valve short-wave receiver using standard four-pin coils with bandspread and choke output. I am sure that a receiver of this description would be welcomed by a good number of readers.—

Wishing PRACTICAL AND AMATEUR WIRELESS a long and successful life.—F. G. SADLER (Stamford Hill).

Radiation Interference ?

SIR,—At about 9.45 p.m. on January 27th, I was listening to the National programme, when I heard the familiar German short-wave interval signal butting in. I tuned the National out and at 9.50 the announcer (after speaking in German) said: "Hello, North America, this is the German short-wave station calling you." Then, also in English, he said that the programme was coming from DJB on 19.74 m., DJD on 25.49 m., and DJC on 49.83 m.

The station could be heard anywhere on the long and medium bands at about R4 and was subject to slight fading.

The programme consisted of an accordion band, choir and military band. The choir sang what appeared to be folk songs.

The receiver used was built a few days ago, having an H.F. pentode as det. and 2 L.F. stages.

Can you offer an explanation ? Has the sun-spot which was so much in the news lately anything to do with it ? Maybe other readers have had the same experience.

Thanking you for your very instructive and interesting journal.—K. SMITH (Durham City).

[The trouble may have been caused by a neighbour using a receiver in an oscillating condition.—ED.]

Correspondents Wanted

SIR,—I have been a reader of PRACTICAL AND AMATEUR WIRELESS for some time and have gained much help and knowledge from it at all times. I am anxious to get in touch with any short-wave and DX fans in this neighbourhood, or in the Bath or Bristol districts. My short-wave set is an 0-v-2, home constructed.—F. FORD, Juniper Cottage, North Wraxall, nr. Chippenham, Wilts.

SIR,—I have read PRACTICAL AND AMATEUR WIRELESS for two years, and I would like to hear from other readers who are interested in general wireless matters and especially in transceivers.—J. COLLINS, 1, Morgan's Ct., Penydre, Neath, Glam.

CUT THIS OUT EACH WEEK.

Do you know

—THAT the field of an energised loudspeaker may be used for the purpose of supplying bias to a mains valve.

—THAT intermittent crackling during a rainstorm when an outside aerial is in use may indicate a leakage in the aerial insulation.

—THAT the ordinary carbon type of microphone should be coupled to a standard grid circuit through a very high step-up transformer—preferably 100 to 1 ratio.

—THAT medium-wave breakthrough on the long waves is often due to wrong coil design or wrong coil connections.

—THAT when high currents are carried any switching in the circuit should be of the quick make and break type.

—THAT temporary fixed condensers of very small capacity may be made up by using ordinary bare wire passed through insulated sleeving and laid side by side.

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., Tower House, 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.

Practical and Amateur Wireless
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The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, PM to *Practical Mechanics*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS

	Date of Issue.	No. of Blueprint.
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D,Pen)	—	PW36B
The Signet Two (D & LF)	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen.D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D, (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
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 (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	20.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	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 "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	—	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)	—	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 (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
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)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four	6.11.37	PW81
SUPERHETS		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
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	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band Spread S.W. Three (HF Pen, D (Pen), Pen)	20.8.36	PW68
F. J. Camm's Oracle All-wave Three (HF, Det, Pen)	28.8.37	PW78
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl.B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	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 Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
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
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	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)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
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)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	—	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.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2HF, D, QP21) (Pentode and Class B Outputs for above: Blueprints, 6d. each)	18.8.34	AW445
Self-contained Four (SG, D, LF, Class B)	25.8.35	AW445A
Lucerne Straight Four (SG, D, LF, trans)	*Aug.* '33	WM331
£5 5s. Battery Four (HF, D, 2LF)	—	WM350
The H.K. Four (SG, SG, D, Pen)	*Feb.* '35	WM381
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*Mar.* '35	WM384
Five-valve : Blueprints, 1s. 6d. each.	*Apr.* '33	WM404
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D. Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	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)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)	—	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	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM336
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	*Oct.* '35	WM375
Varsity Four	*June* '36	WM395
The Request All-Waver	—	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	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	AW330
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)	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome 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 (SG, D, Pen)	*Jan.* 19, '35	AW463
The Carrier Short-waver (SG, D, P)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans)	—	AW435
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver 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.	—	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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM403
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

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.

RADIO, PHYSICAL AND TELEVISION SOCIETY

THE first meeting of the second half of the 1937-38 session was held on Friday, January 28th, when Dr. C. G. Lemon delivered an interesting lecture on transmitters suitable for use on wavelengths below 5 metres. As is well known, the main difficulty encountered on these high frequencies is not the generation of oscillations, but the keeping stable of their frequency. Crystal control, although effective, was not dealt with to any extent on account of the cost being prohibitive to most amateurs. Other methods of stabilisation were, however, gone into fairly fully, and a transmitter using short-line grid control was demonstrated. One point that was particularly stressed was the importance of using very thick leads without bends. This was demonstrated by causing an eight-volt lamp to light merely by holding it across about 2ins. of very thick wire bent so as to form an angle. H.F. phenomena approaching that of diathermy were demonstrated by carefully insulating the high-voltage parts of the transmitter, and allowing members to experience a sensation of heat by placing their hands in the proximity of the anode-circuit.

Meetings of the society are held at 72A, North End Road nearly every Friday evening during the winter months, when there are lectures on radio and other subjects of scientific interest.

New members are always welcome. Further particulars may be obtained from the Hon. Secretary, C. W Edmans, at the society's headquarters, 72A, North End Road, West Kensington, London, W.14.

THE CROYDON RADIO SOCIETY

SHORT-WAVE enthusiasts had their turn at the Croydon Radio Society meeting on Tuesday, January 25th, in St. Peter's Hall, S. Croydon. The programme was presented by Mr. E. Cholot, of Lissen, Ltd., with the title "Hi-Q Short-wave Components," which was followed by a demonstration of his firm's 6-valve, 4-wave, superheterodyne receiver. He urged a return to the old constructor days, when in building one's own receiver much mutual benefit resulted from the loaning of component parts and comparison of views. Indeed, Mr. Cholot appreciated being before such a society as this which helped the amateur constructor as it did. On Tuesday, February 15th, Mr. P. K. Turner, of Hartley-Turner Radio, Ltd., will lecture, and also demonstrate a new "B" type negative feed-back amplifier. Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

THE DERBY SHORT-WAVE RADIO AND EXPERIMENTAL SOCIETY

THE above society has now been reorganised, and we should be pleased to welcome any keen radio enthusiast at our premises, any night of the week. Hon. Sec., H. Turner, Nunsfield House, Boulton Lane, Alvaston.

WIRRAL AMATEUR TRANSMITTING AND SHORT-WAVE CLUB

AN electric lamp to represent the sun and a globe atlas were used by Mr. Norman Campbell Hobbs, G8AA, to illustrate the second part of his talk on "The Theory of DX," to the club members at their meeting on January 26th. Mr. Hobbs spoke of the effect of light and darkness on long-distance transmission and reception, using the light and shadow on the globe to similate conditions prevailing at different times of the day and night, and at different seasons. The talk, thoroughly enjoyed by a large gathering, led to an animated discussion.

Another club member, Mr. Cumberlidge, has been granted his full transmitting licence (G3CK).

Secretary, J. R. Williamson, 49, Neville Road, Bromborough.

BRADFORD SHORT-WAVE CLUB

ON Friday, January 21st, the above club had a very interesting and instructing lecture, and demonstration, of electrical interference filters from Mr. L. D. E. Perkins, of Messrs. Belling and Lee, Ltd. He explained that the object of an interference suppressor is to cause the unwanted H.F. to circulate in a small confined path, provided by the condensers, rather than to pass along the mains, where it can cause interference in a multitude of different ways. Because of this, said Mr. Perkins, it is preferable to deal with the trouble at the source, and not at the set.

There are a large number of activities at the club, and anyone interested should write to the Secretary, S. Fischer, Edenbank, 10, Highfield Avenue, Idle, Bradford, Yorks.

KETTERING RADIO AND PHOTOGRAPHIC SOCIETY

THIS society, which has recently changed its name slightly, has been favoured with two very interesting lectures.

On January 10th, Mr. J. S. Blair, of the Research Dept. of Messrs. Stewarts & Lloyds Steelworks, Corby, gave a talk on "The Use of Electronic Devices in Industry." He mentioned the uses of various types of valves, relays, photo-electric cells, thyratrons, etc., in connection with many types of industrial devices, particularly automatic switches, recorders, etc.

On January 24th, by courtesy of the General Electric Co., Ltd., Mr. F. E. Henderson, A.M.I.E.E., and Mr. W. G. J. Nixon, of the Osram Valve Dept., staged a talk and demonstration on "The Developments in the design of Valve Amplifiers." The highlight of the lecture was the demonstration of the volume "Contrast Expander," aided by records and a microphone.

The photographic section are making great progress and, in addition to running monthly competitions, are shortly making another cine film.

An excellent programme of lectures of photographic subjects has been arranged, and anyone interested in radio or photography is welcome. General and Radio Secretary, Irving L. Holmes (2AXF), "Miami," The Close, Headlands, Kettering.

Photographic Secretary: C. Knighton, 144, Russell Street, Kettering.

THE CARDIFF AND DISTRICT SHORT-WAVE CLUB

THE above club has now increased its activities, and a monthly magazine is to be published and circulated to all members. It is intended that this shall include a "digest" of various foreign magazines, and also articles by members of the local amateur transmitters. The first issue is due for publication on March 1st.

Meetings have now been arranged for the Globe Hotel, Duke Street (opposite Cardiff Castle), Cardiff, commencing at 8.0 p.m. on Thursday evenings. The following dates have been fixed:

February 10th: Visit by members to Blackwood.
February 17th: Local section of R.S.G.B. meeting.
February 24th: To be arranged (talk in all probability), and all interested in short-wave radio are invited to attend.

The Cardiff "Hamfest" has been arranged for March 24th at the same address, but full particulars will be published later. All readers interested are invited to write to the Hon. Secretary: H. H. Phillips, at 132, Clare Road, Cardiff, for further particulars as to membership, etc.

THE WEYMOUTH AND DISTRICT SHORT-WAVE CLUB

THE above club are on the air every Sunday on the 40-metre band, call G8WQ. The club-room is open every day, and morse classes are held on Mondays at 7.30 p.m. General meetings are held at 7.30 every Wednesday. Will any listeners hearing the club kindly send in their reports? New members are required and interested readers residing in Weymouth and district are invited to write to the Secretary, Mr. W. Bartlett, 59a, Franchise Street, Weymouth.

SHEPPEY AMATEUR RADIO CLUB

THE above radio club opened the New Year with full attendance at its QRA, 161, Invicta Road, Sheerness, on Wednesday, January 5th, and a programme for the first half-year was drawn up. It was decided to hold a DX contest for members, with a small silver cup as a prize, and suitable rules were made for the contest. Final closing date, March 14th. A S.W. receiver was commenced for use of the club, and provision was made for adding to it as the knowledge of the members progressed.

Further details of the club will be gladly supplied to any reader in this district upon application to the Hon. Secretary, F. G. Maynard (2CVM), 161, Invicta Road, Sheerness, Isle of Sheppey.

TONYREFAIL AND DISTRICT RADIO SOCIETY

THE meetings of the above society are held weekly on Wednesday evenings at the society's headquarters at 81, Pritchard Street, Tonyrefail, at 7.0 p.m. Members recently paid a visit to the B.B.C. Cardiff studios, and were afterwards entertained by the members of the Cardiff Short-wave Club.

The following officers were re-elected for the ensuing year: chairman, Mr. C. H. Williams (2BYM); hon. secretary, Mr. E. Powell (2BPW); hon. treasurer, Mr. W. T. Rees (GW3CR).

Readers who are interested can obtain any further information by communicating with the Hon. Sec., Mr. E. Powell (2BPW), 44, Pritchard Street, Tonyrefail, Glam.

NEWS FROM THE TRADE

Decca and Brunswick Models

MESSRS. PETO-SCOTT have for disposal a number of Decca and Brunswick receivers at special prices. These will only obtain whilst the present limited stock lasts. Model 33, an all-wave 3-valve battery receiver (list price £7 17s. 6d. less batteries) may be obtained for £5 19s. 6d. cash or 5s. deposit and 18 monthly payments of 7s. 4d., or 12 monthly payments of 10s. 6d., whilst Model 99, an all-wave 6-valve A.C. receiver (list price £14 3s. 6d.) may be obtained for £9 19s. 6d. cash, or 10s. deposit and 18 monthly payments of 12s. 3d., or 12 monthly payments of 17s. 6d. Brunswick model BPU/1, an all-wave A.C./D.C. receiver (list price £13 2s. 6d.) may be obtained for £8 18s. 6d., or 8s. 6d. deposit and 18 monthly payments of 11s., or 12 monthly payments of 15s. 7d.

Tungsram Price Reductions

MESSRS. TUNGSRAM announce a reduction in the price of automobile type valves. The types available and prices are as follows:—

Description.	Type No.	New Price.	Old Price
		s. d.	s. d.
V.Mu. Octode F.C. ..	VO6s	15 0	(18 0)
V.Mu. H.F. Pen. ..	VP6s	12 6	(15 0)
Str. H.F. Pen. ..	SP6s	12 6	(15 0)
D. Diode Triode ..	DDT6s	12 6	(12 6)
Output Pentode ..	PP6As	13 6	(15 0)
High Slope Out. Pen. ..	PP6Bs	13 6	(14 9)
High Pow. Out. Pen. ..	PP6Ds	13 6	(20 0)
V.Mu. Hexode F.C. ..	VX6s	15 0	(18 0)
F.W. Rectifier	PVA6s	10 6	(12 6)

New Philips Chargers

SOME new chargers have been added to the range of Philips charging equipment and will be of interest to the service man who includes accumulator charging in his services. These are priced at 10 guineas, £14, and £29 10s. In addition, there are some new 2-circuit heavy-duty chargers at prices from £23 to £38 10s. Full details of these may be obtained from Philips Lamps Ltd., 145, Charing Cross Road, W.C.2.

Imhof Gramophone Needles

A NEW type of long-playing (fibre) needle is now available from Messrs. Imhof, and will appeal to those amateurs who are interested in preserving special gramophone records. These needles are prepared from a special type of thorn, and are claimed to be capable of playing fifty sides without changing and with no surface noise. It is also claimed that they give the attack and brilliance of the steel needle, and that each one is shaped and pointed by hand. They are sold in boxes of 10 at 2s. The address is Alfred Imhof, Ltd., 112-116, New Oxford Street, W.C.1.

QUALITY ON THE SHORT WAVES

(Continued from page 597)

extensive decoupling in all the H.T. feeds, and large capacity decoupling condensers, preferably of the electrolytic type in order to remove all possibility of hum which is most often troublesome in mains short-wave apparatus.

A circuit embodying the main details so far given is included on page 597, but this is necessarily in outline as individual requirements may vary. Taking this as a basis, however, the keen amateur will no doubt be able to construct a receiver which from the quality point of view will be found to offer remarkable results on the transmissions mentioned and will definitely exceed the quality obtainable from the ordinary broadcast receiver.

QUERIES and ENQUIRIES

Metal Rectifier for 500 Volts

"I have been building a set for the past few months, and have now come to the mains section only to find that the recommended metal rectifier is no longer available. I do not want to use a valve for rectification, but want 500 volts or more at high current. Is it possible to obtain the desired end with metal rectifiers? If so, how do I set about it?"—D. T. (N.W.11).

THERE are two methods of obtaining the high voltage, in both of which two metal rectifiers would be required. These may be used in conjunction with two mains transformers, each delivering the correct output for the separate rectifiers, or with a single transformer delivering double the output required for the single rectifiers. Two H.T.17's connected in series, and fed from a transformer secondary giving 300 volts at 550 mA will enable you to obtain approximately 500 volts at 120 mA and this should meet your requirements. Only two condensers will be needed in this case, each of 6 mfd. and rated at 500 volts. For the two transformer arrangements you would need four condensers.

Eliminator Tappings

"I have a mains unit which has several marks on it which I cannot understand. There is a pair marked S.G. with H under one and L. under the other. In addition there is a socket marked 50/80 and one 100/150, with a plug at the bottom which keeps in one hole but may be turned to fit in three other holes marked medium, high and low. Could you tell me how to use this with my set, which has four H.T. tappings, H.T.1, 2, 3, and 4?"—G. T. (Perth).

THE S.G. sockets are for providing the voltage for the screen of an S.G. or H.F. pentode valve, and the letters H and L indicate high and low voltages. Roughly these may be regarded as 50 and 80 volts. The two sockets bearing double markings (50/80 and 100/150) indicate that the outputs vary between the limits marked and are dependent upon the current flowing. The higher the current the lower the voltage. The lower plug marked medium, low and high must be used in conjunction with the output voltage, and if a low current is taken by the set the plug should be put in the low socket to ensure that the voltage output will not rise above 150. As you have four outputs you will have to couple two of them in your set and probably the S.G. and Detector H.T. leads may be combined and fed from either the S.G. or the 60/80 volt socket. Experiments will have to be carried out to find the best method of using the set, and you may even find that maximum performance will only be obtained when all the anode feeds in your set are obtained by voltage-dropping resistances connected in a single lead fed from the 100/150 volt socket.

Transmitter Crystals

"I am thinking of building a transmitter and should like to know what type of crystal is needed, where it may be obtained and the cost. I presume, of course, that the ordinary receiver crystal is unsuitable and that there is no method of making the crystal at home."—H. Y. (Glasgow).

YOU cannot use the ordinary receiving crystal for a transmitter, and the correct type of crystal is very accurately ground from quartz. As it is essential that this should be correctly made, and as you must submit the maker's calibration chart when applying for a licence you will have to purchase a suitable crystal. They are available in various types for various frequencies, and cost round about £2 or £3. Unmounted crystals for the 1.7 m/c and 3.5 m/c bands cost approximately 25s., and for the 7 m/c band 30s.

Testing Coils

"I have quite a lot of old pattern coils now in my spares box and am thinking of making up a new set. I am keen to use this as a sort of test unit and wonder what is the best plan to test the goodness of the coils—not only from the point of view of tuning, but from the efficiency at different tuning points. I wonder if you could give me an indication of the best way to carry out this end?"—S. J. E. (Hove).

THERE are many different schemes which you could adopt, depending upon the apparatus which you have available. In the simplest form the tuning circuit could be made up from a base of bakelite with sockets and the various coils could each be made up on a similar base with plugs to correspond. Thus one could be tested, removed and another inserted. An alternative plan would be to have a change-over switch at the high-potential end and use a good milliammeter in the detector anode circuit, tuning to a given station and noting the deflection given on the meter. In this way you could compare between the separate coils.

RULES

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

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

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Interchangeable Valves

"I should be glad if you would make quite clear the differences in the bases of the various valves of the American type now available. I see seconds and firsts in some advertisements, and I understand that several English firms (G.E.C., Tungsram, Mazda, etc.) make these valves. Are they all interchangeable in so far as one could take out, say, a Tungsram valve and put in a Mazda, and so on, for test and replacement purposes?"—B. O. V. (S. Croydon).

ALL American-type valves of the same class are interchangeable. You will find, however, that, just as in the English valves, there are 5-pin, 8-pin and other types, and thus only those of a similar type will fit in the same type holder. The Tungsram and other English-made American valves may be interchanged. The latest Mazda octal valves, however, cannot be plugged into any existing valveholder as a different size has been adopted for reasons recently explained in these pages. The G.E.C. (Osram) octals may be plugged into standard octal valveholders.

Double-tuning

"I have just bought a superhet converter and added to my set, but I do not think it is working properly, as I can get all the stations twice, and I should like to know how to tell which is the proper place on the dial. Is there any way in which I can ascertain this, or is the thing not working properly?"—F. T. (Colwyn Bay).

THE effect is due to the fact that the frequency-changing device provides a frequency difference above and below the frequency of the station which sets up the beat note for subsequent amplification. It is quite in order, and is usual with the simpler types of S.W. Converter. It is usual to select the tuning which provides the least interference, as you will find that in some cases one setting will also coincide with the setting of another station, and in that case you would tune to the other point for that station to avoid the interference.

Heater-winding Connections

"I have a mains transformer which has a 4 volt 8 amp. and two 4 volt 2 amp. windings. Of these the 8 amp. and one of the 2 amp. windings are provided with a centre tap, but the remaining 2 amp. winding has no such tap. I wish to use a valve rectifier and should be glad if you would tell me the best way of using the two 2 amp. windings."—N. E. (Grimsby).

THE transformer has obviously been designed for use with a valve rectifier and a 2 amp. output valve, the remaining 4 volt winding being intended for a multi-valve set. The output valves would be fed from the centre-tapped winding, biasing arrangements being included in the centre-tap lead. The rectifier should be fed from the untapped winding, connecting the H.T. positive line to one side of the heater winding. It is not now usual to employ a centre-tapped heater for the H.T. winding, but if you wish to do so, use the centre-tapped winding for this, and provide an artificial centre tap on the remaining winding (with a hum-dinger) for biasing the output valve.

The coupon on page 624 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London. W.C.2.

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RADIOMART

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CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

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25 ONLY FOR SALE.—3-valve kits with valves and diagram, 12/6; 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation. —Universal Radio Co., 221, City Road, London, E.C.1.

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SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Euston 3775.

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VALVES! We hold a comprehensive stock of all types of British and American valves. Replacements for any receiver can be supplied from stock.

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NEW 2-VALVE S.W. KIT, 13 to 86 metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE!**

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COIL FORMERS, 4- or 6-pin low-loss, 1/- each.

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Have you got our new 1938 SALE LIST? FREE for stamped addressed envelope.

MICROPHONES.—Lesdix Microphones reproduce your voice amplified from your radio set to loud speaker. **SOLO BUTTON MICROPHONES**, 1/-. A new Practical Solo Microphone for broadcasting at home. It is a general purpose, robust mike, with solid bakelite body, back terminals, front metal grills. No. 11. New design finely finished, 5/6. No. 11A. Special, in solid brass body, unequalled at the price on speech and music, 7/6. No. "NW" 11 Table Mike.—This is a splendid microphone for speech and music. The bakelite case, containing a 2in. mike and transformer, is on a bronze pedestal. Switch and plug sockets are fitted on the case. It stands unrivalled for quality and price, 15/-.

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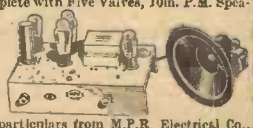

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Special Speaker for above, fitted Pentode Transformer, 600-ohm Field, 7½" cone, etc., **12s. 6d. each.**

AERODYNE 5-Valve Battery Superhet, a really magnificent job, listed at 8½gns. The Chassis is contained in a handsomely finished Walnut Cabinet of Upright design. The Dial is really attractive and is station named. Tuning is indicated by means of a rotating light. The Valves used are as follows, FC2A, VP2, 2D2, PM2B, and Cossor 220PA. Speaker large type P.M. Rola. **Our Price to clear, £4 4s.**

We would emphasize that the above are in both instances Brand new as from the makers.

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350-0-350, 120 m.a. 2-0-2 volts, 2.5 amp., 2-0-2 volts, 4 amp., **10/6.**

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All orders 5/- or over, post free; orders under 5/- must be accompanied by a reasonable amount for postage; C.O.D. orders under 5/- cannot be accepted.

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LOUDSPEAKER repairs, British, American, any make, 24-hour service: moderate prices.—Sinclair Speakers, Alma Grove, Copenhagen Street, London, N.1.

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Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 11. No. 283. February 19th, 1938.

AND PRACTICAL TELEVISION

F. J. CAMM'S "ACME" All-Wave 4

ADJUSTING and OPERATING

THE 1938 ONE-VALVER—See page 629

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. XI. No. 283. February 19th, 1938.

ROUND *the* WORLD *of* WIRELESS

Transmitting Topics

AN increasing number of listeners are daily taking an interest in the transmitting side of radio, and among the most popular of the articles recently published are those of the Experimenters dealing with this subject. In the past we have given articles on transmitting, including constructional details of a small transmitter, and in response to the very large demand we are commencing a further series of articles on this branch of radio. We must, however, again remind readers that no apparatus of this type may be built until a licence has been obtained. In the interests of every listener this step should be remembered, as infringement of the Law may easily result in a tightening up of the conditions and thus not only make it more difficult for yourselves, but for others who will come along later. A little thoughtlessness can cause no end of trouble, and a badly built transmitter used during broadcasting hours may spoil the enjoyment of hundreds of listeners over a wide area. Therefore, if you intend to take up this branch of the hobby, read up everything you can about the subject first, and not until you are fully prepared should you attempt to build any apparatus. The artificial aerial will enable you to carry out many hours of interesting experiment, and you will be able to familiarise yourself with the various aspects of the game, so that you will eventually find no difficulty in obtaining a full licence, and going on the air as a qualified transmitter.

Write a Slogan

THE makers of the Avo test instrument are offering valuable cash prizes to anyone who can write a suitable slogan for use in their advertisements relating to the Avo Valve Tester. The first prize is £25, and ten other prizes of £2 10s. each are to be awarded. There are no conditions of entry, and slogans have to be written in block letters on a postcard and sent to the company at Winder House, Douglas Street, S.W.1.

Plastics for Lenses and Scales

FOLLOWING a recent announcement regarding the production of a plastic material suitable for moulding high-quality photographic and similar lenses, it is now announced that a factory is to be opened at Slough for the production of such lenses, and that scales and panels for radio sets are also to be made from this material. These are to be illuminated by remote light transmission, and it is stated that brilliant lighting is possible by the extreme clarity of the material used and due to its properties of internal reflection and the carefully calculated optical reflecting surfaces.

Television Service Standardised

AN official announcement was made last week regarding the present B.B.C. television service. It is stated that the present system is to be standardised for a period of at least three years, so that existing apparatus may be purchased with the utmost confidence that it will not be rendered obsolete or require modification for a period of at least three years.

ON OTHER PAGES

Sir Harry Lauder Again

THE B.B.C. announces that on March 16th listeners will again have an opportunity of hearing that well-known Scottish comedian, Sir Harry Lauder. He will give a programme lasting half an hour and will be accompanied by the B.B.C. Variety Orchestra, directed by Charles Shadwell.

B.B.C. Orchestra in Nottingham

ON March 9th the B.B.C. Symphony Orchestra, under the direction of Sir Adrian Boult, will give a concert in the Albert Hall, Nottingham, at 8 p.m. The programme will include works by Busoni, Brahms, Delius and Wagner. Tickets are available from Messrs. Kent and Cooper, Ltd., 32, Market Street, Nottingham.

A Russian Choir

IN the National Music Hall programme on February 12th a Russian Choir, under the direction of Theodore Potoyinsky, will be heard. The B.B.C. Variety Producer, John Sharman, heard this choir whilst he was dining at a West End restaurant, and was so interested in their performance that he invited them to participate in his Music Hall variety. This programme will also be notable for the inclusion of Hetty King, the male impersonator, who will probably be making her last radio appearance in this country for some time.

A Gershwin Echo

ALTHOUGH George Gershwin, the composer, is most remembered for his "Rhapsody in Blue," during his lifetime he was working on a serious operatic version of the Negro play "Porgy." This was finished, and the opera "Porgy and Bess" was produced in New York in 1935. Excerpts from this were recorded under Gershwin's supervision and are to be broadcast for the first time in this country on February 20th in the National programme.

Lewis

A WILD and romantic island on the West Coast of Scotland, Lewis, was recently the subject of a visit by the B.B.C. recording van. Engineers made records on the spot of all sides of life there, including impressions of the arrival and departure of the mail boat at Stornoway, of a Ceilidh, or a Hebridean wake, and of a scene in a shieling, and these will be heard on February 26th.

Scott Insulated Wire Company

A NEW factory at Queensbury, Middlesex, is almost completed, and will house the Scott Wire Company. The new factory will bear the name of "Queensland Works," and under the most modern conditions all up-to-date types of wire will be manufactured.

ROUND the WORLD of WIRELESS (Continued)

Canada's New Stations

TWO of the five new high-powered broadcasting stations controlled by the Canadian Broadcasting Corporation were recently opened at Montreal and Toronto. The new transmitters, rated at 50 kW each, are the most powerful in the Dominion. Montreal's call sign is CBF (910 kc/s), and that of Toronto, CBL (840 kc/s). Both stations use the vertical type aerial, the masts of which have a height of 647 feet.

University Radio Course

IT is reported that WOSU, Ohio State University's station, has started courses "on the air" in French and Spanish, in response to demands for knowledge of foreign languages which has grown up in America with the increasing popularity of listening to foreign stations.

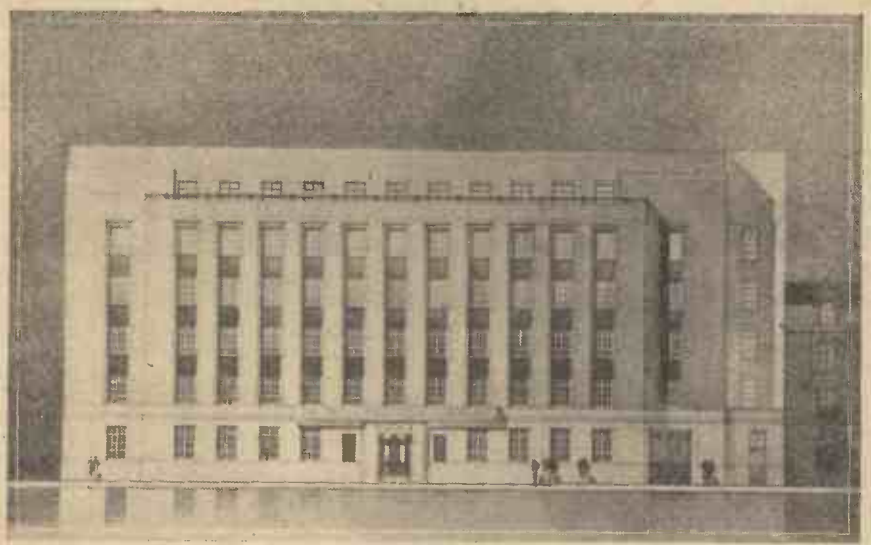
France's Four Million Listeners

ACCORDING to a recent report from Paris, the number of "official" listeners is steadily growing in France, as in most countries. The number has risen from 3,218,540 in December, 1936, to 4,163,692 in December, 1937.

British Industries Fair

A MICROPHONE impression of the Heavy Section of the nineteenth British Industries Fair has been arranged by J. T. Tovey, one of the Midland Regional announcers, from recordings made at Castle Bromwich, and will be broadcast on February 23rd. Over 300,000 square feet have been booked this year and about a thousand exhibitors are represented. The principal industries are hardware, ironmongery, building, gas and electricity, and engineering. Publicity material has been issued in ten languages to 110 countries. So far the largest response of foreign buyers has been from Holland. The Duke of Kent is to visit the Fair on March 1st.

INTERESTING and TOPICAL NEWS and NOTES



An artist's impression of the proposed new headquarters for the B.B.C. in Belfast. On the ground floor there will be a large studio, an artists' waiting-room, band-rooms and cloakrooms, ventilation plant, boiler-house and stores. Two talks studios, music library, listening hall, board-room and offices will be contained on the first floor; while on the second floor space will be devoted to a conference-room and offices. The third floor will be principally for office use, though the right wing will contain two dramatic studios, effects studio and listening-rooms.

Technical equipment—the control-room, machine-room, battery-room, cubicles, echo-rooms—will be housed on the fourth floor. The top floor will contain the General Purposes studio, artists' lounge, and club-room, canteen, kitchen, rest-rooms and offices.

"Rehearsal" and "Show" on the Air

ANOTHER peep behind the scenes in the North's "Rehearsal" series will be broadcast in the morning of February 23rd, when listeners will hear preparations for the evening's broadcast from the Alexandra Theatre, Hull. The show itself will be heard by Regional listeners in the evening of the same day.

Variety from Peterborough

FRANK TERRY'S concert party "Pleasure on Parade" will be heard in a Variety bill from the Empire Theatre, Peterborough, on February 23rd. It has broadcast on several occasions, and includes several well-known revue artists.

Organ Recitals

THE fifth recital in the series called "Round the London Organs" will be given by Berkeley Mason from a B.B.C. studio at Maida Vale on February 28th (National), and will be preceded by a description of the organ. On March 4th (National) Berkeley Mason will again give a recital, this time on the organ in the Concert Hall at Broadcasting House.

Broadcast from the Gizeh Pyramid

THE National Broadcasting Company of America recently undertook an interesting broadcast when Mr. W. B. Emery spoke to the United States from the interior of the great Gizeh pyramid, on the edge of the Sahara Desert, 7,000 miles away.

A microphone in the centre of the 50-centuries-old Cheops tomb was wired first to an hotel in Cairo, then to London whence the programme was transmitted on a short wavelength across the Atlantic.

The dramatic moment came when the twentieth-century voice, echoing round the tomb, linked the New World with the world of 5,000 years ago.

B.B.C. and Band Broadcasts

WITH reference to the statements recently published, the B.B.C. wishes it to be known that in the matter of broadcasts by bands from outside the studios its contracts are with the managements concerned. Eighteen months ago the B.B.C. offered to attend any meeting called between the managements and the Musicians' Union. The B.B.C. has said that it is ready to raise the fee in London to twenty-five shillings for each musician.

South African Radio Relays

WE understand that on the Gold Coast seventeen radio relay stations are in operation, each of them relaying Empire transmissions to many thousands of listeners.

Television in India

ACCORDING to a recent report, all details for the television service from Bombay will soon be completed, and it is hoped that the transmitter will be working by April.

SOLVE THIS!

PROBLEM No. 283.

Jackson had a three-valve (S.G., D. and Power) receiver in which the first valve was of the variable-mu type. This set was built on a plain wooden baseboard. He decided to convert this receiver on the lines of the Corona and, accordingly, purchased the necessary Plymax chassis and coils and built the receiver. Although the theoretical circuit was faithfully followed he found that he could obtain no signals on any waveband, but when the aerial was transferred to the anode lead to the first valve signals could be heard—although not very strongly. What mistake had he made? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 283 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, February 21st, 1938.

Solution to Problem No. 282.

Atkins had overlooked the fact that the output valve in his three-valver was already overloaded and, consequently, the addition of a further valve only added to the trouble. If he had fitted the volume control before the output valve of his three-valver he would have been able to control the powerful stations and would have had the advantage of the additional amplification on weak stations.

The following three readers successfully solved Problem No. 281, and books are accordingly being forwarded to them: A. J. Newman, 18 House, D.Y.R.M. School, Guston, Nr. Dover; W. Flower, 13, South Parade, Lincoln; S. J. Scott 7a Dorothy Road, Lavender Hill, S.W.11.

THE FIRST OF A NEW SERIES

Transmitting Topics

An Introductory Article for All Readers New to the Subject, Dealing with the Requirements of an Amateur Station, and Appealing for Closer Co-operation Between All Interested in Transmitting. By L. ORMOND SPARKS.

QUITE a lot of London's atmospheric deposits has collected on my aerial insulators since my last contribution to Transmitting Topics, so I would like to express my hope that all those readers who are interested in the subjects covered by the previous articles are well on their way to getting their "full" licence, or, better still, have already passed their P.M.G. tests and now belong to the steadily increasing number of genuine transmitting enthusiasts.

Speaking of insulators and aerials, I hope that many did not experience such trouble as I did during the recent gale. My lattice mast (Fig. 1)—35ft. in height—was brought down with a crash, while the top section of my other mast was broken adrift and had to be hauled down. The aerial rig, Zepp with twin feeders, became so hopelessly entangled with neighbours' lattice work and other garden decorations that it had to be cut to pieces to assist removal of the wreckage.

Fortunately, no one was hurt; needless to say, I have learnt a lesson from it all, but more about that anon.

Fig. 1.—The lattice mast built by the author of this article, and which was blown down in the recent gale.

Genuine Experimenters

The majority of constructors become, at some time or another, intrigued with the idea of transmitting, and as it is not a difficult matter to make up a circuit which will act as a transmitter—of sorts—some of them are carried away by their enthusiasm to such an extent as to rig up some such form of signal generator or oscillator and actually put it into operation.

Such procedure is to be strongly condemned, as it is liable to prove most detrimental to the welfare of the real enthusiast, apart from causing serious interference to nearby broadcast listeners.

While I fully appreciate that many constructors might have serious reasons to prompt them to adopt such undesirable methods, it cannot be denied that there are many who might make up such gear—to put it quite frankly—for *simply fooling around*, without any intention of taking the subject seriously or applying for a P.M.G. licence.

To the real enthusiast I would say, get an A.A. P.M.G. licence as quickly as possible and make the utmost use of it, and thus equip yourself with sufficient knowledge and experience to enable you to get a "full" licence when the time comes when you wish to take your studies, or hobby, a stage further.

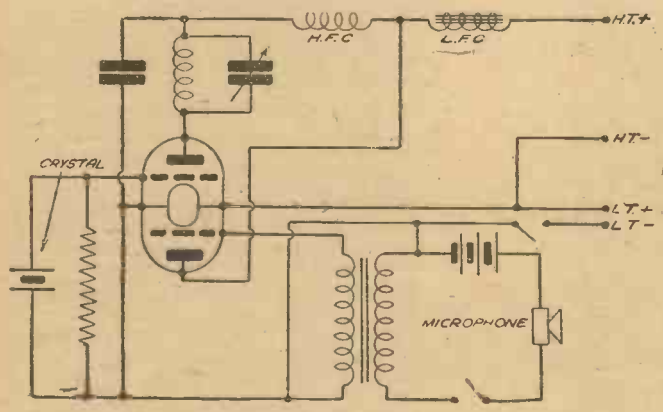
So far as the others are concerned, might I suggest, in their own and the other fellow's interest, that they *pack it up* and stick to the receiving side of radio, as the illegal use of any form of transmitting gear is a serious offence.

From these remarks it will be obvious, I hope, that this series of articles is intended to help those who are really interested in the subjects covered by the title heading; therefore, reports or suggestions from those holding A.A. or "full" licences will always be welcomed, especially if call-signs are quoted.

Co-operation

Transmitting is a subject which calls for the closest co-operation between all station owners, whether A.A. or "full" licences are held, as, unlike receiving, it is essential to obtain reports, compare apparatus and circuits, see different forms of aerial rigs and station lay-out and, speaking generally, assist each other by the exchange of ideas and opinions. To enable this essential work to be carried out and good

(Continued overleaf)



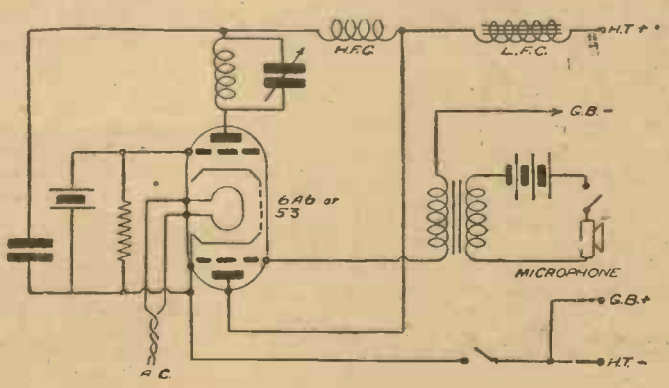


Fig. 2 (above). Circuit diagram of the 2½-watt transmitter referred to in the text, and Fig. 3 (right) An A.C. mains version of the same transmitter

TRANSMITTING TOPICS

(*Continued from previous page.*)

progress made, it is a good idea for those in the same districts to get together from time to time and discuss their activities. Many Radio Clubs have Transmitting Sections, and are able, therefore, to give useful assistance to their members interested in the subject, so there is really no need for any enthusiast to be lonely in the furtherance of his hobby. As I have said before, send in your reports and details of your station so that the other fellows can hear of your ideas and methods.

What Constitutes a Station?

For the benefit of those new to these articles, I feel that an answer to this question is essential, as so many amateurs have a very hazy idea as to the equipment necessary, and the cost of equipping a station.

To commence with, the licence question is the first problem. All who are *really* interested in the subject should first of all apply to the P.M.G. for what is known as an A.A. Licence, which allows one to use transmitting gear—providing its design satisfies the authorities concerned—connected to a "dummy" or "artificial aerial," which prevents the signals from radiating beyond the boundaries of the house in which it is situated.

Now a great number of amateurs are under the impression that such facilities are not much use. Let me dispose of that idea at once. With an A.A. outfit, it is possible to carry out practically all the tests and experiments that would be possible with a "full" licence or radiating station, excepting, of course, experiments with radiating aerials. Much valuable work can be done and an unlimited amount of practical and theoretical experience can be gained with such a station, and what is also of vital importance, when the time comes for application to be made for a "full" licence, an experimenter stands a much better chance of an application meeting with approval if he has held an A.A. for, say, six or more months. To the beginner to transmitting, therefore, I would say, get your A.A. as quickly as possible and make good use of it.

Gear

Once the authorities have been satisfied, the question of equipment can be considered. In this direction many are again under the impression that electricity mains are essential. Admitted that mains-operated outfits save a lot of trouble, and allow greater power to be obtained than by batteries—taking costs into consideration—but mains gear usually costs more to make up, and, after all, one is not concerned with great power with an A.A. station.

The 2½-watt battery-operated transmitter, Fig. 2, described in the issue of January 2nd, 1936, requires a lot of beating for the beginner. It is simple, efficient and quite reasonable in cost, while its design is such that it is neat and compact and can be placed in any odd corner of the shack. For those with A.C. mains available, Fig. 3 shows the A.C.-operated counterpart which has the advantage of giving nearer 5 watts output, or I should say, input, to the aerial system.

To those not versed in transmitting circuit requirements, the inclusion of a crystal may seem a little confusing, so let me explain briefly why it is shown in both circuits.

With any transmitting gear it is absolutely essential for some means to be employed to maintain consistently the oscillations signal produced at a constant predetermined frequency or wavelength. The P.M.G. is *most* particular about this point, so use is made of the properties of piezo-electric crystal which, when connected in the grid circuit of the oscillator in place of the conventional coil and variable condenser, only allows oscillations to be generated at a frequency determined by the cut and dimensions of the crystal. Although the crystal might appear to be costly, it is actually one of the cheapest and most consistently accurate means of satisfying the authorities.

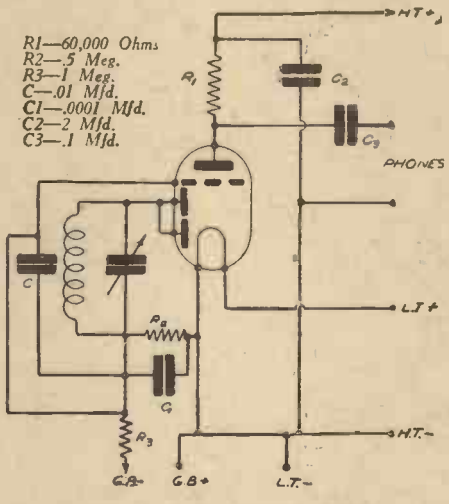


Fig. 4.—A simple headphone monitor.

On no account should any form of transmitter be used without some such means of keeping the signal at a constant frequency, otherwise serious interference is likely to be caused to broadcast listeners.

Another essential item in a station is a monitor, to enable checks and tests to be made against the signals generated. One of the most simple arrangements is that shown in Fig. 4 which can be used for tests of signal strengths and modulation, and determining the comparative efficiency of different circuit arrangements. Actually a crystal or one-valve receiver can be used, but with the latter it is essential to see that the circuit is well off the point of oscillation and preferably housed in a metal box.

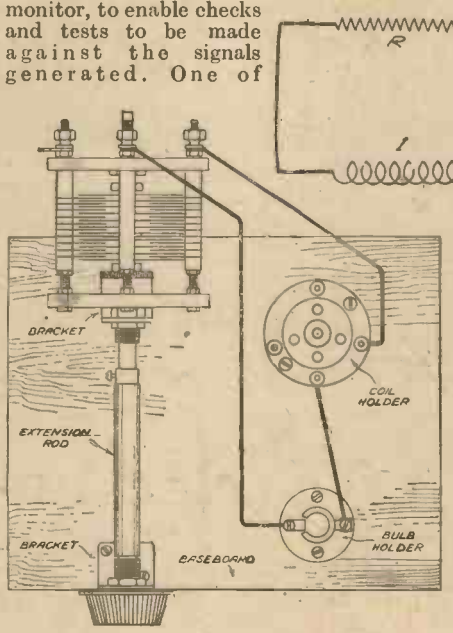


Fig. 5.—Theoretical circuit, layout and wiring of an artificial aerial for use with the transmitter.

The Artificial Aerial

There are various arrangements which will satisfy the requirements of an A.A., the ultimate design depending largely on the input applied, but so long as the fundamentals, namely, inductance, capacity and non-inductive resistance, are embodied, it is not a matter of great importance which design is selected; in fact, it is an item which lends itself to some interesting experiments. The arrangement shown in Fig 5 is quite suitable for average use. It consists of a low-consumption pocket lamp or fuse bulb and a two-winding coil coupled to a variable condenser, the coil and condenser being selected to tune to the frequency of the transmission.

The brief details of the essential requirements given above must not be considered as descriptions of such, as they will be dealt with fully in future articles, so that the beginner will be able to gain a sound foundation of the subject. For the more advanced readers, I intend covering different types of transmitters, modulators and aerial rigs.

Components

Many constructors are under the impression that transmitting apparatus calls for special and sometimes expensive components and, likewise, they refrain from taking up the subject because their budget will not allow any additional expenditure. While such impressions hold good for transmitters rated above, say, 15 watts, it does not apply to the gear which will satisfy the beginners' requirements. For example, coils can be wound on standard 1½ or 1¼in. formers, variable condensers can be of the ordinary short-wave type, and the same applies to H.F. chokes, valveholders and fixed condensers, so it is highly probable that the majority of parts will be found in the "spares box" or, if necessary, that they can be purchased at very reasonable prices.

If funds permit, it is wiser, of course, to buy the best of components, by which I mean those designed for the work, as they will always be useful as the power of the apparatus is increased. High insulation and low loss are the essential requirements, as one is concerned with the handling of *high-frequency* currents and, later on, high voltages, both of which will soon show up any defects in the insulating materials.

Valves

The question of make and type often causes some perplexity, and it is not always possible to select the correct type from the recognised British valve manufacturers' valve lists, and one is often forced to select an American make. But it is now very satisfying to note that it is possible to obtain the majority of American types manufactured in England by British manufacturers.

The question of cost cannot be overlooked, however, and most constructors are familiar with the fact that the American products can be secured from advertisers in this journal at a figure far below that demanded by British makers. When such valves are used their filaments require a different voltage and current to the usual 4 volt 1 amp. of the British makes, so it means, therefore, that a separate filament or heater transformer—speaking for A.C. operated valves—must be purchased to satisfy their requirements.

The 1938 One-valver

An Easily-made and Efficient One-valve Medium and Long-wave Broadcast Receiver which is Ideal for Beginners and Experimenters By W. J. DELANEY

ALTHOUGH the small receiver is apt to be despised in these days of 7- and 8-valve superhets, there is still a very wide field of application for the simple one-valver. Recent correspondence shows that apart from the many listeners who require such a receiver as a useful stand-by whilst a new set is being built or while overhauls are being made to existing apparatus, there is also a need for such a receiver for students and young people who are just embarking on radio as a hobby. Many schoolmasters, for instance, have asked for details of a set which may be used as a demonstrating model, either for handicraft instruction or to explain many of the theories underlying modern radio technique.

There are many interesting sidelines to the simple set in spite of the fact that such a very small number of components will be found in it. For instance, the tuned circuit will consist of a coil and variable condenser, and it is possible to show the effects of inefficient condensers, either by the loss of volume—such as heard or as measured by means of a meter in the anode circuit—or by the alteration in the tuning range. Thus, in some parts of the country a B.B.C. station may be found at the very end of the dial, and when an alternative variable condenser is fitted this may not be located, simply because the minimum capacity is too high to enable the circuit to tune down to the low wavelength.

Components Required

Similarly, the H.F. choke may be exchanged and the efficiency of this demonstrated in a similar manner, volume suffering when an inefficient component is employed, and in some cases it may be possible to show that reaction is erratic or perhaps unobtainable when a certain type of choke is fitted. Thus the one-valver may be made the means of many interesting hours of experiment, and the receiver here described has been designed with this end in view. A complete specification is attached, and the parts mentioned should be purchased in order to build the receiver in the form in which it is presented. A full-size blueprint may be obtained to enable the construction to be followed by those who have not previously made a receiver, or for the use of masters, clubs, etc., and there is nothing difficult in the work of building the set. A modern air-core coil of the screened type has been specified so that the apparatus may be used as a reliable home receiver, a screened coil suffering less from atmospheric conditions which may affect an unenclosed coil. Furthermore, if the coil is removed from time to time to enable alternative coils to be tried out, the wiring of the coil will not be distorted and thus the coil may be put back and the original tuning positions will hold good.

With an unscreened coil, although the efficiency may, under certain conditions, be higher, constant handling may distort the former or shift the wire on the coil and thus upset previous calibrations. Similarly, the H.F. choke has been designed as a standard component and is not affected by handling. A separate switch will, however, be used with the coil, so that when a home-made coil is used in place of the specified coil there will be no difficulty in connecting the necessary wave-change switch. The latter is of the three-point type which may, when desired, be used as a two-point (or on/off) switch by ignoring one of the terminals on it.

A Full-Size Blueprint, No. P.W.85, may be obtained price 1/-.

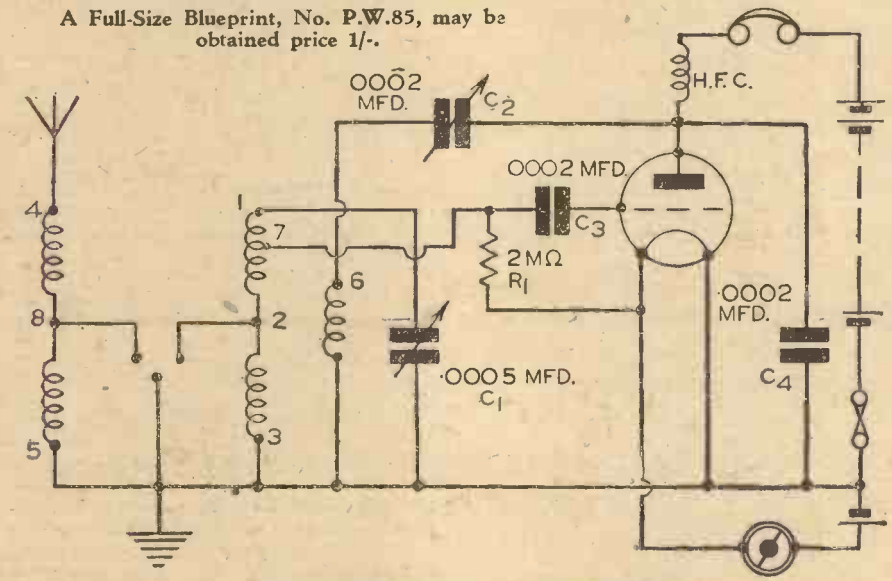


Fig. 1.—Theoretical circuit of the one-valver.

Wiring

The condenser is mounted by means of screws in the brackets provided, whilst the wave-change switch and the reaction condenser are mounted on small brackets designed for the purpose. The on-off switch, by means of which the set is switched on and off, has been fitted at the back of the chassis, as it will only be needed at the beginning and the end of a period of listening, and it enables the panel lay-out to be preserved in a balanced fashion without restricting the scope of subsequent experiments. The grid condenser and grid leak, as well as the anode-bypass condenser, are of the modern type having wire ends, which are used for connecting the components direct in the required position. For the remaining wiring, bare tinned copper wire, gauge 22, should be used, and as this set is intended for the beginner we may point out that the ends of the wire should be turned with the aid of pliers in a clockwise direction so that

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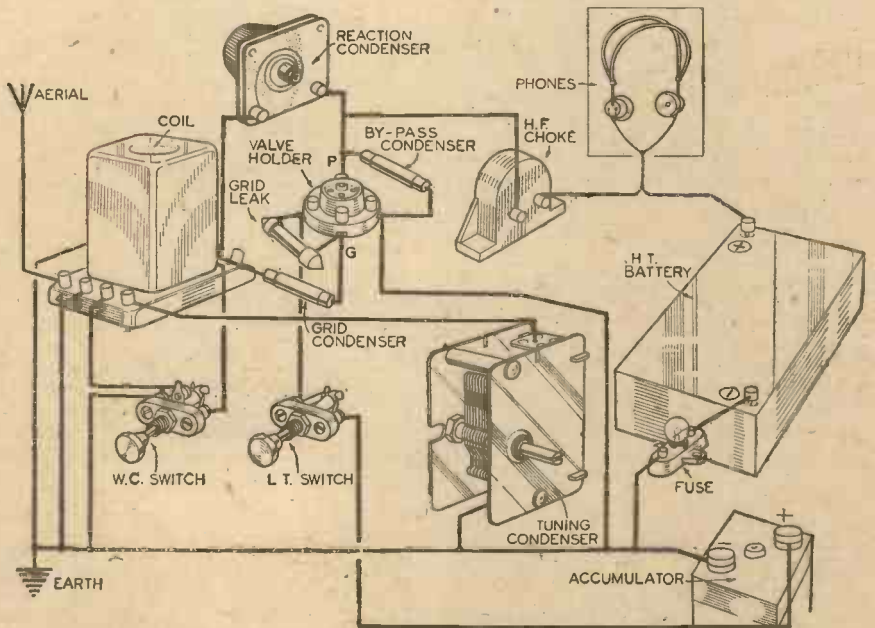


Fig. 2.—Pictorial representation of the circuit which may be compared with Fig. 1 by those who cannot yet read a theoretical circuit diagram.

THE 1938 ONE-VALVER

(Continued from previous page)

when placed beneath the terminal nuts the wire will not be forced out as the nut is tightened. If the wire loop is turned in the wrong direction tightening the nut will force out the wire.

Connect the battery leads to the points

LIST OF COMPONENTS FOR 1938 ONE-VALVER

One "Uni-Gen" dual-range coil (Wearite).
One .0005 mfd. tuning condenser (Bulgin).
One H.F. choke (B.T.S.).
One .0002 mfd. reaction condenser (B.T.S.).
One 4-pin baseboard type valveholder (W.B.).
One 2-point push-pull switch (Bulgin).
One 3-point push-pull switch (Bulgin).
Two .0002 mfd. tubular fixed condensers (T.C.C.).
One 2-megohm wire-end grid leak (Dubilier).
One fuseholder and fuse, type F.5 (Bulgin).
One metal-covered baseboard 10in. by 6in. (Peto-Scott).
Two terminal-mounting blocks (Belling-Lee).
Four insulated terminals, A., E., L.S. and L.S. (Belling-Lee).
Three component-mounting brackets (B.T.S.).
One 4-way battery cord (Belling-Lee).
One D.210 valve (Cossor).
One 66-volt H.T. battery (Exide).
One 2-volt L.T. accumulator (Exide).
One pair 4,000-ohm headphones (Ericsson).

as indicated on the blueprint or the small wiring diagram accompanying this article and connect the positive and negative L.T. leads to the positive and negative terminals on the accumulator. Remember that positive is coloured red and negative black. The H.T. battery should be of the 60 or 66-volt type and the negative H.T. plug should be inserted into the negative battery socket. The positive plug should be inserted into the positive socket first of all, but subsequently you may find that you can reduce the voltage and thereby obtain smoother reaction control. Use a good aerial and a good earth and a good pair of headphones—2,000 or 4,000 ohms will be most suitable.

Operating Instructions

Pull out the rear switch, and the set is then in working condition. Pull out the wave-change switch, and the set is adjusted for the medium waves. Push this switch in and the set is tuned to the long waves. With the condenser specified the medium waveband will be from 180 to 550 metres, and the long waves from 750 to 1,950 metres. As the reaction condenser is turned in a clockwise direction you will hear a rushing noise in the 'phones which will gradually increase until a noise aptly described as a "plop" will be heard. In this condition the set is what is known as oscillating, and if the tuning dial is turned a whistle will be heard; this whistle is radiated by your aerial and will be heard by all your neighbours over a wide area, so always turn the reaction control back as soon as the "plop" is heard. You will find that this is essential in your own interests, as in the condition in which the set is now placed speech and music will be distorted and unintelligible. To receive C.W. (continuous wave) Morse signals, however, you must have it in that condition. Next week we will give some further hints on the adjustment and operation of the receiver and the experiments which may be carried out with it. In the meantime, remember that a full-size blueprint is available.

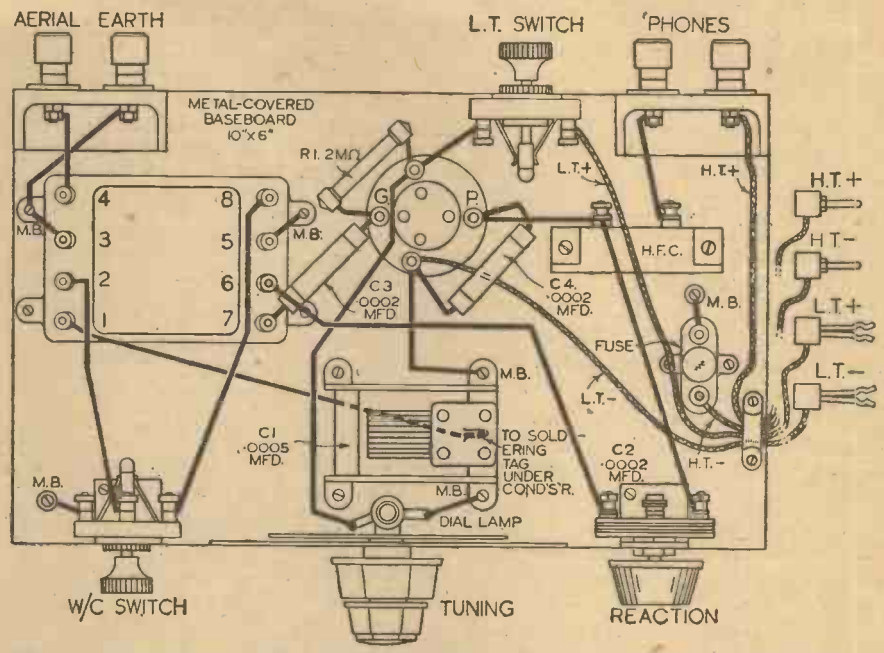


Fig. 3.—Wiring diagram of the one-valver. A full-size blueprint is available from these offices, price 1/-.

IN ENGLAND AND IN GERMANY!

Unfortunate News

A FEW days ago the B.B.C. made it public that from the technical point of view the televising of this year's Derby race should be quite satisfactory. This was very primarily due to the fact that the Epsom Downs have a high situation, and this permits the erection of a satisfactory transmitting aerial to beam the televised picture signals towards the Alexandra Palace receiving aerial located at the summit of the lattice mast. It has been proved, as a result of the many outside broadcast tests which the B.B.C. have undertaken during the last few weeks, that the success of the experiment is dependent very primarily on the "clearness" of the ether link between the mobile unit and the television headquarters, and that is why ground height in the case of the former, coupled with an absence of intervening hills or other obstacles, is so essential. According to a recent statement, however, the possibility of the Derby being televised has received a setback as the Epsom Grand Stand Association are said to have refused permission for the necessary facilities. It is difficult to correlate this attitude, however, with what happened both in 1931 and 1932, for in both these years the Baird Company had their daylight television van against the rails opposite the grand stand at Epsom, and on a low definition standard successfully broadcast televised pictures of the race in conjunction with the B.B.C. It is to be hoped that wiser councils will prevail for the world-wide interest in the race would give the high definition television service a wonderful boost. It certainly cannot be on the score of preventing people from attending the race, for television would not do that, but would on the other hand provide an unmitigated thrill for those who for one reason or another cannot make the journey to Epsom on the day in question.

A German Experiment

IN connection with the annual Ball of the German Press, which is to be held in Berlin, the government authorities are to carry out a television experiment on an ambitious scale. The function itself takes place in a series of halls in one large building, and an attempt is to be made to televise stage performances in one hall, and show the results in another through the medium of pictures projected on to a large screen. It is not yet known what particular processes are to be employed for this work, for in that country two methods seem to be equally popular. In one, the electron camera is employed at the transmitting end, while in the other the intermediate film process with its slight delay factor undertakes the work. At the receiving end results can be portrayed by mechanical scanners when the standard of definition does not exceed 180 lines, but for 441 lines the projection type cathode-ray tube may be employed, or alternatively the Fernseh Company's recently improved intermediate film receiver. It is possible that with the last-named larger pictures may be secured, but it will be interesting to learn what degree of success is achieved with the experiment. As far as this country is concerned, from the latest news available it seems possible that a far more ambitious scheme will be attempted than has been done in Germany. With the improved B.B.C. television cameras it is only a matter of time before extracts from actual London theatre shows will be available for those in possession of receiving sets. This course of action will be helped by the co-axial cable ring which has been laid round Central London. Furthermore, it is confidently anticipated that within the next few days the Television Advisory Committee will issue an important statement concerning the pending developments to be expected during the course of 1938. On all sides the outlook is rosier than ever it has been, and the culmination of the intense development work should present itself at Radiolympia in August.

ON YOUR WAVELENGTH

By Thermion

Prevention of Radio Interference

I HAVE received a communication from the National Association for the Prevention of Radio Interference, of Long Island, New York, which body has an English representative. Membership is free, and members merely have to sign a declaration that they will do all in their power to further the purpose of the Association in securing passage of adequate legislation for control of preventable radio interference, and to avoid the use of any electrical apparatus which causes such interference. The purposes of this Association are stated to be "to work for improvement of radio reception throughout the entire spectrum, through elimination by law and in other ways, unreasonable, preventable, and unnecessary electrical disturbances which are knowingly and wilfully created and which distort radio signals to the detriment not only of listeners' enjoyment of their radio receivers, but also constitute serious menaces to efficient operation of military, police, aviation and general commercial point-to-point radio communication.

"Achievement of this purpose will be brought about chiefly through co-operation of manufacturers and users of electrical apparatus which causes radio interference. This co-operation eventually will result in improvement of such devices so that they no longer will radiate interference.

"Inasmuch as it has only been very recently that radio interference has come to be recognised both as a public nuisance and a menace to public safety, very few communities as yet have suitable legislation providing for control of interference-causing apparatus. One of the primary purposes of this association is to devise and bring about the passage and enforcement of such legislation.

"Radio interference is an international as well as a local problem, and should be governed both by local and international law.

"Associate membership in this Association entails no responsibility upon the member for the actions of the Association or its financial obligations; there are no dues or other expenses devolving upon the member. In becoming an associate member your only obligation is your pledge to support suitable local and international legislation for control of interference, and where possible to use only such electrical equipment as has been so designed and constructed that it will not cause interference."

Now, I do not like the idea of an American body trying to operate to get existing British laws altered. Where it is necessary to get them changed let us institute schemes to get them modified ourselves. We do not require, nor do we seek advice from Americans on this matter. The laws of this country have been a pattern to the world, and it may sound something like an insult to the British race that citizens of a comparatively new country whose own laws are based on those of ours, and were inspired by them, should now seek to start a British section in the mistaken idea that they can set our house in order.

We already have machinery in this country for dealing with radio interference; you merely have to write to the Postmaster-General or to your local postmaster if your set suffers from electrical interference. The Post Office will then investigate the matter to your satisfaction, and most probably eliminate the trouble. There is, therefore, no need for American operations of the sort I have mentioned.

Club Journals

I HAVE received another club journal, this time from the Brentford Amateur Radio Society. This is in the form of duplicated foolscap sheets, which includes club news and notices, technical information, and reports of meetings. I quite agree with Mr. Deane Sainsbury that with a small membership it is out of the question to have such a journal printed. I rather like the informative style of these sheets.

Humour

HEREWITH a communication from A.M.P., of Boston:

"Some time ago I built for a friend the Iron-core Two (QPP), an *Amateur Wireless* design, and results were fairly good. Some time after he asked me if I could make it so as to get a bit more volume. National and Regionals were fairly good, but Radio Normandie and Hilversum were not strong enough for pleasant listening. I added an SG stage and results were very good.

"A few months after, I had occasion to visit him, when I noticed that he had shortened his aerial. I had fitted one up about 75 feet long, and he had cut it down to about 40 feet.

"He told me that since I had improved his set it was using a good bit more battery, and so he thought that by using a shorter aerial there would not be quite so much battery used. I was several hours the following Sunday proving to him by the use of a borrowed milliammeter, using his present aerial, and then with a longer one, that he was wrong. Even then I do not think I properly convinced him.

"My set is a det. 2LF. I have tried it with RCC in both stages, and RCC and transformer, but have come back to two transformers."

I am sorry to have to disillusion A.M.P., but aerial length *can*, and often does, affect H.T. consumption. It is possible for H.T. consumption to *increase*, as well as decrease with a shorter aerial. I would also remind A.M.P. that the volume control in some cases affects H.T. consumption.

The Power of Criticism

HEREWITH extract from a book review in *John o' London's Weekly*:

"The odd thing is that oratory has fallen out of favour just when applied science has put into almost every household an instrument able to give the orator an enormously increased audience—the wireless receiver. Because on normal occasions fewer than half-a-dozen people are gathered together in one room to listen to what the wireless has to say, it is usually argued that the wireless manner must eschew the deliberate effects of oratory, must at all costs be easy, colloquial, unbuttoned."

Perhaps we should bless the radio that we all are able to hear the oratory, whereas formerly only the favoured few could do so. We should also be grateful that such devastating critics do not seem to exist to-day. Take, for example, the appended quotation dealing with Gladstone, and made by Lord Randolph Churchill.

"Gentlemen, we live in an age of advertisement, the age of Holloway's pills, of Colman's mustard and of Horniman's pure tea; and the policy of lavish advertisement has been so successful in commerce that the Liberal party, with its usual enterprise, has adapted it to politics. The Prime Minister is the greatest living master of the art of personal political advertisement; Holloway, Colman, and Horniman are nothing compared with him. Every act of his, whether it be for the purpose of health or of recreation, or of religious devotion, is spread before the eyes of every man, woman and child in the United Kingdom on large and glaring placards."

Or the following piece of biting sarcasm: "The forest laments in order that Mr. Gladstone may perspire." Here is another piece still dealing with Gladstone.

"For the purposes of religious devotion the advertisements grow larger. The parish church at Hawarden is insufficient to contain the thronging multitudes of flycatchers who flock to hear Mr. Gladstone read the lessons for the day, and the humble parishioners are banished to hospitable Nonconformist tabernacles in order that mankind may be present at the Prime Minister's rendering of Isaiah, or Jeremiah, or the Book of Job."

A number of workmen "were guided through the ornamental grounds, into the widespreading park, strewn with the wreckage and the ruins of the Prime Minister's sport. All around them, we may suppose, lay the rotting trunks of once umbrageous trees; all around them, tossed by the winds, were boughs and bark and withered shoots. They come suddenly on the Prime Minister and Master Herbert, in scanty attire and profuse perspiration, engaged in the destruction of a gigantic oak, just giving its last dying groan. They are permitted to gaze and to worship and adore, and, having conducted themselves with exemplary propriety, are each of them presented with a few chips as a memorial of that memorable scene."

Such criticisms as these make me most envious.

High-resistance Joints

WHEN testing continuity in circuits it often proves worth while to employ an ohmmeter, rather than a mere continuity tester, and this fact was forcibly brought home during the servicing of a reader's set recently. He had made all the usual tests, but results on the set (an all-waver) were very poor, especially on the short waves. The set was given a careful examination and proved to be wired perfectly correctly and all joints were apparently sound. The valves were tested and found in order and coil connections were also found in order. All working currents and voltages were correct, yet results were definitely very poor. When a resistance meter was used to test between various earthed points it was found, however, that between two such points on the chassis (which incidentally formed the link between coils and condensers) there was a resistance of over 5,000 ohms, due to poor contact between the surface of the chassis and the leads which were bolted to them. The constructor had used a pair of 'phones and battery to test continuity, and thus the high-resistance joint was not discernible.

Speaker Resonance

A SPEAKER was recently examined in order to trace the cause of an unnatural bass boom and a peculiar rattle on certain of the higher frequencies. The speaker was a very old model, but was in very good condition and should have given good results. The cone was 10 inches in diameter and the field was of the energised type. After considerable tests and examination it was decided that the trouble was due to the design—the speaker having no doubt been intended for a rather small output. It was eventually overcome satisfactorily by packing a very small quantity of ordinary cotton wool round the speech coil. The wool was first "teased" out and made very thin, pushed between the speech coil and the gap with a thin slip of wood, and this gave the necessary improvement without sacrificing any of the ordinary tones.

Magnetic Screwdriver

ALTHOUGH apparently well known to the majority of constructors, it should be pointed out to beginners that a magnetic screwdriver is of great use in placing screws in awkward corners. A few turns of wire wrapped round the blade of the screwdriver and connected to a voltage source provides sufficient magnetism, but in a number of cases a steel screw is not the best fitting to employ.

The Post Office Pays

THE Post Office services as a whole showed for the year ending March 31st, 1937, a net surplus for the year, after charging interest on capital, of £12,306,769, a decrease of £232,341 as compared with the surplus in the previous year. The lower surplus is to be attributed to the substantial reductions in telephone tariffs—estimated to cost £1,250,000 in a full year—which were made during 1936-37. As a result of those reductions the surplus on the Telephone Service fell from £2,126,847 in 1935-36 to £1,472,370 in 1936-37.

And now the Post Office seeks still further to compete with commercial enterprise by wanting to embark upon the sale or hire of wireless apparatus via the relay system. The B.B.C. is already a competitor in the publishing business. Shall we in a few years time find that the Government is the only shop-keeper? Will Mr. Gordon Selfridge in applying for a job in some Government store give as a qualification that he once kept a small shop in Oxford Street?

Radio Service Engineers

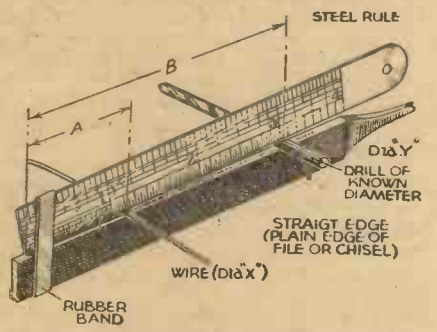
I HAVE received a letter signed by a number of people (many of whom I do not know) who, although "recognising the good intentions of bodies now in existence, are of the opinion that radio service engineers stand in urgent need of an organisation formed and equipped by themselves to give collective voice to the immediate and overdue necessity for the regulation and control of hours, wages and status in the retail radio industry, and empowered to negotiate to that desirable end." They also believe "that a general shortening of hours and the stabilisation of service conditions would be welcomed by many dealer-employers." I take it that my correspondents have in view another trade union, and whilst their aspirations in this direction are a matter for their own concern, I feel more inclined to support some new organisation which will raise the standard of technical ability, rather than a new organisation which is merely concerned with what the service engineer wants to be paid, how many hours he is going to work—in short, with what he *wants* rather than with what he is going to *give* in exchange for what he wants. I do not think I am alone in the opinion that a high percentage of service engineers know nothing of wireless, and less about service. In any case, why the misuse of the word engineer? Many service engineers should prove their merit before they can be considered of value.

A PAGE OF PRACTICAL HINTS

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

Measuring Wire Gauges Without a Micrometer

NOT all radio enthusiasts are fortunate enough to possess a micrometer to ascertain the size of fine wires. However, I have found the following method possesses



A useful improvised device for measuring the gauges of fine wires.

a good degree of accuracy, and is very satisfactory.

A suitable straight surface is found and a steel rule is secured by a rubber band, as shown. Then a drill (Y) or rod of slightly larger (known) diameter than the wire to be measured is placed between the angle formed by the rule and straight edge.

The wire (X) is then placed between the drill (Y) and the acute angle formed by the straight edge and rule so that both it and the drill are just gripped.

The dimensions A and B upon the rule are then measured, and by similar triangles we have :

$$\frac{\text{Diameter "X"}}{\text{Diameter "Y" (known)}} = \frac{\text{Dimension "A" (Measured)}}{\text{Dimension "B" (Measured)}},$$

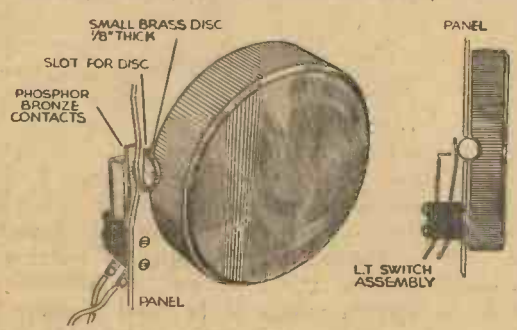
therefore

$$\text{Diameter "X"} = \frac{\text{(Diameter "Y")} \times \text{(Dimension "A")}}{\text{Dimension "B"}}$$

—W. A. HARRISON (Aintree).

Removing Another Control from the Front Panel

WITH the aid of a few pieces of ebonite procured from an old telephone key switch, a small sheet of phosphor bronze (or brass) and a bell-dome striker,



Method of operating an L.T. and filament switch from a condenser knob.

the panel in the position required for filing the disc slot, this slot being on the left of the knob, which is set at the minimum position of the reaction condenser. The contact assembly was simple enough to arrange, but there is one small point to be remembered here, concerning the fitting of the contact pieces. These are insulated from each other by means of two ebonite bushes, through which pass the 6BA fixing screws, as shown in the sketches. It will be seen that immediately the reaction condenser control knob is turned, the small brass disc is forced inwards thus making the two contacts engage, completing the L.T. filament circuit. It may, of course, be adapted for any other type of switching.—P. E. MAWDSLEY (Bedford).

THAT DODGE OF YOURS!

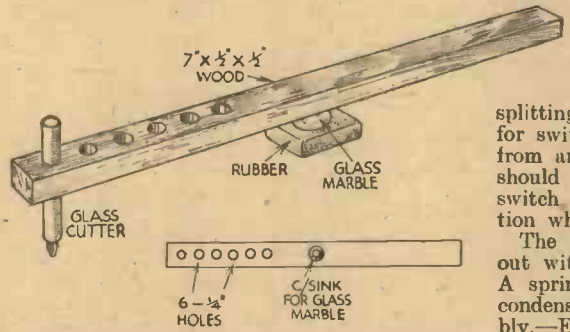
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover

I constructed a novel switching device for direct operation off the reaction condenser knob.

I first of all drilled a number of holes in



A simple glass-cutting tool for cutting discs of glass for dial faces.

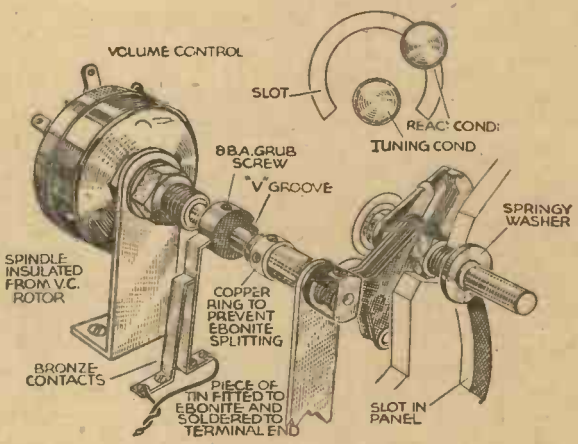
A Glass Cutter for Dial Faces

TO make this handy device a circular groove is cut in a piece of rubber to take a glass marble. A piece of wood 7in. x ½in. x ½in. is then obtained, and six ¼in. holes are drilled in it, as indicated in the sketch. Another groove is then cut in the middle of this piece of wood which is placed on the marble. A glass cutter is inserted in either of the six holes, and when the wooden arm is revolved a truly circular piece of glass will be cut which can be used for a dial face.—D. K. POWELL (Hereford).

A Triple-control Device

IN a small receiver I have just constructed I have the novel switch shown in the accompanying drawings. I am using an American type of volume control not incorporating a switch, but with a rather long spindle. This I mounted on a suitable bracket, coupling to the protruding section of the mica-dielectric type reaction condenser by means of a length of ebonite fashioned to fix over this part of the condenser, as shown. To prevent the ebonite splitting, I used a copper ring, and for switching, a disc of ebonite cut from an old switch cam; this cam should be arranged to engage the switch contacts in the "off" position when at minimum reaction.

The slot in the panel was drilled out with a ¼in. bit, and then filed. A springy washer soldered to the condenser bush completed the assembly.—E. E. LESCOTT (St. Leonards-on-Sea).



A novel triple-control device.

The Experimenters Discuss

Some More Notes About Readers' TX Circuits

WHEN we opened the subject of transceiver construction a few weeks ago our intention was to write a couple of short articles in order to satisfy those readers who had written to us on the matter. But the two articles simply resulted in our being inundated with correspondence in connection with simple transmitters in general. As we pointed out last week, we have been almost overwhelmed with interesting letters, to most of which we have attempted to reply by return.

Although we do not propose to give much more space to the transmitting side in this section at present, we do want to pass on one or two of the circuits that readers have been good enough to send to us. And if we do not deal specifically with transmitting for a short time, we shall certainly continue to include in our general articles any details of circuits of particular interest that we receive.

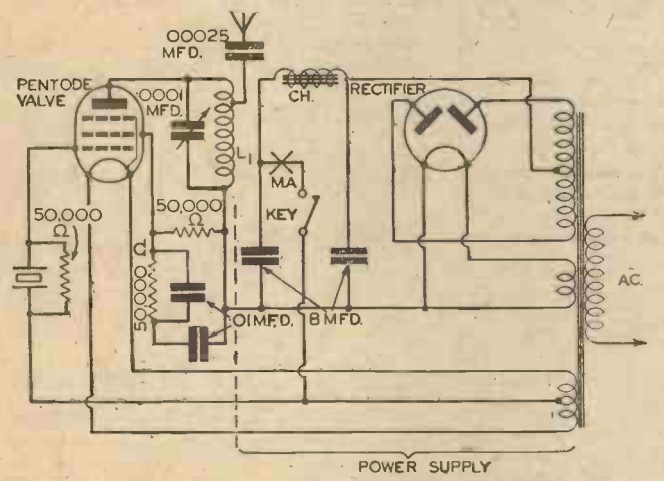


Fig. 1.—The Hartley arrangement used in Mr. Heyne's transmitter.

Single-valve A.C. TX

Reader C. Heyne, of Taunton, Somerset, thanks us for the details of Mr. Thomas's transmitter that we sent along to him, and encloses a circuit for a single-valve crystal-controlled A.C.-operated transmitter that he has received from an American source. We reproduce it in Fig. 1, and it will be recognised as being a fairly standard arrangement of Hartley style. A pentode valve is used, and a 40-metre coil consists of 10 turns of 14-gauge wire on a 2½in. diameter former. He does not say it, but the coil should be wound on a rigid skeleton former, the turns being spaced by about twice the diameter of the wire. The optimum position for the aerial tapping should be found by trial, but the tapping should be made as near as possible to the anode end; a crocodile clip could be used in finding the best position.

The valve can be almost any output pentode with 4-volt filament, the rectifier being a full-wave 250-volt 60 mA type. For the pentode, a Cossor PT41 could be used, or a tetrode such as the Osram KT41 or Hivac AC/Z might be employed instead. Values of most of the components are shown, and the iron-cored choke should be rated at about 20 henries at 50 mA.

Three-valve Battery Transmitter

By way of contrast is the three-valve battery-operated TX circuit shown in Fig. 2 and sent by a reader who prefers to

by The Experimenters

be known as O. W. L. (is there a catch in that?), of Bournemouth. The coils shown are for 40 metres when wound on a 1½in. diameter former. As made by O. W. L., the turns were placed side by side, the grid and anode coils being separated by 1in. when placed end to end. It will be noticed that the oscillator circuit is not fundamentally different from that used in Fig. 1 and in several circuits that we have previously given. Choke modulation is used, a centre-tapped output choke being included in the anode circuit of the oscillator.

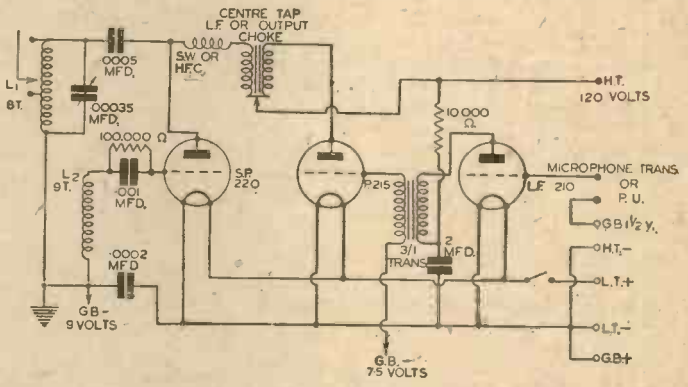


Fig. 2.—A three-valve transmitter for battery operation.

The modulator section includes two valves, which give a fair degree of amplification between the microphone and the oscillator. No difficulty should be experienced in building an outfit round this circuit, but it would be far better to use crystal control if it were to be used by a fully-licensed amateur on an outside aerial. The only alternative would be to have an accurately-calibrated wavemeter with which frequency checks could be made at frequent intervals. It is, however, more suitable for use by the beginner with a dummy aerial, for the circuit is of a rather old-fashioned type which has greater merit as a very simple set than as a high-efficiency outfit.

Battery Transceiver

Coming back to the transceivers, we have received the circuit shown in Fig. 3 from Reader D. Kettingham, of South Harrow. It represents an arrangement that Mr. Kettingham used successfully some time ago. You will see that the TX is on the left, the receiver portion being on the right. You will also recognise in the TX our old friend the Hartley circuit. We used the Hartley with great success on the 440-metre band about 1924, but thought that it had died a natural death since then. Apparently we were wrong. In any case it is a very good arrangement for the beginner, for it rarely fails to behave satisfactorily immediately it is connected up.

Change-over from transmit to receive is effected by means of the three switches shown, which should preferably be ganged.

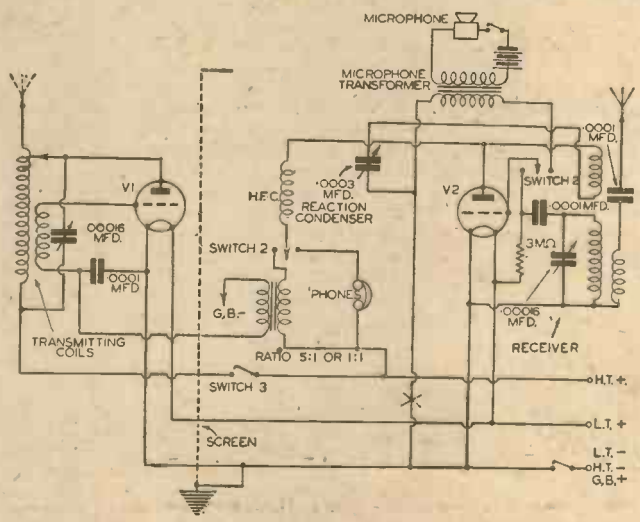
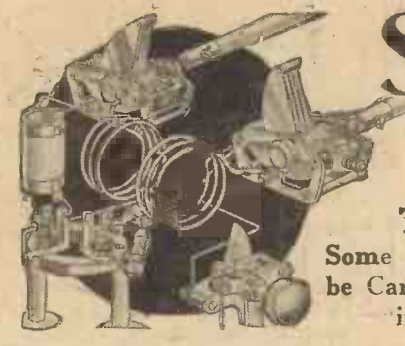


Fig. 3.—An interesting transceiver circuit suggested and used by Mr. Kettingham.

The receiver circuit is of the usual modified-Reinartz style, and there is provision for bringing either the tuning circuit or the secondary of the microphone transformer into the grid circuit by means of Sw. 1. The second switch enables either the 'phones or the primary of an inter-valve transformer to be included in the anode circuit, according to whether you are receiving or transmitting. Switch number 3 breaks the H.T. feed to the transmitting valve during reception. The sender of the circuit used an Osram HL2 for V.1, but a small power would no doubt be better.



Short Wave Section

TAPPED-COIL CIRCUITS

Some Interesting Experiments Which can be Carried Out at Low Cost are Discussed in this Article by A. W. MANN.

TO incorporate up-to-date components in a short-wave receiver, and thus to keep abreast of technical developments, is a most desirable state of affairs, but there are some constructors who, for financial reasons, cannot do so. This applies especially to young enthusiasts, for whose benefit the following notes are written concerning different types of coils and tuning circuits.

For example, Fig. 1 shows a simple two-valve circuit in which a tapped aerial coil is used. Whilst a receiver employing this type of coil is less selective than other types employing aperiodic coupling, and commercial coils, it will nevertheless provide a reasonably good performance.

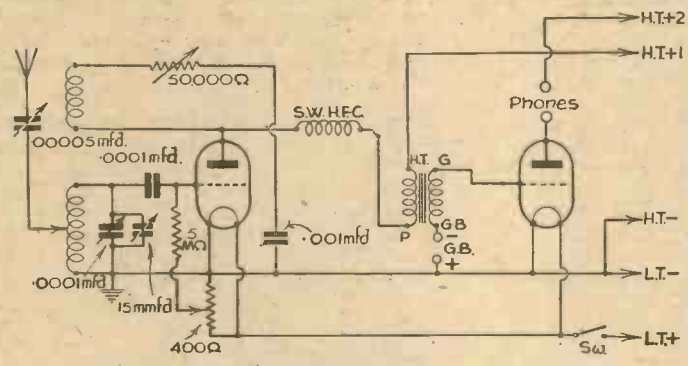


Fig. 1.—A simple two-valve circuit using a tapped aerial coil.

Tapped Aerial Coil

Before going further let us examine it in detail. The aerial is capacity coupled to the grid coil via a .00005 mfd. preset condenser, and a crocodile clip is fitted to the aerial lead, thus enabling tapping adjustments to be made as required according to the range covered by the coil. Band-spread tuning by means of a 15-mmfd. condenser is a refinement which makes for easier tuning.

The reaction scheme, however, differs from common practice, and is controlled by means of a 50,000-ohm variable resistance in conjunction with a .001-mfd. fixed condenser.

This arrangement provides a very fine control of reaction, and used in conjunction with the 400-ohm potentiometer enables smooth oscillation to be obtained.

A receiver employing the circuit outlined can be built on metal chassis lines, the variable resistance and potentiometer being insulated from the metal panel. Suitable coils can be made at low cost, and wound on 1¼in. diameter ebonite or paxolin formers.

Details of Windings

The following data will be found useful as a guide.

For 28-55 metres. Minimum and maximum range approximately.

Grid, 16 turns 30 gauge tinned copper wire spaced 3/32in.

Reaction 10 turns 32 gauge silk-covered wire.

Distance, between grid and reaction coils ¼in.

For 16-36 metres. Minimum and maximum range approx.

Grid 8 turns 30 gauge tinned copper wire spaced 3/32in.

Reaction, 7 turns 32 gauge silk-covered wire.

Distance between windings 3/32in.

Reaction winding close wound.

Tuning condenser .0001 mfd.

Allowance for circuit differences should be taken into consideration when employing the above data.

Difficulty is sometimes experienced when bare wire coils are wound on paxolin formers, and a tapping clip is used, owing to the jaws of the clip not having sufficient purchase.

There are two methods of overcoming the trouble; for example, a long slot about 1¼in. wide can be cut or drilled out of the former before the coil is wound. Alternatively, short wire studs can be soldered to the individual turns, but it should be remembered that when tapped coils are used, the tapping point or position on the individual turns is as important as a choice of a particular number of turns.

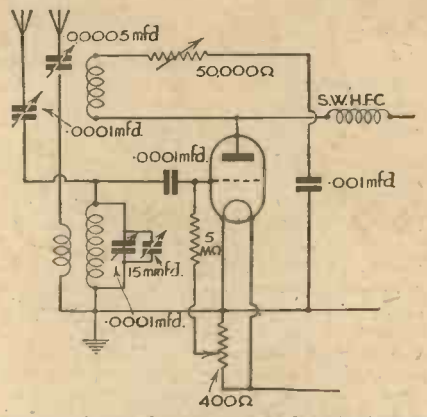


Fig. 2.—Circuit diagram showing how the detector circuit of Fig. 1 can be modified.

Fig. 2 shows in theoretical form how the detector stage can be modified at a later date to suit either four or six-pin commercial coils. Experimental coils, however, should be wound to conform to commercial standard pin connections.

Fig. 3 shows in theoretical form the once-popular Hartley circuit. In this arrangement an earth tap is used, and in which one half of the coil acts as the reaction coil.

Coil Construction

Reverting to paxolin formers, Fig. 4 shows a spaced coil wound on a former of this type in which a slot has been drilled out, and finished with a flat file. It will be seen that the tapping clip has a good surface of wire to grip, thus ensuring good contact.

Fig. 5 shows an alternative idea in which short pieces of wire or stubs are soldered at different points of the coil A, B, C, D, as designated.

Fig. 6 illustrates a sound and modern method of mounting coils. Small stand-off insulators are used, and these provide a most rigid method of support.

The tapped coil principle can, of course, be applied to the short-wave adapter, and Fig. 7 shows a suitable circuit. This arrangement is very flexible, and with suitable coils can be used to cover all bands between 10 metres and 160 metres, and higher. The aerial tap being altered to suit the various bands covered by individual coil and condenser combinations and tap position.

In commenting on the variable tapping

(Continued overleaf)

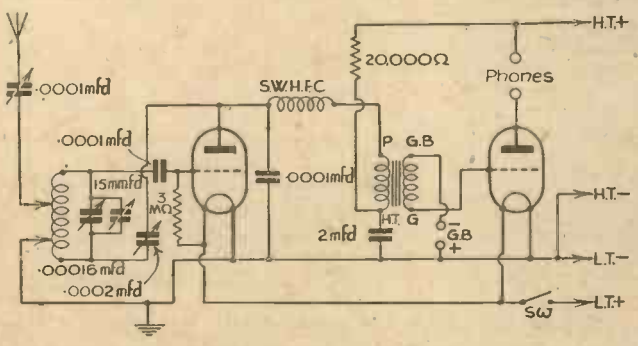


Fig. 3.—Theoretical diagram of the Hartley circuit.

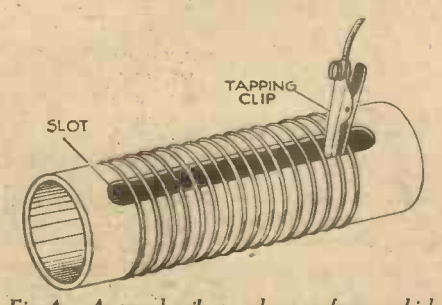


Fig. 4.—A spaced coil wound on a former which is slotted for the tapping clip.

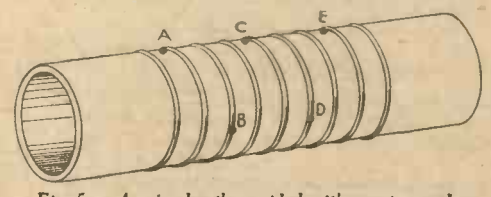


Fig. 5.—A spaced coil provided with tapping studs.

SHORT-WAVE SECTION

(Continued from previous page.)

system as applied to short-wave receivers the writer wishes to stress the following points: Dead-end losses must not be forgotten. It must also be understood that the over-all efficiency will be lower than in the case of commercially designed coils.

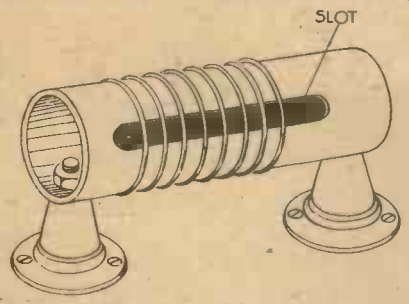


Fig. 6.—This method of mounting coils ensures rigidity.

Calibration

There is also another most important point, and this appertains to calibration. To calibrate a tuning dial with the tap at a fixed point of the coil, and to alternate between different tappings, cannot be done with any hope of retaining accuracy of calibration. If tapping studs are soldered to the coil-turns, one is assured of tapping to the same position, but even so only a fair degree of accuracy is to be expected.

When accurate calibration to the degree possible in amateur work is desired, the most satisfactory method is to use standard commercial coils of the four and six-pin type, or alternatively, one of the many dual or triple-wave tuner units.

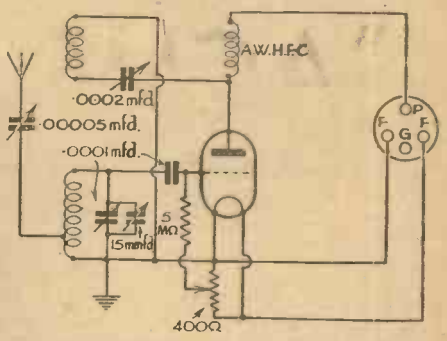


Fig. 7.—A typical circuit for a short-wave adaptor.

Leaves from a Short-wave Log

War Bulletins from Formosa

THROUGH JIB, Taihoku (Taiwan), Formosa, the Japanese authorities broadcast daily war news bulletins in English, Japanese and Chinese between G.M.T. 14.00-15.00 on 28.48 m. (10,535 mc/s).

Brazil's Propaganda Broadcasts

The transmissions made by PRF4, Rio de Janeiro, through PSH, Marapicu, on 29.35 m. (10.22 mc/s) daily from G.M.T. 00.00-02.00, are occasionally supplemented by a broadcast towards G.M.T. 20.00, PSE, Marapicu, operating on 20.09 m. (14.935 mc/s).

Another Spanish Broadcaster

Radio Norte, Madrid, is the call of EAR4M, a station owned by Union Radio in the Spanish capital. Transmissions are made daily from roughly G.M.T. 21.00 on 42.82 m. (7.006 mc/s).

The Frequency of Upol

UPOL, the call-sign of the radio station installed by the Soviet North Polar expedition, is to be heard nightly on 13.995 mc/s, or approximately 21.44 m. Two-way communication has already been established on several occasions with French, British and North American amateurs.

A New Venezuelan Station

French listeners report the reception on most nights towards G.M.T. 00.30 of a broadcast by Radio Barquisimeto giving the call-sign YV3RD (V ?), and working on 46.41 m. (6.466 mc/s). This must not be confused with YV3RA in the same city operating on 51.02 m. (5.88 mc/s), of which the slogan is: *La Voz de Lara*, or with YV2RA, situated at San Cristobal (Venezuela), formerly on 52.45 m. (5.72 mc/s), and now said to have reduced its wavelength to 51.95 m. (5.775 mc/s), *La Voz del Tachira en San Cristobal*. It is well heard from G.M.T. 23.00 onwards, but at its best between G.M.T. 01.30-04.00.

Three Spanish Groups

During the past eighteen months so many changes have been made in the Spanish broadcasting networks that it is not an easy matter for the set owner to establish the identity of the transmitters on the air. In Catalonia there now exist eleven medium-wave stations including Barcelona (EAJ1), Radio Asociación (Barcelona), and nine other transmitters of low power working on either 200 or 201.1 m. Of the Spanish Government transmitters there appear to be five medium-wavers at Madrid, Jaen, Valencia, Almeria and Murcia, as well as two powerful short-wave stations at Aranjuez, and a host of small fry which now operate on the 40-metre amateur band.

The Nationalist or "Franco" network comprises six medium-wave stations at Salamanca, Saragossa, Burgos, Seville, San Sebastian and Pamplona, and a further 39 stations working on 200 or 201.1 m. In addition six short-wave transmitters are now in daily operation, of which EDR3, el Tablero (Tenerife), rated at 20 kilowatts, is the largest.

Australian February Schedule

Sydney, VK2ME, 31.28 m. (9.59 mc/s), continues to work on Sundays from G.M.T. 06.00-08.00, and from 10.00-14.00, with a special transmission on Mondays from G.M.T. 14.00-16.00. VK6ME, Perth, on the same frequency, will work on weekdays only daily from G.M.T. 09.00-11.00. VK3ME, Melbourne, 31.55 m. (9.51 mc/s), broadcasts on weekdays only daily from G.M.T. 09.00-12.00 (noon). The time schedule of VK3LR (now VLR), Lyndhurst (Victoria), remains unchanged.

Special Broadcasts from Switzerland

The Swiss Broadcasting authorities have started a series of experimental transmissions through the League of Nations station at Prangins. A broadcast will be made on the first Sunday of each month at the following times: G.M.T. 11.00 through HBJ, 20.64 m. (14.535 mc/s), and HBO, 26.31 m. (11.402 mc/s) destined to Australia, British India, the Philippines and Iraq. At G.M.T. 14.00, a broadcast for Japan and China is carried out through HBH, 16.23 m. (18.48 mc/s), and HBO, 26.31 m. (11.402 mc/s). Later, at G.M.T. 19.00, HBO will be on the air again for Egypt and South Africa, with HBP, 38.48 m. (7.797 mc/s), transmitting for Morocco and Algeria.

Radio Cultura, Paraguay

ZP14, Villarica (Paraguay), on 48.78 m. (6.15 mc/s), giving out the slogan, *Radio Cultura, La Voz del Corazon de Sud America* is now stated to be working daily from G.M.T. 22.00. All announcements are in the Spanish language, and the studio closes down towards G.M.T. 05.00 with Sousa's popular march *Stars and Stripes*.

A Regular Chili Broadcaster

CB 1190, Valdivia (Chile), now on 25.11 m. (11.910 mc/s), relays CB 69, a medium-wave station at Valdivia, nightly in three sessions, namely, G.M.T. 15.00-20.00, 22.00-01.00 and 02.00-04.00.

S.W. Station for Vienna

A new station is to be erected on the Bisamberg, the mountain overlooking Vienna. The wavelengths chosen are 25.42 metres and 49.4 metres, and for preliminary tests, on a power of 50 kW, non-directional aerial systems will be employed so that reports from all districts may be tabulated. Eventually special beam aerials will be employed.

OPERATING AND ADJUSTING F. J. CAMM'S

"ACME" ALL-WAVE FOUR

Complete Instructions for Trimming and Adjusting This New Receiver, Together with Operating Instructions and the Adjustment of the Various Voltages

FULL constructional details were given in last week's issue, and there is just one point which may be added to those notes. It was stated that in order to render effective the screening used over certain leads the screens should be earthed, and it was suggested that a lead be soldered to the screening cable for this purpose. There are, however, quite a number of readers whose ability with the soldering iron is such that the internal insulated sleeving might be damaged, with the result that a short-circuit might be introduced, and therefore an alternative method of earthing will have to be adopted. One method is to cut off the sleeving slightly longer than the length of the lead, and then carefully to push the internal insulated tubing out at one end for a short distance. With a tapered tool a hole is then pierced in the other end of the plaited metallic covering and the insulated sleeving carefully pushed back so that it comes through this hole at the side. It should be pushed in so that a length of empty sleeving is left at the other end and the same procedure should be repeated. The insulated tubing should then be pushed out of this latter hole and this will leave the screening cable with two fairly long insulated lengths of tubing projecting with a strip of the plaited covering sticking out at right angles. This may then be twisted up and placed beneath a bolt-head or nut and will remove the necessity for soldering and at the same time give adequate protection at the ends against a short-circuit.

This view shows the completed receiver and illustrates the neat and compact layout which has been adopted.

SPECIFICATION FOR THE "ACME" 4-VALVE RECEIVER

One metal chassis fitted with coils, trimmers, S.W., H.F.C. and S.M. drive (Peto-Scott).
One 2-gang condenser, .0005 mfd. bar type (Polar).
One reaction condenser, "Dilecon" .0003 mfd. (J.B.).
One differential condenser, .0001 mfd. "Dilecon" (J.B.).
One all-wave H.F.C., H.F.15 (Bulgin).
One potentiometer with switch (3-pt.) 50,000 ohms Lab. type (Erie).
One potentiometer, 25,000 ohms, V.C.34 (Bulgin).
One Microfuse and holder, 200 mA (Microfuse).
One socket strip, A1, A2, E. (Belling and Lee).
One Class B input transformer, D.P.41 (Varley).

RESISTANCES

One 2 megohm, ½-watt
One 25,000 ohms, 1-watt
One 60,000 ohms, 1-watt
One 1 megohm, ½-watt
One 20,000 ohms, 1-watt
One 100,000 ohms, ½-watt
One 10,000 ohms, 1-watt
(Dubilier).

FIXED CONDENSERS

One 8 mfd. F.W., 150-volt
Two 2 mfd. F.W., 200-volt
Two .005 mfd. type 300
Two .0001 mfd. type 300
Three .1 mfd. type 250
One .04 mfd. type 300
One .03 mfd. type 300
(T.C.C.).

VALVEHOLDERS

Two 7-pin chassis standard
Two 4-pin chassis standard
(Clix).

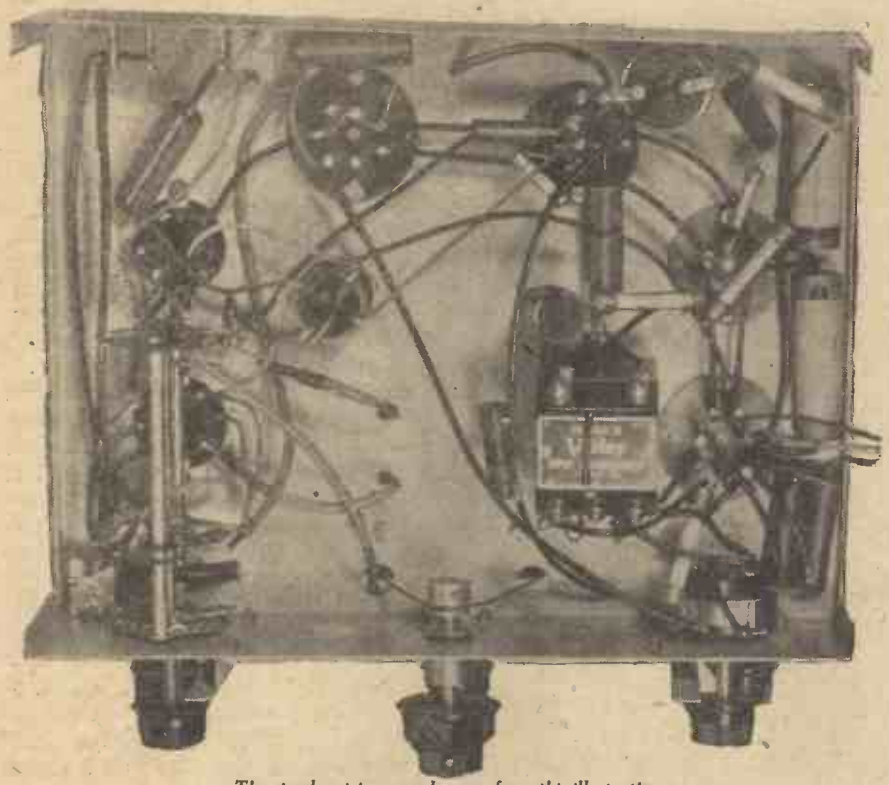
VALVES

One Cossor 210 V.P.T. 7-pin.
One Cossor 210 S.P.T. 4-pin.
One Cossor 210 L.F. or 215 P.
One Cossor 220 B.
PLUGS: H.T.—, H.T.+1, H.T.+2, G.B.+, G.B.—1, G.B.—2 (Belling and Lee).
SPADES: L.T.—, L.T.+.
One speaker, Type 38-J (W.B.).
One H.T. battery, 120-volt
One bias battery, 9-volt
One 2-volt accumulator
(Exide).

Trimming

Before the receiver will give maximum results on the medium and long waves the small trimmers fitted to the underside of the chassis will have to be adjusted, the trimmer nearest the panel being included across the aerial coil, and the trimmer nearest the aerial-earth socket being the one included in the coil between the first and second valves. Plug the H.T.+1 lead into the 45-volt socket for preliminary tests, and G.B.—1 into the 4.5-volt socket. G.B.—2 should be inserted into the 7.5-volt socket for the first tests and at a later period you may modify all of these voltages according to the results obtained. Turn the right-hand lower knob to a central position, and this will set the receiver to the medium waves. Turn the knob immediately above it clockwise as far as it will go, and turn the remaining two knobs on the left of the chassis anti-clockwise. The centre knob on the upper row should also be turned anti-clockwise as far as it will go and the receiver may then be switched on. This is done by turning the lower left-hand knob in a clockwise direction, and after a very short movement a click will be heard indicating that the on/off switch has been adjusted, and further movement of this knob will affect the H.F. gain, and for the early tests it should be turned about half-way through its complete travel. Next turn the main tuning pointer to the setting of your

local station—the dial being marked with station names to simplify matters. You should hear some signals at that point, although the signals may be weak. If nothing can be heard, rotate the knob so that the pointer travels over a short distance either side of this mark, or until you can hear a signal at some part of the dial. As soon as a signal is heard, find the exact tuning point and then carefully adjust the two trimmers referred to until the pointer is brought to the correct setting on the dial and signals are at maximum. If it is found that signals are too loud to identify easily the exact point, turn the left-hand lower knob in an anti-clockwise direction, and this will reduce the signal strength. Having obtained best results a station should be found at another point on the dial on this waveband to check up the setting of the trimmers, and when correctly carried out the wavelength settings should hold for all stations throughout the scale. Turn to the long waves (right-hand lower switch anti-clockwise) and signals should be found at the correct markings in this case also. If not, a slight adjustment should be made to the two trimmers so that these two wavelengths are correctly indicated. It should be noted that the top right-hand control—the variable selectivity device—will affect results very slightly, and this also acts as a volume control. Therefore, if a station is located exactly with this control at maximum, and for some reason the control has to be turned towards minimum, a slight readjustment of the tuning pointer may be necessary, but the movement will only be very small.

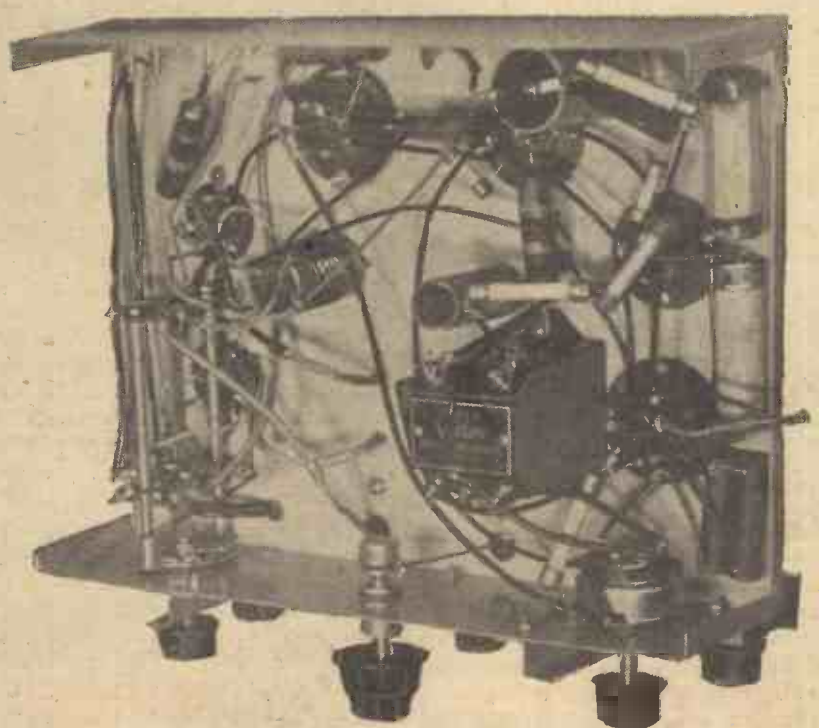


The simple wiring may be seen from this illustration.

THREE WAVEBANDS—18-52, 200-550, 900-2,100 metres. Over 1 watt output.

Adjustments

To receive a weak station it will be found necessary to keep the aerial condenser at maximum (clockwise movement) and to use also the reaction control and the H.F. gain control. When reaction is turned up (clockwise movement), the sensitivity and selectivity will be increased. If oscillation sets in before best results are obtained, turn back the H.F. gain control slightly. Similarly, if it is found that with reaction at minimum, oscillation takes place when the set is switched on or adjusted to any particular wavelength, the H.F. gain should be reduced slightly by turning back the H.F. control. In most cases a position will be found where this gives best all-round results and it may not be necessary to touch it except in very special circumstances. For instance, a very weak station may be located but it may be difficult to listen to it owing to a background from a high-power station working on a nearby wavelength. To separate these two stations the aerial trimmer will have to be adjusted, together with the H.F. gain control and the reaction control, and these three controls together will enable various degrees of selectivity to be obtained. In an extreme case it may also be found desirable to use the tone control to cut out the usual background noises due to atmospheric and similar disturbances. In all but the most extreme cases the selectivity will be found to satisfy all normal requirements, and the amount of latitude



Another view of the underside of chassis showing the wiring.

offered by these three controls will satisfy the most critical listener who is not anxious to use the superhet arrangement.

Battery Adjustments

When the receiver has been trimmed and used for a short period, experiments may be conducted with a view to finding the most satisfactory battery adjustments. The voltage at H.T.1 will govern the sensitivity of the detector stage and also affect the smoothness of the reaction control. Accordingly, experiments should be made to find a voltage which gives smooth reaction and satisfactory sensitivity in that stage. G.B.—2 is the bias applied to the driver valve, which may be either the 210 L.F. or a 215 P. Where economy is a consideration the former valve should be obtained. If high-power output is required the bias should be as low as possible consistent with good quality signals, but where economy is the most important consideration the bias should be as high as may be applied without distortion. The voltage at G.B.1 will affect the sensitivity and also selectivity of the first stage, and in most cases a voltage of 4.5 will be found to offer the most satisfactory results. The tone control is, of course, adjusted according to the type of item being received, and each listener will have his own opinions regarding the best setting for this control.

Short Waves

When the receiver is adjusted to the short waves (right-hand lower switch clockwise), the two trimmers are out of circuit and the aerial is of the aperiodic type, the short-wave choke acting as the aerial coil. Terminal A1 will in most cases be found desirable for the short waves except in very bad cases, where the aerial trimmer will assist in removing the damping effect of the aerial and may assist in obtaining smooth reaction control. The remaining adjustments are exactly as have been mentioned for the broadcast wavelengths, except that tuning will have to be carried out very slowly and the smaller of the double tuning knobs will have to be used for tuning. The station indications on the short-wave dial will assist in locating the stations, although it should be remembered that a large number of stations will be heard at quite a small interval, and the utmost care is needed to tune them in clear of one another.

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.

EDGWARE SHORT-WAVE SOCIETY

THE first lecture of the above newly-formed society was held on Wednesday evening, February 2nd, at the Edgware Constitutional Club, Edgware, when the chairman, Mr. P. A. Thorogood, introduced Mr. L. Brand, G2KQ, who gave a talk on Low-powered Transmitters, bearing in mind cost and possibility of higher power at a later date.

A description and details of a 10-watt transmitter was drawn out in stages, and questions on alterations and adaptations of members' own parts were discussed. After an enthusiastic meeting, the lecturer promised to give a 9-valve 18-watt short-wave set to the first new member who still had no artificial aerial licence, and could transmit Morse at 12 words per minute, by March 9th. New members are welcome any Wednesday evening at 8 p.m. at the club, and further particulars can be obtained from the hon. secretary, G. Yale, 40, Raeburn Road, Edgware.

THE I.S.W.C. (BRIGHTON CHAPTER)

AN interesting meeting of the above club was held on Wednesday, January 3rd, at the local H.Q. A number of interesting lectures for the future have been arranged. Regular Morse instruction is an important feature of each meeting. A.A. licences are now held by seven of the club's members, as well as two full calls, and the club anticipate a call being granted shortly.

All local persons interested in any phase of radio are cordially invited to attend at the headquarters: Seafield Dance Hall (Seafield Garage), Kingsway, Hove. Enquiries will be welcomed by the acting secretary, C. T. Fairchild (2DGR), 1A, Dover Road, Brighton, 6.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THE above organisation is to hold its Fifth Annual Dinner and Dance on Saturday, March 5th, at Maison Lyons, Shaftesbury Avenue, W.1. The function will be attended by short-wave listeners from all over the British Isles, also by representatives of the radio manufacturers and broadcasting organisations. The chief guest will be the French Consulate-General. It is hoped that all short-wave minded people, especially readers of PRACTICAL AND AMATEUR WIRELESS, will attend. Tickets are 6s.6d. each. Evening dress optional. Early application for tickets is essential. Arthur E. Bear, 100, Adams Gardens Estate, London, S.E.16.

ROBERT BLAIR RADIO SOCIETY

THE above society is now twenty strong, and has formed itself into two groups, one for beginners, and another for advanced and specialising members. The construction of a transmitter has begun, to be used when the A.A. licence that has been applied for is granted.

The beginners' group have been entrusted with the construction of those component parts that can be tackled by amateurs.

The Morse class, which is held on Wednesday and Thursday evenings, is fortunate in having with them a member who holds a 1st Class P.M.G.'s Certificate, so they are being well looked after, and are making fine progress.

Hon. sec., A. R. Richardson, 24, Mercers Road, London, N.19.

EASTBOURNE AND DISTRICT RADIO SOCIETY

AT the general meeting of the above society held in their new club-rooms—The Science Room, Cavendish Senior School—the secretary announced that the M.P. for the Division, C. S. Taylor, Esq., had accepted the Presidency of the society.

Mr. J. A. Penfold gave a lecture on "High Quality Amplifiers." He described in detail the evolution of the R.C.C. amplifier and the calculation involved. He enumerated the various forms of distortion, viz., frequency, harmonic, and phase, and gave illustrations of their causes, effects, and cures. Owing to the temporary aerial, he was unable to demonstrate fully his own set.

The next meeting will take place on February 28th, when a lecture will be given on the "Principles of Amateur Transmission." All those interested should communicate with the secretary, J. P. Glickman, Kersal, Brodrick Road, Hampden Park, Eastbourne.

RADIO, PHYSICAL AND TELEVISION SOCIETY

AN interesting lecture on "Electrical Measuring Instruments" was delivered by Mr. C. W. Edmans on Friday, February 4th. The most important types of voltmeters and ammeters with their relative advantages and disadvantages, were described, and methods of calibration were discussed. The use of rectifiers for purposes of making alternating-current measurements with moving-coil instruments was explained fully, and after pointing out the various causes of errors and how these errors may, to a certain extent, be overcome, instructions were given enabling members to convert a moving-coil milliammeter into a general-purpose meter suitable for radio work.

Meetings of the society are held every Friday evening during the winter months at 72a, North End Road, West Kensington, London, W.14. Further particulars may be obtained by writing to the Hon. Secretary, C. W. Edmans, 17, Prince George's Avenue, Raynes Park, West Wimbledon, S.W.20.

BRITISH SOUND RECORDING ASSOCIATION

A JOINT-MEETING with the Croydon Radio Society was held on Thursday, February 3rd, at B.S.R.A. Headquarters, 44, Valley Road, Shortlands, Kent. The success of the evening was assured by the large attendance and the interest aroused by Mr. L. Widger's talk on "Sound Recording on Direct Play-back Blanks" with subsequent practical demonstrations. Mr. Widger is the recording engineer for St. Dunstan's, and the National Institute for the Blind. Among the disc recording apparatus used was a portable recorder brought along by Mr. O. Katz, of the V.G. Manufacturing Co., Ltd. An amateur constructed ribbon (velocity) type microphone and an Epoch moving-coil microphone were employed for recording. Excellent quality recordings were "cut" on "Phonodisc," "Pyral" and "Simplat" blanks. The members of the Croydon Radio Society expressed their appreciation of the facilities provided by personally recording the vote of thanks.

To assist beginners to make successful recordings is one of the main objects of this Association, so that if any reader would like to receive particulars of membership of the B.S.R.A, please send a three-halfpenny stamp to: Hon. Secretary, Mr. Jas. F. Butterfield, 7, Ernest Close, Beckenham, Kent.

THE DERBY SHORT-WAVE RADIO AND EXPERIMENTAL SOCIETY

THE above society invite any reader who is a keen radio enthusiast to attend our meetings held every Tuesday evening at 8 p.m. in our clubroom.

We have a number of vacant dates for lectures and demonstrations, and would appreciate any communication from firms willing to give lectures or demonstrations to members of our society. Further information may be obtained from the secretary, H. Turner, Nunsfield House, Boulton Lane, Alvaston, Derby.

THE SLOUGH AND DISTRICT SHORT-WAVE CLUB

ONE of our most successful meetings was held on February 1st, when Mr. K. Sly gave the second of his series of lectures on the fundamentals of radio. This talk dealt mainly with the various types of condensers, their construction, and uses. Ably assisted by his brother, Mr. Sly demonstrated valve and condenser tests with the aid of a neon lamp, while specimen condensers were dissected and put on view.

The second part of the meeting consisted of a display of apparatus made by members. Owing to pressure of time, we were unable to continue with the construction of the club RX, and this item has been put forward to the next meeting.

We have recently enrolled several new members, and we hope that anyone interested in the club will write to, or call at, the address below.—Hon. Sec.: J. H. White (2DAJ), 20, Chalney Road East, Slough, Bucks.

THE EXETER AND DISTRICT WIRELESS SOCIETY

THE first meeting of the Exeter and District Wireless Society for their Spring Session was held on Monday, February 7th, at No. 3, Dix's Field, Exeter, and the first lecture for this session was given by Mr. H. A. Bartlett, a well known local amateur transmitter.

He took for his subject "First considerations for the would-be transmitter." He started from the receiving end, and carried his talk right through to the final transmitting stage, showing the audience each step which should be taken by the person who is sufficiently interested to obtain a transmitting licence.

Meetings are held each Monday, at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

Important Broadcasts of the Week

NATIONAL (261.1 m. and 1,500 m.)

Wednesday, February 16th.—Symphony Concert from the Queen's Hall, London.

Thursday, February 17th.—Variety from the Holborn Empire.

Friday, February 18th.—The Bartered Bride, a comic opera by Frederic Smetana.

Saturday, February 19th.—Palace of Varieties programme.

REGIONAL (342.1 m.)

Wednesday, February 16th.—Excerpt from Hide and Seek, from the London Hippodrome.

Thursday, February 17th.—John Snagge goes diving.

Friday, February 18th.—Concert party programme from the Grand Theatre, Doncaster.

Saturday, February 19th.—Ice Hockey: World Championship Series, a commentary during play from the Zimni Stadium, Prague.

MIDLAND (296.2 m.)

Wednesday, February 16th.—Romance in Music: vocal programme.

Thursday, February 17th.—Orchestral programme from the Town Hall, Birmingham.

Friday, February 18th.—The Changing Midlands: Looking at the Future.

Saturday, February 19th.—A Recital of Ivor Gurney's songs.

NORTHERN (449.1 m.)

Wednesday, February 16th.—Excerpts from Humpty Dumpty, from the Grand Theatre, Leeds, and from Cinderella from the Palace Theatre, Manchester.

Thursday, February 17th.—Variety from the Grand Theatre, Blackburn.

Friday, February 18th.—Concert party programme from the Grand Theatre, Doncaster.

Saturday, February 19th.—The Northern Philharmonic Concert, from the Town Hall, Leeds.

WEST OF ENGLAND (285.7 m.)

Wednesday, February 16th.—They Made the West—a chronicle of English History—5, Pirates, Slavers, Heroes All, a talk.

Thursday, February 17th.—Choral programme.

Friday, February 18th.—Ice Hockey: a running commentary from the Coliseum, Bristol.

Saturday, February 19th.—Hunting Men at Home: a programme from the Tudor Music Room at Marston Court.

WELSH (373.1 m.)

Wednesday, February 16th.—Darts: a running commentary on the final stages of the Welsh Sports Cup Knockout Competition, from the Carlton Restaurant, Cardiff.

Thursday, February 17th.—Three Characters (and a Dog) In Search of an Author, a dramatic feature.

Friday, February 18th.—Power for the People: a dramatic programme showing the great part that electric power plays in our lives to-day.

Saturday, February 19th.—Mystery at Milford Haven: a serial play from Taffrail's novel—6: Death for a Smuggler.

SCOTTISH (391.1m.)

Wednesday, February 16th.—Our Lady's Port of Grace, Newhaven feature.

Thursday, February 17th.—Clann Righ Lochlainn: The Clan of Lochlann, a one-act play by Bessie J. B. MacArthur.

Friday, February 18th.—Music from the Scottish Past.

Saturday, February 19th.—Scotch Broth: A "record" collection of Scots Variety turns.

February 19th, 1938. Vol. 3. No. 88.

Closer Co-operation

THE Parliamentary benediction on the television service was followed by an R.M.A. dinner at which were present manufacturers, Press, representatives of the B.B.C., and Television Advisory Committee. During the course of the speeches the whole television situation was explained in detail and Sir Frank Smith gave an opinion that in ten years' time the industry would boast of an annual turnover of £100,000,000. A plea was put forward for the establishment of a satisfactory export market, it being stated by the speaker that television was the most marvellous invention since the Creation, while every worthwhile contribution to its development had been made in this country. Another outside broadcast van had been ordered so as to extend this particular side of the programmes which had proved so popular. With a concerted effort of this nature there seems little doubt that television is assured of rapid development, and the next important item is purely a financial one to consolidate the aims of those in charge of the service. Another sign of the times is to be the closer co-operation between sound broadcast and television broadcast officials of the B.B.C. The former intend to include excerpts from the television programmes with the idea of making those who listen-in realise what they are missing from the vision point of view. A start has already been made in this connection, and the results should certainly justify the efforts.

A New Set

IN connection with this year's British Industries Fair, the Baird Company have introduced a new television receiver which has been called Model T.14. Designed on modern lines, it represents the high-water mark of technical achievement, for it embodies a television set giving a brilliant black and white picture 13½ inches by 10¾ inches in size which is viewed in a part-mirrored lid. In addition, the figured walnut cabinet incorporates an all-wave radio receiver, radiogram, automatic record changer with crystal pick-up, and either a cellarette or record storage chamber, according to customers' requirements. An instrument of this nature certainly provides a wide choice of home entertainment and is a great improvement on the T.13 set of the same firm. It will be shown for the first time on Stand A709 in the Grand Hall of the Olympia section.

Picture Size

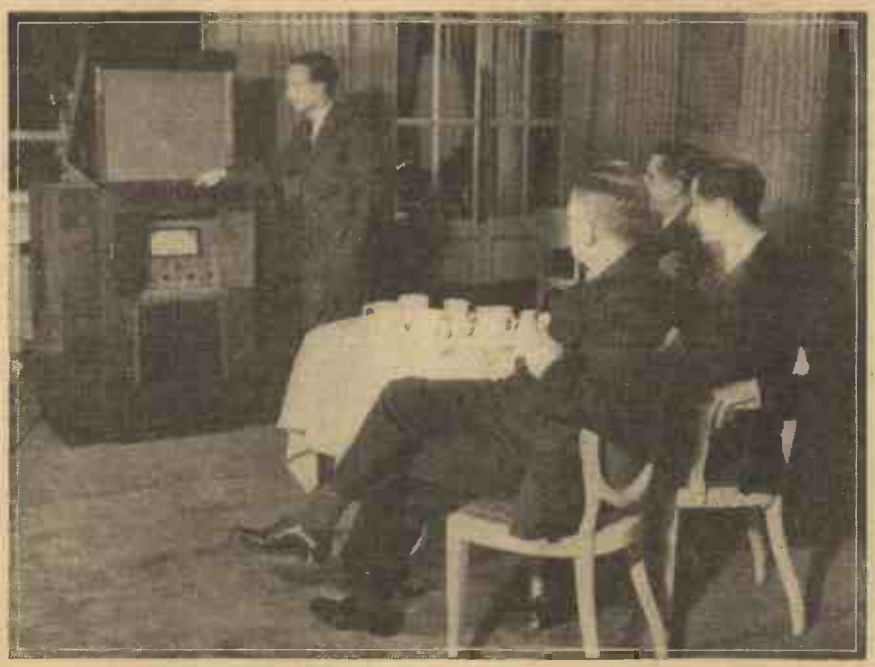
THE problem of the right picture size for a home television receiver still forms the subject of heated arguments wherever engineers foregather. Leaving out all questions of cost there are many who voice the opinion that the 10 by 8-inch picture provided by a 12-inch cathode-ray tube is just correct for the few members of the family who assemble in the average-sized room to enjoy the programme service. In support of this, arguments are brought forward showing that at the average viewing distance this gives the same eye reaction as a cinema picture seen from, say, the circle seats in a modern cinema. This is no doubt correct, but a 50 per cent. increase in picture area is a distinct advantage if the number of people looking-in is augmented by unexpected visitors. It is not possible to watch a television picture in comfort close to a set owing to the line formation of the image becoming unduly prominent. On the other hand, if the picture size is increased too much, then the minimum viewing distance must go up in the same proportion for the same line reason and this may tax room accommodation and tends to crowd the company together. There is no doubt that increased picture size means increased cost for a variety of reasons—larger tubes, more expensive cabinets, bigger scanning voltages and so on—so that in the end it resolves itself into a personal matter entirely. At the present state of the art those purchasers who wish to limit their expenditure will find the smaller size picture of, say, 10 inches by 8 inches sufficient to provide exceedingly good entertainment value. On the other hand, anyone able to meet the additional cost will find extra satisfaction given by a picture some 50 per cent. larger in area, as furnished by an overscanned 15-inch diameter cathode-ray tube.

A Surprise Demonstration

THE other day the public audience at the Dominion Cinema, London, were given a surprise item in the programme by the inclusion of a demonstration of Baird colour television. The programme included a fashion show of ladies' hats; pictures of flags and notable people, and a compère illustrating different characters. All the pictures were in colour, being transmitted from a special studio at the Crystal Palace, the vision signals being on a wavelength of 8.3 metres from a low-power ultra-short-wave radio transmitter whose aerial was located at the summit of the South Tower. The three primary colours of red, blue and yellow were used, a synchronised colour filter scheme enabling the pictures seen on a twelve-foot screen to be reproduced with remarkable clarity. Scanning by mechanical means—a combination of slotted disc and mirror drum—was used at both the transmitting and receiving ends, a primary definition of twenty lines being interlaced in such a manner that the final picture was built up into 120 lines.

Mr. Baird Satisfied

AT the conclusion of this surprise public demonstration, Mr. Baird disclosed that he was more than satisfied with the experiment. He pointed out that the show had proved quite definitely that the television transmission of colours by wireless to a large screen was an accomplished fact. While admitting its present imperfections when compared with present black and white processes, the inventor stated that the colour process was being developed in the company's laboratories by both the cathode ray and mechanical systems, and the perfection of the former would eliminate the moving bar effect now seen on the present day colour television pictures. Just as modern high definition television pictures had progressed rapidly from the crude efforts of ten years ago, so a similar state of affairs would arise with colour and the ultimate aim was full-sized colour television pictures for every cinema.



The new Marconiphone large-screen television receiver being demonstrated to members of the Press.

TELEVIEWS

A Novel Application

WHILE in this country concentrated effort inasmuch as television is concerned seems to be directed towards the perfection of a public service for entertainment purposes, in countries abroad news repeatedly comes to hand of novel applications of the science for quite different purposes. A case in point is that in Moscow, where television apparatus has been installed in the infectious disease wards of a hospital. A relative of a patient is led to a panel outside the ward where a television receiver screen is linked to a camera inside the ward. The camera is wheeled slowly past the different beds until at a signal given from outside, it stops, and the patient in that bed is visible to the person outside. A telephone from the bed to the panel enables conversation to be undertaken, while the camera gives a television picture of the patient without any danger of infectious contact between the visitor and the person ill in bed. Joy and pleasure is given to all by an ingenious application of this nature, and the humane benefit must be very material to anyone isolated in hospital under such circumstances. The case serves to furnish just one more instance of the extensive ramifications of television, and shows how in the future routine will be altered when simple portable equipment is developed which can be handled by even unskilled hands.

Projection Tubes Again

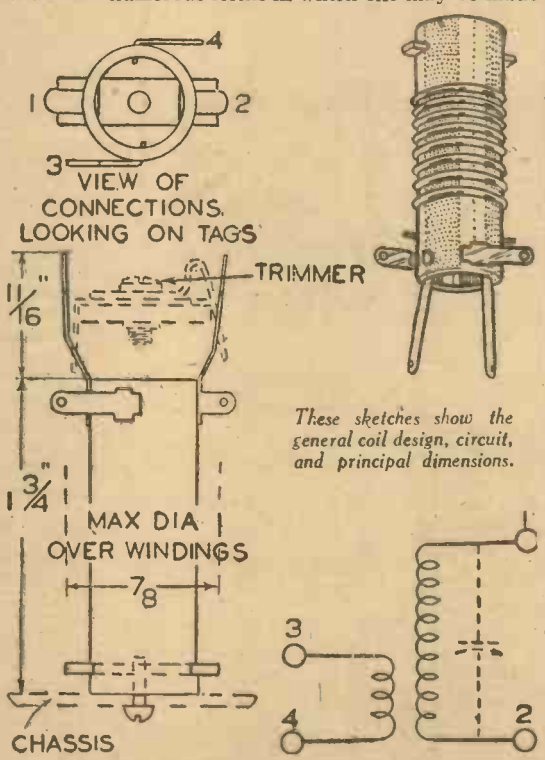
IN the summer of last year the first projection cathode-ray tube receiver was shown as a Baird exhibit at the Science Museum Television Exhibition. This was followed by both the Philips and Marconi-E.M.I. companies showing a home model receiver using the same form of C.-R. tube at Radiolympia, although the exhibits were withdrawn from the exhibition after two days at the request of the R.M.A. Now both the Marconi and H.M.V. companies have produced a projection tube receiver in a commercial form suitable for clubs, hotels or small halls. This gives a picture 22in. by 18in., and serves to emphasise the value of this small type of tube for television picture reconstitution when used for back projection on to a translucent screen with a suitably arranged lens system and mirror reflectors. Sets built on these lines were shown at the 1937 Berlin Radio exhibition, being described some weeks ago in these columns. It must not be overlooked either that Germany also showed how projection tubes can be used in a modified form of light spot scanner at the transmitting end. In a demonstration which the Germans staged, the tube was made to replace the familiar disc or mirror drum type spot light scanner. The apparatus was designed to enable the small but intensely bright field on the tube screen to project its scan by means of lenses on to a person's features, so that the reflected light variations could be made to activate suitably positioned banks of photo-electric cells. Used in this way, the device has the advantage of being silent in operation, and may find application in various forms of public address television systems where extreme mobility and ease of setting up on site were the most important factors to consider in the installation.

THE BRITISH LONG-DISTANCE LISTENERS' CLUB

All-wave Set Design

SINCE the publication of an article on the design of a "communications" type of receiver, a large number of members have written for further details, and it would appear that the types of set required are almost impossible to count. One member requires only one short-wave range in addition to the broadcast bands, whilst another requires two or three short-wave ranges. It is also surprising what a large number of listeners require the set to be really "all-wave"—that is, covering all wavelengths from 5 to 2,000 metres without a gap. Such a scheme is, of course, very difficult to devise, and in most cases is totally unnecessary, as from 100 to 200 metres there is little to provide entertainment. Certain commercial broadcasts might prove of value to learners of the Morse code, but as these are practically all in code there is nothing to be gained from them, and, furthermore, under the strict conditions of the licence, a listener is not supposed to listen to anything but the broadcast entertainment programmes. However, for those who are interested in a set which may be controlled by a multi-contact switch to cover many wavelengths the latest Wearite coils should prove of value. As we have mentioned before in these pages, the coils are of very small dimensions, air-cored, and designed for all-wave or experimental apparatus. We give the essential data concerning these coils in the accompanying illustration and it will be noted that there are only four connections required, although a small padding condenser must be used in conjunction with them to provide the necessary trimming adjustment to enable a gang condenser to be used.

In this range of coils (known as the Type "P") there are aerial coils, H.F. transformers, oscillators, filters and beat-frequency oscillators, so that a really modern set may be built round them. A further great advantage is the very low cost, the prices ranging from 1s. 4d. to 1s. 9d. each. Special multi-contact switches for use in conjunction with these coils are also available.



These sketches show the general coil design, circuit, and principal dimensions.

Details of the Wearite Type "P" coils.

Auto-tuning Units

Members who are interested in converting their existing broadcast apparatus for push-button tuning, may be interested to know that this may easily be carried out, provided that a short-wave converter is employed in conjunction with their receiver. In other words, the conversion is carried out by building a simple short-wave converter and providing this with the push-button mechanism (built up on the lines described in a recent article). This converter unit will then be connected to the broadcast set in the usual way, and the latter will be tuned to the long waves, the set being operated merely by pushing the buttons for the desired station. If one of these buttons is connected to an ordinary change-over switch, it may be used as a manual control, cutting out the converter and connecting the aerial direct to the aerial terminal on the broadcast set.

Neutralising Condensers

A very small capacity condenser which often proves useful to the experimenter is the old type of neutrodyne condenser. This was available in many different types, and for members who are anxious to try out various experiments with this midget type of condenser there are numerous forms in which one may be made up. For instance, two small pieces of metal tubing, one small enough to fit inside the other, and a piece of glass tubing—cut from a test tube, for instance—will make quite a good condenser. The smaller piece of tubing may be fitted with a disc at one end, and soldered to a threaded rod so that it may be raised and lowered with very small movements. An alternative idea is to use two pieces of thick tinned-copper connecting wire, each pushed inside a piece of insulated sleeving, or a piece of glass tubing. These are then laid side by side, and by varying the amount of metal inside the tubing the capacity may be varied. Where permanency is desired these two pieces of wire may be held down firmly on a wooden baseboard by means of a small clip of ebonite or wood. Discs—such as halfpennies or metal blanks—may also be used, and adjusted towards each other by means of a threaded rod as already mentioned. For higher capacities, a disc of mica, waxed paper and other materials may be placed between them.

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.

F. C. B. (Newport, Shropshire).—The set was designed by a contemporary which is no longer published and we are unable to supply a blueprint.

T. O'N. (Ireland).—We are not familiar with the pack, which is apparently the mains section of a commercial set, and thus it may be very difficult to use it with an ordinary set.

R. G. J. (Aylesham).—At 7 amps the resistance to drop 6 volts would be .85 ohms approximately. Would it not be better to tap off your 6 volts from the accumulator? If you use the resistance a wire-wound type must be used, and it should be joined between the positive lead and the positive 6-volt terminal on the cell.

W. A. W. (N.19).—The speaker may be unsuitable. Ascertain from the makers what type of speaker has to be used before dismantling the other set.

G. E. V. (Hounslow).—We cannot quite follow your reasoning. You do not need the currents of G.B. and L.T. for the purpose, and it is a fairly simple matter to make the unit. Difficulty would be experienced in trying to operate the valve filaments from D.C. in view of the high cost entailed in dropping the mains voltage to 2. A trickle charger would be a more economical proposition.

E. J. W. (Wigan).—We do not advise you to dismantle the meter without first communicating with the makers in order to ascertain what difference this will make to the readings. It may be necessary in this particular meter to make some compensating connection if the rectifier is removed. Any good power or L.F. type of valve may be used for your purpose.

T. E. B. (Dublin).—We cannot supply blueprints of commercial receivers, and the set is not one of our designs. We have nothing which we could recommend to enable you to use up the parts in question.

P. W. (Hill, Nr. Rugby).—You may find that a good iron-core choke in series with the detector anode (H.T.) lead will remove the ripple and give you the desired results. A high-valve resistance may be just as useful, but it will reduce the voltage more than the choke mentioned.

L. G. A. (Bridgend).—So far as we can trace no such blueprint may be obtained in this country.

E. H. R. (S.W.20).—We regret that the blueprint in question is no longer obtainable, and was not one of our publications.

A. J. (Aintree).—The blueprint is no longer obtainable and issues describing construction are now out of print.

L. McG. (Bristol 8).—We think there is some fault in your modified wiring, but we have no details of the set and think it would therefore be desirable to write to Messrs. Cossor and obtain circuit details in order that you could check your connections.

F. G. P. (Leicester).—The colour-code in question is identical with that used for resistances. The standard is micro-microfarads.

G. B. D. (Bristol).—So far as we are aware you will be unable to make use of your televisor. It has not yet been found possible to adapt a scanning scheme of the type you refer to and great difficulty would be experienced in obtaining sufficient brilliancy with such a small spot. What form of modulation would you intend to adopt for the light you mention?

F. R. S. (Newport).—The cost would depend upon the components used. We cannot supply a blueprint and therefore cannot give a quotation. The output is also rather high for a battery-operated unit, and the cost of maintenance would be very high indeed.

R. W. C. (Horley).—The consumption figure given by the makers is the maximum and will only be obtained when the valve receives maximum H.T. Your current is very low, and this may be due to a faulty valve or to insufficient H.T. It would account for the distortion.

J. A. (Fife).—The full address should be given when it can be traced. The Radio Amateurs Call Book gives many such addresses, and in addition, gives addresses to which cards may be sent where the full address is not known.

R. S. (Markspool).—The International Coupon is obtainable from any Post Office and you should send one with your report of reception, which should be as complete as possible. You must not always expect to receive a card in exchange, but in the majority of cases a card will be sent.

J. W.-S. (Rugby).—Values will depend upon the valves and the makers will be able to supply you with the most suitable values. Some experiment may be necessary before a satisfactory circuit is obtained.

C. P. (W.9).—We recommend the Harris Radiogram or the Listeners 5-watt Amplifier, the former battery-operated and the latter A.C. mains operated.

BOOKS RECEIVED

FUNDAMENTALS OF RADIO, by F. E. Terman. Published by McGraw-Hill Publishing Company, Ltd., Aldwych House, London, W.C.2. 458 pp. 278 illustrations. Price 21s.

This is a text-book of modern radio, prepared and printed in U.S.A. There are seventeen chapters progressing from the Fundamental Components of a Radio System, through Circuit Elements, Valve Amplifiers, Transmitters, to Radio Aids to Navigation. It deals very fully indeed with all aspects of modern radio, both on the transmitting and receiving side. Many of the terms used, components illustrated, and complete receiver circuits discussed, are essentially American, and in some cases may prove rather obscure to the English amateur. Such terms as antennæ, power lines, and tubes will, however, readily explain themselves when studied in conjunction with the remaining text, and the book will appeal to all who are anxious to obtain in one volume a complete treatise on the technique of modern radio in all its phases.

AIRCRAFT RADIO, by D. Hay Surgeoner, A.F.R., Ae. S. Published by Pitman. 151 pp. 54 plates and 19 line drawings. Price 12s. 6d.

This is a complete manual of radio as applied to aircraft and deals, in addition to the equipment used in modern aircraft, with direction finding, blind landing and similar applications. There are 10 chapters dealing with The Development of Radio for Aviation; the Control of Radio Networks and International Regulations; the Allocation of Wavelengths and Wave Characteristics; Communications Systems; Directional Systems; Approach and Landing Systems; Communications, D.F. Equipment and Operation; Airport Equipment; Weather Broadcasts and Airport and Airway Lighting. In preparing the book the author has had the assistance of the principal firms engaged in this country and abroad in the design and building of the apparatus, and thus it is fully authentic and up-to-date. Although no circuits of the various pieces of apparatus are included, there are very detailed illustrations of the different types of transmitter and receiver which will no doubt prove of great interest to the modern radio student.

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

The Superhets' Rival

SIR,—I was very interested in the above article, and wish to add my name to the many I am sure you will receive asking for a complete circuit (with list of components) of this interesting set.—H. F. DANIELS (Bowes Park).

SIR,—It was with great interest I read your contributor's article "The Superhet's Rival" in a recent issue of PRACTICAL AND AMATEUR WIRELESS.

For a number of years we have sponsored the Straight 2H.F. set—we scarcely consider it a "rival" of the superhet—the latter, we consider, does not even rival the Straight 2H.F. job.

For the reception of any worthwhile programme the straight set has certainly all the advantages of the superhet, without any of its defects.

There is only one further improvement, namely the employment of a separate L.F. valve for the amplification of the L.F. component, i.e., use the D.D.T. purely for rectification and delayed and amplified A.V.C.

The question of short waves does not appear to us as a big problem as the single valve converter does all that is required, the complete outfit, converter, 2H.F. tuner, and 14-watt amplifier, providing the best possible results in radio.

Thanking you for an interesting article.—COULPHONE RADIO MFG. CO., LTD., (Hutton, nr. Preston, Lancs).

SIR,—*Re* your article in a recent issue—"The Superhet's Rival"—a well-designed 2H.F. such as you describe, will meet a long-felt want. I have a 6-watt push-pull amplifier working a "Magnavox" 66.—S. PHILLIPS (Chelmsford).

SIR,—I would be glad if you published a detailed description of a straight circuit unit with A.V.C.—if only for long and medium waves.—A. H. FISHER (Lewisham).

[*The above are representative of the many hundreds of letters we have received on this subject and a receiver is accordingly being designed. The majority appear to require the set as a "unit" for addition to an existing amplifier, but we may make arrangements to modify the unit so that it may be built as a complete receiver. The use of a S.W. converter for short waves is not being overlooked.*—ED.]

Esperanto Broadcasts

SIR,—I was very pleased to read the paragraph about the Esperanto broadcasts from Czechoslovakia. There are about fifty stations broadcasting in Esperanto at the present time. Among these, the best are (1) Athlone, on the first Sunday of each month, talking about the Irish language and culture; (2) Hilversum (301 and 1,875 m.), giving lessons and information on Tuesdays, Saturdays and Sundays; (3) Rome (420.8 m.) and 2RO (31.13 m.), giving news bulletins and tourist talks on Mondays and Saturdays; and last but not least (4) Radio-Paris and Paris P.T.T., alternately broadcast a play every Monday night.

Rome, during the present month, are holding a contest over the radio in French, English, German, Spanish, Dutch and Esperanto. The prizes consist of railway return tickets from the frontier to Rome, and coupons for full hotel accommodation for fifteen days.—W. FARRAR, Secretary, English Esperanto Group (Leicester).

A 20-metre Log from Mablethorpe

SIR,—During the time I have been a reader of PRACTICAL AND AMATEUR WIRELESS I have not seen a 20-metre log submitted from this district. I enclose mine, which I trust may be of interest to other readers. The following have been received during the past 10 days:—

HH2B, SV1NK, CT2BC, EA3SI, CN8AV, ZB1A, ZE1JA, FA3HC, FA3JY, CN8AM, W9RLA, W4BMR, OK1SZ, ES5D, SP1MR, YT7KP, HB9BX, OZ3U, EI3J and TF3C. These stations were obtained at speaker strength, using the A.W. Short-wave World-beater 4 with outdoor aerial (inverted-L) 45ft. long and 22ft. high at mast end.—W. H. RUSSELL (Mablethorpe, Lincs).

CUT THIS OUT EACH WEEK.

Do you know

—THAT results with a portable receiver may often be improved by using an earth lead—connected to the L.T. negative terminal.

—THAT an air-spaced series aerial condenser will often accumulate a static charge and may give rise to a shock if touched.

—THAT with a push-pull stage an output choke may be used in place of an output transformer.

—THAT an air-core coil has a much larger field surrounding it than an iron-core component of similar inductance.

—THAT special ganged condensers are not essential for use in a superhet circuit, as padding condensers may be used in conjunction with a "straight" condenser.

—THAT metallic cabinets are now being used abroad for broadcast receivers.

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., Tower House, 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.

Practical and Amateur Wireless
BLUEPRINT SERVICE

These Blueprints are drawn full size.
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless ..	..	4d. Post Paid
Amateur Wireless ..	..	4d. " "
Practical Mechanics	..	7½d. " "
Wireless Magazine	..	1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, PM to *Practical Mechanics*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS	Dateof Issue	No. of Blueprint.
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	—	PW36B
The Signet Two (D & LF) ..	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen) ..	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans)) ..	*June* '35	PM1
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 (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-wave Three (HF, Det. Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW4
Fury Four (2SG, D, Pen) ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	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 "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.0.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	—	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)	—	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 (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
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)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four ..	6.11.37	PW81
SUPERHETS		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	5.6.37	PW40
F. J. Camm's 2-valve Superhet ..	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
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	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four ..	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band Spread S.W. Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE		
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set ..	12.12.36	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 Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans) ..	—	AW388
Full-volume Two (SG det., Pen) ..	—	AW392
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
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	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)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
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)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen) ..	—	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.		
65s. Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.35	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 (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*Apr.* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	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)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)	—	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	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..	—	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) ..	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America ..	23.1.37	AW429
Rome 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 (SG, D, Pen)	*Jan.* 19, '35	AW463
The Carrier Short-waver (SG, D, P)	*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-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver 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.	—	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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392 ..	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-) ..	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM403

QUERIES and ENQUIRIES

Reaction Control

"I am puzzled about the reaction on my simple set I have made. I always read that this should increase signals, but when I turn up the reaction condenser the signal fades away. Can you explain this? Is the valve faulty, as I have no duplicates which I could try and do not want to buy a new one unless it is essential?"—W. I. C. (Stocksbridge).

IF the reaction coil is connected the wrong way round this can cause the effect you mention. In some coils the reaction winding has both ends free, whilst in other coils one end of the winding is internally joined to the earthed end of the tuning coil. With this arrangement you cannot make a mistake, but in the former case you can reverse the connections made to the two ends and you should do this in your case. We may also mention that the value of the grid leak, the efficiency of the H.F. choke and the capacity of the anode by-pass condenser all play their part in the effectiveness of the reaction circuit and if you cannot obtain smooth reaction you should attend to these points.

Switch Losses

"I have tried to make an all-wave set but am afraid that I am up against a difficulty which I cannot explain. The coils I am using have been already used in separate receivers and I know the volume and waverange covered by them. I have used the latest type of multi-section switch which is supposed to be designed for the job and should like to know where I have tripped up."—A. F. (Glasgow).

ALTHOUGH you may have used an efficient switch you have probably overlooked the effect of the wiring to the switch and the tuning condenser, etc. When you use a coil singly there will be only a small additional amount of wiring, but when using several coils there will, no doubt, be additional wiring, due to the switches, and in addition the proximity of the coils to each other and to the chassis may also have a very marked effect on the range and efficiency. Incidentally, although you do not mention the make of the coils, we might point out that special ceramic switches are now available, and will give quite a marked reduction in the losses experienced in this type of receiver.

L.T. Supply

"I have modernised my set now that I have A.C. mains available, and have bought an old mains unit which will be suitable for my set. There is a 4-volt winding on this for valves, and I should like to know what type of resistance I must use to drop this to 2 volts for my valves, which take a total of .5 amps. Will a choke also be necessary?"—P. C. (Carlisle).

YOU cannot use the output in question as this is A.C., and your 2-volt battery valves must be operated from D.C. Even if you took one-half of the winding, the voltage would be excessive for the valves, and in addition, the A.C. would result in such serious hum that no signals would be audible. You must, therefore, first rectify the supply, and a rectifier to deliver 2 volts has to be fed with at least 6 volts A.C., and even so the output would be unsuitable for feeding battery-type valves. The best plan, if you wish to make the set "all-mains," is to obtain an A.C. trickle charger and keep your accumulator in good condition by charging it regularly.

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.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

I.F. Transformers

"I have a pair of 110 kc/s I.F. transformers, and now wish to change over to the 465 frequency. I can get a new oscillator coil and can pad the oscillator condenser, but am uncertain whether the transformers could be modified to give me the new frequency. Perhaps, if they can, you would indicate the best method of doing this."—P. R. (S.E.1).

TO increase the frequency to which the I.F. transformers tune you have to reduce the inductance, and thus the only way to carry out your desired effect will be to dismantle the components and remove turns from the coils. We cannot tell you how many turns may have to be removed, and cannot advise the modification as you will undoubtedly find difficulty in accurately matching the various sections in order to obtain accurate settings. In some types of transformer it may prove that with the trimming condensers at the very minimum the 110 kc/s components will approach very nearly to 465 kc/s, but in most cases turns will have to be removed.

H.F. Pentode Connections

"I always understood that the screen of an H.F. pentode had to be provided with an H.T. voltage lower than the anode, and I am sending a cutting of a circuit employed in a commercial receiver, in which the screen is joined to the anode. You will see also that the suppressor is joined to the same point, and I should be glad to know how this method of connection works out in practice, and its advantages."—A. C. (Basingstoke).

IN the circuit in question the valve is not used in its capacity as an H.F. amplifier. It is merely employed as an oscillator in a superhet frequency-changing circuit, and this particular type of valve is employed in preference to a triode in order to make full use of the remaining characteristics of the valve. It is acting as a triode, with the two grids and anode all functioning as the anode, and this is a particular case which must be judged by itself.

Extension Speaker Phenomenon

"I am using an extension speaker with my set, with two leads running through two rooms. The other day when I switched on volume was very poor at the extension point, but in the room with the set volume was as usual. After a number of tests I discovered that one of the wires running to the extension had broken, but what I cannot discover is how I could get any signals with the lead broken. The ends were not touching, and there was a gap between the ends at the break."—G. J. (N.W.10).

YOU are, no doubt, using a filter-fed output circuit, one extension lead being joined to the condenser connected to the output anode, and the other lead being joined to the earth line. It was no doubt the latter wire which had broken, and the return to earth which is necessary for the completion of the output circuit was made by the capacity existing either across the broken part of the wire, or by the capacity existing between the other lead and earth—owing, no doubt, to its proximity to the wall along which it ran. You could connect a fixed condenser across the broken ends and still obtain signals in the same manner.

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

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COLOUR TELEVISION EXPLAINED—

See page 657

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

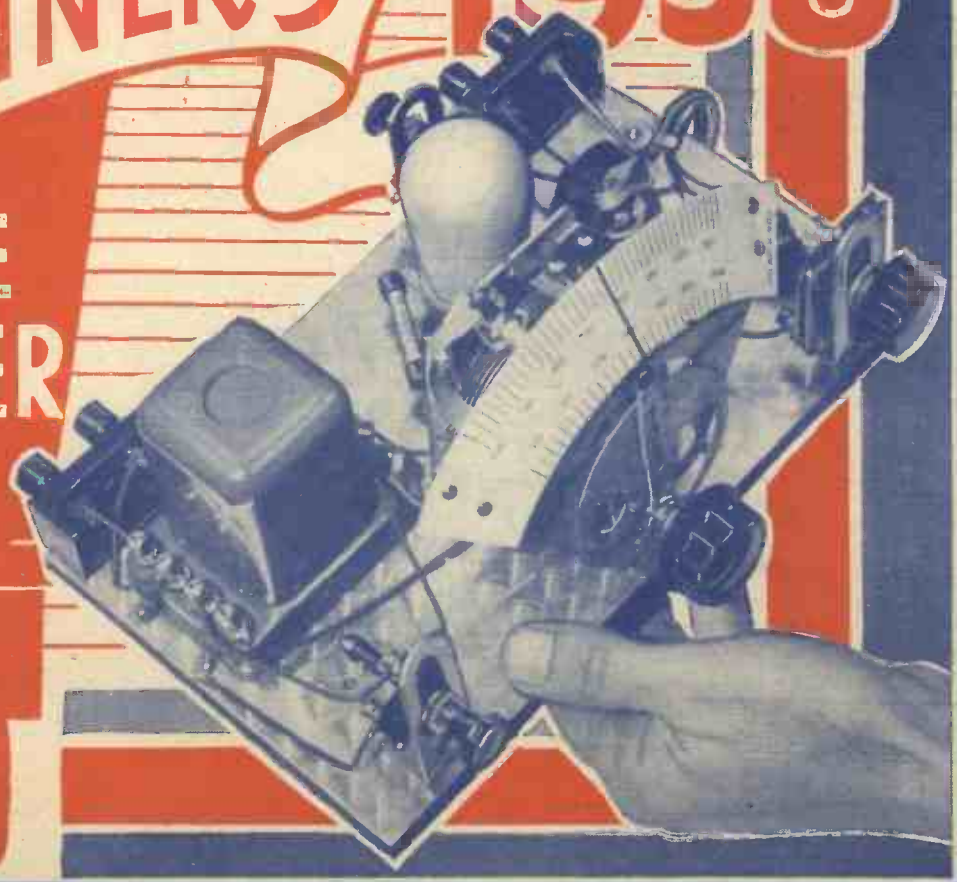
3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 11. No. 284. February 26th, 1938.

The BEGINNER'S ONE VALVER 1938



A Long-Wave Rejector Unit—See Page 664

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. XI. No. 284. February 26th, 1938.

ROUND *the* WORLD *of* WIRELESS

Colour Television

THE present-day television system is admitted by experts in all parts of the world as being the most efficient which can be designed with present-day knowledge. England is the only country in which a regular television programme for domestic use is being transmitted, and in no other country in the world are complete domestic television receivers on sale. Many other countries are experimenting with high-definition systems, and in America and Germany satisfactory transmissions have been carried out and transmitting equipment designed, but so far domestic receivers have not been made generally available. Engineers and technicians connected with the various companies have installed apparatus at different points for test purposes, but we lead the world in this respect, and with the extension of hours which will shortly take place we are establishing a lead which it will be very difficult to overtake. At present, however, the pictures are in monochrome—that is, in one colour, the general tone depending upon the chemical with which the fluorescent screen is coated. The next step in developing television is to produce the picture in natural colours, and Mr. Baird, the well-known pioneer of television in this country, has succeeded in evolving apparatus which enables this to be done, and a full description of the transmitting and receiving equipment is given in this issue for the first time. The next step will, of course, be to produce the coloured picture stereoscopically, and with that step television will be perfected.

Television at Ideal Homes

AT the forthcoming Ideal Homes Exhibition in London it is anticipated that television demonstrations will be given. An extensive television exhibit is being arranged, and if plans so far prepared materialise, a reproduction of the television studio from which various acts will be televised to the receivers in the exhibition may be included.

Bologna Not to Close Down

IT is stated that reports to the effect that Radio-Marconi (Bologna) is shortly to close down are without foundation. This station supplies a definite need in Italian broadcasting and is required in addition to the other stations such as Bari and Trieste.

Cambridge Instrument Company

THE Head Office and Showrooms of the Cambridge Instrument Company, Ltd., have been transferred from 45, Grosvenor Place to 13, Grosvenor Place. The 'phone number remains Sloane 9146.

KTSM Joins N.B.C. Network

DURING the spring the city of El Paso, Texas, will join the regular audience of the National Broadcasting Company, and station KTSM will become a member of the Pacific supplementary group available to either the Red or Blue networks.

ON OTHER PAGES

Aerial Television

ALTHOUGH it has not been possible to obtain verification, it is reported that tests are being made in this country with a portable television camera fitted to an aeroplane, with a special transmitter designed so that the 'plane could transmit to a distant point a picture of the ground over which it passes. Such a device would be of the utmost use during war-time, but the standard type of existing apparatus would be very difficult to adapt for such a purpose.

A Ghost Story

HUGH ALLEN'S story, "Gallows Hill," in the Northern programme on March 1st, has a theme sound, the creak of a swinging gibbet, weirdly appropriate to this shocker which links the hold-up of a snow-bound coach in the days of the highwaymen to fatalities at the crossroads to-day.

Theatre Variety

ON March 1st a variety bill will be broadcast from the Opera House, Cheltenham, under the direction of Reg. A. Maddox Theatrical Enterprises, Ltd. The principal acts will be Bob and Alf Pearson, Roy Davey and George Harold.

B.B.C. Orchestra at Aberdeen

ON March 23rd the B.B.C. Symphony Orchestra, under the direction of Sir Adrian Boult, will give a concert in the Music Hall, Aberdeen, at 8.0 p.m. Works by Schubert, Beethoven, Strauss and John Ireland will be included, and tickets may be obtained from Messrs. Paterson, Sons and Marr Wood, Ltd., 183, Union Street, Aberdeen.

Bryan Michie

SINCE he left the B.B.C. Bryan Michie has acquired many "fans" as a result of his stage activities and it is now reported that a fan club has been inaugurated, similar to those which have been started for well-known radio and stage stars. It is stated that he is the first B.B.C. official to be given this honour.

Radio, Stage and Screen

A NEW endeavour is to be made to link the interests of the three fields of entertainment, as a result of which the chiefs of stage and screen production are to be called to the microphone to give their stories of triumphs and failures. Closer co-operation between producers will undoubtedly lead to better and brighter programmes.

Carroll Levis and His Discoveries

IN a special programme on the Regional on March 2nd Carroll Levis will bring to the microphone those artists from all parts of Britain who have been most popular with listeners during the last two series of "Discoveries." At least fourteen acts will be included in this "encore" broadcast and a studio audience will, as usual, be present.

ROUND the WORLD of WIRELESS (Continued)

New B.B.C. Appointment

WE are informed that Mr. Cyril Conner has been appointed Newcastle Director, and will take up his duties after Easter. He was educated at Haileybury and Oxford, and was called to the Bar as a member of the Inner Temple in 1924. He has close family connections with the North East Coast.

Belling and Lee at British Industries Fair

THIS well-known firm have staged a very interesting display at the B.I.F., and their stand is devoted almost entirely to appliances for the suppression of electrical interference with wireless communication, for use at the source of trouble, and at the listener's end. All appliances are in accordance with the relative B.S.I. specifications. Specially designed H.F. filters are shown with and without chokes, H.F. chokes in hank form, and as complete units in metal cases, from 2 to 100 amps., lift and neon suppressors, flashing sign suppressors, etc., and small units in bakelite cases for connection to small electrical appliances.

Opera at Stratford

THE Royal Carl Rosa Opera Company is to pay a visit to the Memorial Theatre, Stratford-upon-Avon, in February, and on February 25th there will be a broadcast of the first act of "La Bohème." Luella Paikin plays Mimi and the other principal parts are taken by John Torney, Hubert Dunkerley, George Hancock, Phillip Bertram and Liddell Peddieson.

Orchestral Concert

SIR DONALD TOVEY will conduct the Reid Symphony Orchestra in a Concert broadcast from the Usher Hall, Edinburgh, on February 24th. He will have as his solo artist Ina Souez, a soprano whose beautiful voice has won her countless admirers among the listening public. She will sing two Arias "Come Scoglio" from Mozart's "Cosi fan tutte," and "Casta Diva," by Bellini. Included in the orchestral part of the programme will be Schubert's Overture, in the Italian style, and works by Respighi and Mozart.

"Snow White and the Seven Dwarfs"

IT is interesting to note that within a week or two of the London première of the full-length Walt Disney film, "Snow White and the Seven Dwarfs," a radio version of it is to be broadcast on the National wavelength on March 15th and on the Regional on March 17th—the earliest dates on which space can be found in the programmes. This will be John Watt's first production since he became Director of Variety some months ago and he is adapting the story for a one-hour broadcast.

INTERESTING and TOPICAL NEWS and NOTES

John Snagge, the B.B.C. commentator, receiving final instructions from divers, prior to entering the tank for a rehearsal of his under-water broadcast.

The film itself runs for an hour and twenty minutes. It took three years to make, cost more than £250,000, and consists of over two and a half million drawings. It is the first full-length screen show without a human actor. In the radio version the part of "Snow White" will be taken by Wynne Ajello, who appeared in most of John Watt's earlier adaptations of the "Silly Symphony" and "Mickey Mouse" films.

Each of the seven dwarfs—Dock, Happy, Sleepy, Grumpy, Dopey, Sneezy, and Bashful—will probably be cast from members of the B.B.C. Revue Chorus, who brilliantly re-created for radio the quaint and amusing animal characters whose "crack's" and capers have so delighted filmgoers.

Ships and Seamen

LISTENERS who like to hear reconstructed history will eavesdrop on Francis Drake and Queen Elizabeth discussing Drake's plans on board the *Golden Hind* in the school broadcast on February 24th. In the same programme, Captain Cook will be heard describing his plans and his needs in connection with his voyage of exploration in the Southern seas.

Televising International Rugger

TELEVISION'S first Rugger game—the international match between Scotland and England—will be seen by viewers on March 19th. Three cameras will be used: one on the north stand, and two opposite the respective twenty-five yards lines. It will thus be possible to cover the whole field, both in comparative close-ups and with plan views. Captain H. B. T. Wakelam's commentary in the National programme will accompany the vision transmission.

Northern Concerts

DURING the present week the North will provide two midday concerts in the Regional programme. On February 25th a quartet led by Eric Eaden in chamber music from Mozart and Beethoven will be broadcast from Sheffield University, and the Northern Orchestra on February 26th seeks southern sunshine with Rossini's "Italian in Algiers," Fauré's "Sicilienne," and Respighi's "The Birds" suite.

"Song Album"

IT used to be a custom in many families to have a song album between whose covers were preserved songs grave and gay, stirring and sentimental, that were most popular with members of the household. Mark H. Lubbock, B.B.C. Music Director of Variety, belonged, quite naturally, to such a family and from his cousin's collection he has chosen eight typical numbers to be broadcast on February 24th (Regional) in a programme called "Song Album."

The songs will be sung by Lorely Dyer and Stanley Hoban, to the accompaniment of The Frank Walker Octet, conducted by Mark H. Lubbock, who, with George Gordon, will present the half-hour show.

SOLVE THIS!

PROBLEM No. 284.

Deville built a Det. L.F. set with band-pass tuning utilising a gang condenser. After some time he decided a better set was needed and accordingly bought an S.G. valve and remodelled the set into portable form. He wound a frame aerial and split the two band-pass coils, using one for the grid circuit of the detector stage and the other for the S.G. stage, connecting the aerial across the first tuning condenser. He found, however, that results were very inferior, only two stations being received. Why was this? Three books will be awarded for the first three correct solutions opened. Envelopes must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 284 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, February 28th, 1938.

Solution to Problem No. 283.

When Jackson modified his receiver he used the same variable-mu control connections as in the Corona, the grid being returned to the control potentiometer through a grid leak. The control was mounted on a bracket on the metal surface of the baseboard, and he had chosen a control with a "live" spindle. Accordingly the grid of the first valve was earthed through the potentiometer and this prevented the first stage from functioning. The control should have been insulated from the bracket, or the metal surface cut away below the bracket.

The following three readers successfully solved Problem No. 282, and books have accordingly been forwarded to them:—B. R. Sparrow, St. Julian's House, St. Stephens, St. Albans; G. J. Begg, 24, Quarryside Buildings, Nybster, Aukengill, Wick; F. G. Cockerill, 133, Beckett Road, Doncaster.

The 1938 One-valver

Completing the Wiring, Modifying the Selectivity, and Making a Coil for Use in this Simple Receiver - - By W. J. DELANEY

IN the main constructional details which were given last week there was one important point which was not dealt with, but which must be given very close attention when building the receiver. On the blueprint it will be found that three sets of insulating washers are shown attached to the three component-mounting brackets, and it is essential to use these or adopt some other scheme to insulate the switches and the reaction from the metal baseboard. If the circuit is examined it will be seen that the metal baseboard is employed for certain earth return leads, these being marked with the letters M.B. At these points bare wires are joined beneath heads of screws driven into the baseboard, and this saves a certain amount of wiring, as the various M.B. points are interconnected through the metal surface. The component-mounting brackets will also be in contact with the base and thus will be earthed through it, and as the spindle of the reaction condenser and also the spindles of the switches will come into contact with the bracket, steps must be taken to prevent the circuit from being completed through them. If this step is not carefully watched the L.T. and H.T. supplies will be short-circuited. Small circular insulating washers are obtainable, however, and may be attached on each side of the lock-nuts used for mounting these components, and when attaching the outer nut the components should be carefully moved so that the spindle does not come into contact with the sides of the brackets.

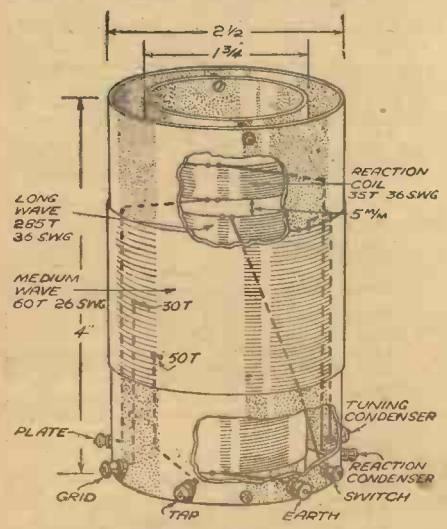


Fig. 2.—Constructional details of an experimental coil for this receiver.

An Alternative Scheme

There is a simpler scheme which may be adopted if difficulty is experienced in obtaining the washers, and this is to cut away the metal surface beneath the mounting bracket, cutting out a square of the metal slightly larger than the foot of the bracket. This may be done with a chisel or a sharp knife, making quite certain that when the bracket is screwed down no part of it touches the metal surface. To ensure that the two wires from terminals No. 3 and 5 on the coil unit make good contact with the base, the paint on the projecting lugs should be scraped away until the metal is left clean and shiny and then the two wires may be attached by means of two of the screws used to hold the coil in position. In one of the illustrations on this page it will be noted that instead of using a bolt for earthing the wire from the fuse the wire has been placed underneath the H.F. choke and this saves a bolt or screw. Similarly, the wire from the wavechange switch which is shown connected to the chassis may, if desired, be attached to the screw holding down the coil.

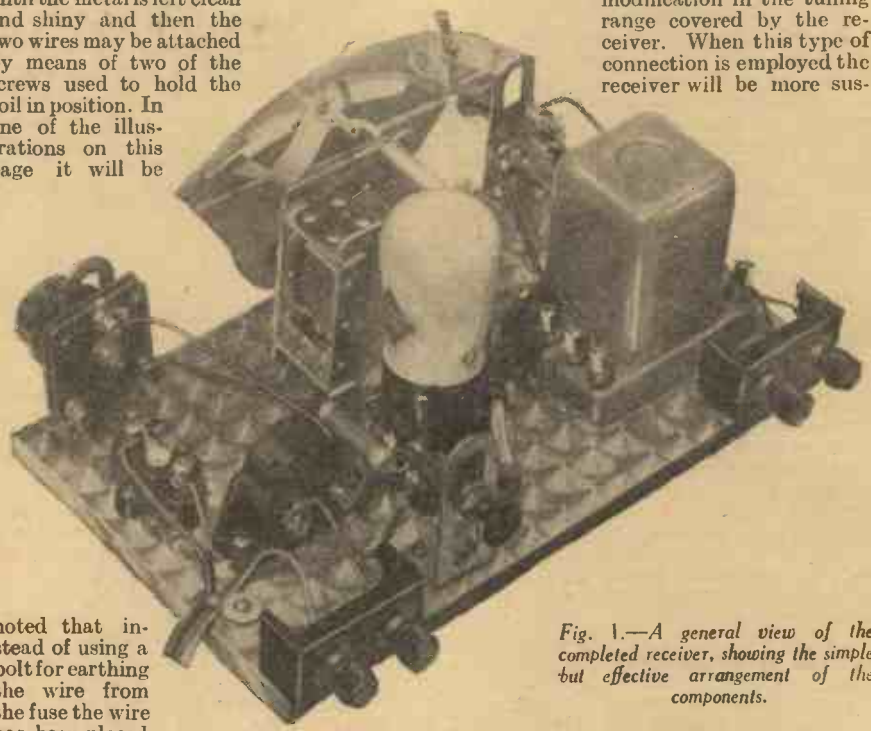


Fig. 1.—A general view of the completed receiver, showing the simple but effective arrangement of the components.

Improving Selectivity

Under the majority of conditions met with in this country the selectivity of the set should be adequate to separate the local stations, but in some parts it may be found that the two local stations just overlap. Alternatively it may be found that conditions are extremely good in some places and that distant stations are received so well that they afford entertainment value, but the local stations form a background which prevents the satisfactory reception of those stations. The selectivity may be improved by fitting a condenser between the aerial terminal and terminal 4 on the coil, and this condenser may be a fixed component or a variable, or semi-variable device, the latter type affording scope for adjustment to suit varying conditions. A maximum value of .0003mfd. should be chosen, and if a pre-set condenser is employed it may be mounted by the side of the aerial-earth terminal mount and the lead from the aerial terminal disconnected from terminal 4 on the coil and joined to one side of the condenser, the other side of this being joined to terminal 4.

In some cases it may be found that results are improved if this condenser is joined between the aerial and terminal 1 on the coil unit and this will cut out the primary winding, giving a reduction in selectivity, an increase in volume, and a modification in the tuning range covered by the receiver. When this type of connection is employed the receiver will be more susceptible to differences in aerial size than when the connection to terminal 4 is employed, and in most cases this latter connection will be found preferable.

Making a Coil

For those who wish to experiment, a very suitable type of coil to make is illustrated in Fig. 2, and from this it will be seen that two formers are used, one fitting inside the other and kept in position by four fixing screws and distance pieces, the

(Continued overleaf.)

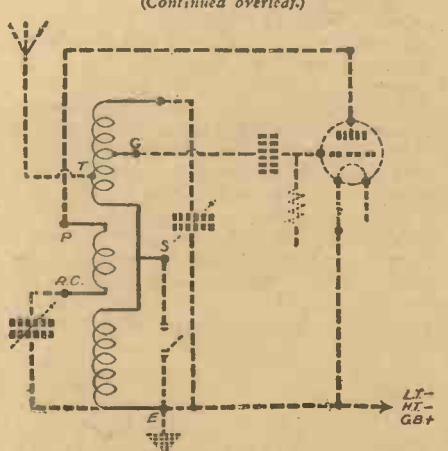


Fig. 3.—Theoretical circuit of the coil shown in Fig. 2.

THE 1938 ONE-VALVER

(*Continued from previous page*)

outer former being used to provide connecting points by the terminals shown.

The theoretical circuit is shown in Fig. 3, and it will be seen that it differs slightly from the Wearite coil. The tappings are provided to secure the highest degree of selectivity possible with a coil of this type, but it must be appreciated that, efficient as the coils are, they cannot be expected to compare with the specified iron-cored type. For the reaction coil, the winding connected to the terminals "plate" and "reaction condenser," 35 turns of 36 S.W.G. enamelled wire is required, while for the long-wave section, i.e., the coil connected to the "earthy" end of the medium-wave winding and the terminal "switch" and the "earth" terminal, 285 turns of the same wire is necessary.

The reaction and long-wave windings are wound on the inner former, there being a distance of 5 mm. or about ⅛in. between them. It is advisable to note, at this point, that the actual position of the reaction coil in relation to the medium and long-wave windings is very important, if smooth and adequate reaction is to be obtained on both wavebands.

The above remarks also govern the position of the L.W. winding to that of the M.W.; actually the top ends of both windings should be level with each other, otherwise there will be excessive or a loss of reaction on one waveband.

The medium-wave grid coil consists of 60 turns of 26 S.W.G. enamelled wire, and tappings are taken at the 30th and 50th turns from the upper end. Note the connections to this coil; the commencement goes to the "tuning condenser" terminal; the first tap (30th turn) to "grid"; the second tap (50th turn) to "tap"; and the end of the coil to "switch" and the start of the L.W. winding.

H.F. Choke

For those who wish to experiment with a home-made choke there are various forms which may be employed, the simplest consisting of a hank of wire, say gauge 26 or 28 D.C.C., wound round a small diameter object (such as a broom-handle) using 150 to 300 turns, wound simply as a coil without any regard to orderliness. When completed it should be slipped off the former and tied round with cotton or wrapped with insulating tape. A better type will be wound in sectional form on a tube such as a glass test-tube, winding each section in hank form as in the previous case, but dividing the total amount of wire into four or five sections. The sections may be kept in position by means of dabs of sealing-wax.

The method of getting foreign or long-distance stations is to adjust the reaction to the desired point to give sufficient volume and to adjust the tuning condenser at the same time, as adjustments of the former necessitate slight adjustments of the latter.

Tune Carefully

Thus, two hands are needed to keep the controls "in step" and it will be found that as the reaction is turned up the selectivity sharpens so that a little skill is needed until the "hang" of the set is obtained. Remember that the better the aerial the longer the range of the receiver, and use the best earth you can obtain. A long aerial is not needed, but it should be as high as possible, unless you live close to a B.B.C. station, when adequate volume will no doubt be obtained with an ordinary indoor aerial.

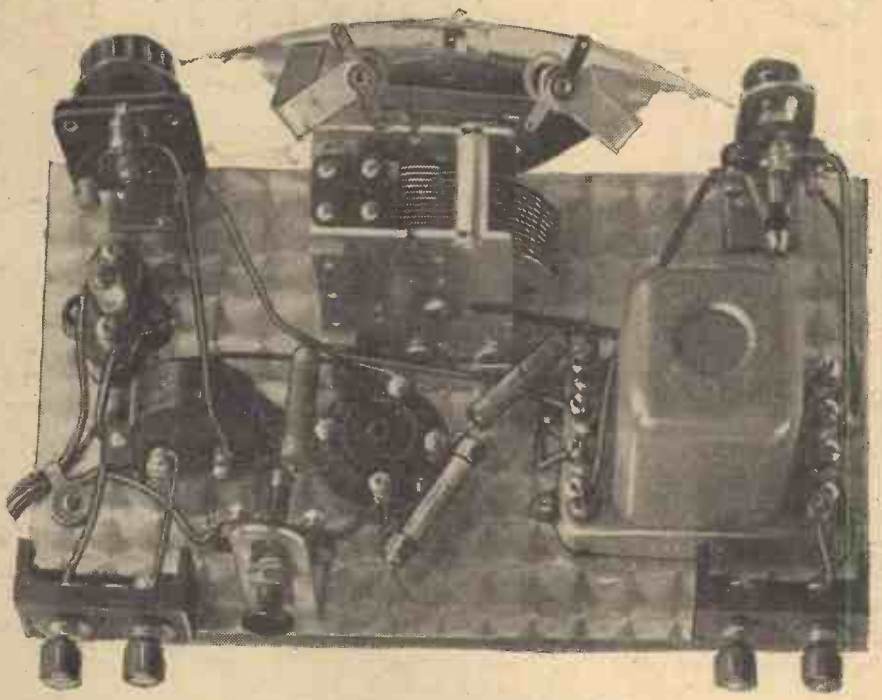


Fig. 4.—A bird's-eye view of the receiver.

NEW RADIO STAMPS

WE have mentioned on previous occasions the interesting link between the hobbies of radio and philately, and many amateurs collect the stamps which are received when QSL cards are sent to them. It will often be found that stamp-collecting will form friendships which might otherwise be lost, and when sending out reports of reception some amateurs enclose with the report a request for an unusual stamp, and in return send with their report a stamp of this type for the use of the amateur to whom they are writing. Unfortunately we, in this country, do not issue so many special stamps as foreign countries, and as a matter of interest we attach herewith two illustrations of some new stamps which have been issued by Italy and Egypt. The former has been issued in honour of the late Marchese Marconi, whilst the latter commemorates the Radio Conference which takes place at Cairo. By keeping a specialised selection, that is, by grouping all radio stamps in one album or by keeping only this type of stamp if you are not generally interested in stamp collecting, a most interesting collection may be formed, and the majority of amateurs in all parts of the world are quite willing to co-operate in acquiring the necessary stamps.

Two new Radio commemoration stamps issued by Italy and Egypt.

A SCIENTIFIC AGE

A LEADING newspaper the other day was dealing with the fact that the news-reel is proving a useful adjunct to history. It was also stressed that in an age which has seen the rapid growth of broadcasting from a scientific novelty, and toy, to a national necessity, and the growth of the cinema in a comparatively short space of time, from a penny peepshow to a world-wide mirror, it may well be that television will come forward just as unexpectedly, and supersede them both. But in television the film may not have a rival but a valuable ally, although at the present time the two seem to have little in common.

A Question of Cost

Whereas the editor of the news-reel can select the work of a dozen different cameras, and edit them at his leisure, the television producer must do this on the instant. On the other hand, the television authorities need not worry about the cost of film, for modern electron cameras do not use any. Small wonder, then, that the present television service has to build up a transmitting and receiving technique of its own, without the ability to refer to what has been done before. It is pioneering work of an intriguing, and interesting kind.

ON YOUR WAVELENGTH

By Thermion

I Break the Chain!

I EXPECT every one of my readers has received at some time one of those absurd "Chain Letters" which are supposed to have been started by an officer in the War. There is no accounting for the mentality of the sort of people who waste their time in sending this sort of letter, and it is my fervent hope that most of them have at long last been taken to asylums or put in padded cells, those of them, that is, who are not in gaol, for there can be no doubt that these people are either criminally ignorant or mentally deficient. One or two of them, however, are still at large, for I have received one of these chain letters during the last week. My regret is that the poor idiot that sent it did not append his name and address. Had he done so I should have had no hesitation in informing the police or the local Relieving Officer. This is how the letter went:

"Slow the chain to none,
The Chain of Good Luck."

"This Chain was sent to me, I am sending it to you, within three days, so that the chain may not be broken. Make three copies of it and send them to whom you wish good luck. This chain was started by an officer in Flanders. Do not forget to send it on or it will bring you bad luck (it is remarkable how the prediction has come true since it was started). Send this and three more copies within three days and see what happens on the fourth. Do not keep it or it will bring you bad luck. This chain was started in 1915."

I have not kept it. I have torn it into shreds and hurled it with disgusted annoyance into the waste-paper basket. I do not believe this nonsense about an officer in Flanders. If the chain of good luck has had the effect mentioned, there would no wars, no Income Tax, no squabbles, no rows, no law courts, no police, no poverty, no dissatisfaction even with the B.B.C. If any of my readers are aware of the person or persons who are sending these letters round I hope they will give me their names and addresses in confidence so that I can put a period to their activities. It is illegal to issue threatening letters, and this chain letter is a threat of evil if you do not comply with the request to send three copies. Why should you only pick *three* people whom you wish good luck? I advise any of my readers who receive such letters to keep the envelopes so that I can trace the person or persons by means of the post mark.

Those Good Samaritans

I MUST ask all of those readers who may be so kindly disposed as to wish to distribute spare parts to other readers to refrain from asking me to help. I have inserted one or two offers of this nature, but find that regular readers of the paper do not respond to them. I do, however, receive hundreds of letters from readers who see the paper in public libraries, and in many cases they pitch a pitiable tale which upon investigation is found to be quite untrue. Most of them start off by saying that they have been a regular reader from No. 1. They then follow on with some lying story about being out of work, starving wives and children, deeply interested in the hobby but can't afford the parts, and so on. I happen to know that in some cases the correspondents care nothing about wireless, had never read this paper, and merely wanted the parts to sell. My advice to those readers who wish to dispose of their junk is to distribute it locally, where they can investigate claims on the spot, and distribute to the most worthy case. The drivel I have been reading as a result of my paragraph under the title of "A Good Samaritan" has destroyed my last fragmentary belief in the power to do good.

An Idea

A READER, referring to my attack on crooners, says that he has often tuned in to dance music, and on hearing the crooners, says he has heard better music from a couple of cats on his garden wall. He thinks, therefore, that those readers who like crooners cannot have garden walls. That's an idea!

Hire Purchase

I NOTICE the following in the *Efficiency Magazine*. It is headed "As Others See Us."

"Last month, in the island of Competitia, I chanced to drop into a conference of small radio dealers.

"On a big sign at the back of the platform were these words—*Make It Easy for Anybody to Buy Anything*.

"In his opening speech, the Chairman said: 'We have found that the ordinary hire-purchase methods, reckless as they are, are not good enough to enable us to get rid of our radio sets.

"'We allow a man who pays us 2s. to come in and take away a radio set, but what about the man who does not possess 2s.? I ask you for suggestions.'

"One of the dealers sprang up and said: 'Suppose we offer any man or woman or child a Penny Box. We can say: "A penny a day takes a radio set away." In 3½ years a £5 5s. radio set will be paid for.'"

. . . We Get Madder and Madder!

BUT the writer's imagination does not stop short there, for he goes on:

"Another dealer said: 'My scheme is to allow any family to take away a radio set and we will collect the money from their grandchildren. You can't beat that.'

"'Yes, I can,' said a third dealer. 'I say—make a sporting offer. If a man wants a £10 radio set, let him put 2s. on a 100 to 1 horse and hand the bet over to us. Then we'd be sure to get our full regular price once in a while, anyway.'

"This last suggestion seemed to win the approval of most of the dealers. There was much excitement and enthusiasm. I felt that I needed fresh air. So I went out."

Variable Mule!

E. T. R., of Hull, vouches for the veracity of the following story: "I was inspecting some valves in a second-hand shop, and enquired the price of a screened-grid valve. I began to examine the same for markings

which would indicate the type, when the owner of the shop said : 'That's not an ordinary screen-grid ; it's variable mule.' I said : 'You mean variable mu.' The dealer, however, was insistent." I know some valves play monkey-tricks, and perhaps this variable mule accounts for it.

Colour Television

I HAD a 'phone call the other day from Mr. J. L. Baird asking me to go along to the Dominion Theatre to witness a demonstration of large-screen colour television. There were only about six technical journalists present. The demonstration satisfied me that the system has great possibilities, and is reasonably perfect to-day. The colour picture of His Majesty The King was particularly excellent, whilst all of the other pictures were good. This demonstration indicates that with a little encouragement television will create a demand for programmes, and sets, which would make existing demands for wireless apparatus seem small. Television is inevitable, and the sooner we make up our minds to encourage it the better. It seems such a pity that those who are behind the scenes in developing television should lack the encouragement they deserve.

Auto Tuning

AS in past years, attention this year will be focused on producing special tuning dials, and automatic gadgets like press-button tuning. I cannot see the purpose of this unless the set itself is capable of receiving the stations, and of separating them. Let us first of all get rid of interference, break-through, overlapping, spread, side-band splash, and make our sets reasonably selective before we introduce gadgets which merely do automatically what we can now do by turning a knob, and do just as well. I learn that at least 17 manufacturers will announce receivers incorporating automatic tuning, and we shall probably see them at Radiolympia. Some, of course, are already on the market. Some of the systems are employing motor drives, another uses a dial like an automatic telephone dial. I cannot see why we should want to be so lazy; still, the proof of the pudding is in the eating, and if the great public requires such a system, the firms are wise in supplying public demands.

Now Then, Sleuths!

I HAVE before mentioned some of the peculiar effects which often arise with standard receivers, and in many cases there is a simple solution to the problem. There are occasions,

Notes from the Test Bench

Dismantling Components

AN interesting case of a fault arising through a component being dismantled recently occurred. A receiver had been built from parts which had been lying idle in an amateur's junk-box, and to make sure that everything was in good order the various items had been taken apart, cleaned, and assembled. The receiver which was built was the simple H.F., detector and L.F. arrangement, with a two-gang condenser and a two-gang coil unit, and when tested out the long-wave National transmitter was received, but the London Regional was heard faintly in the background. The builder did not try to get any other station, but made various tests with a view to cutting out what he assumed was break-through, and a considerable amount of time was spent in modifying the aerial, fitting H.F. filters, and so on. Eventually the trouble was found to be due to the fact that in putting together the switch assemblies on the coils one had been reversed, with the result that one coil was tuned to the long and the other to the medium waves. The tuning for Regional and long-wave National approximately coincided and thus accounted for the two stations being heard together.

Switch Contacts

THE majority of switches are of the self-cleaning type, and it may be found that with constant use the springs become slightly weakened, with the result that the cleaning action ceases. This is due to the fact that the switches are generally in the form of bent "fingers," which are forced beyond their maximum position as the switch cam moves and this exercises a scraping motion at the points of contact. Consequently, if it is found that a switch of this type becomes noisy after a period of use, the fingers should be examined and, if necessary, bent again slightly to exercise the necessary wiping motion as the switch is operated.

Self-centring Device

WHEN ganging two or more condensers or components, such as may be needed in a short-wave set, it is sometimes found to be difficult to get both components straight in line so that the spindles may be easily joined. To avoid this difficulty, it should be remembered that special connecting or ganging devices are available in which any out-of-truth is rendered of no account. This type of ganging device has a pair of flexible connectors on each side, and these are attached to a ring so that the device can turn from side to side as the spindles are rotated. This device is referred to as a "Flexible Coupler."

however, when no ordinary solution is forthcoming, and the following is an instance. J. W., of Wigan, writes :

"I constructed a three-valve det. 2L.F. short-wave set, and on trying it out could get no results, with the exception of a weak Morse signal which remained unaltered over the entire tuning range.

"Peering round for likely faults, etc., I happened to pull the coil (a standard Eddystone 22-47 metres) *out of its socket*—out, mind-you—and I was flabbergasted to hear dance music which turned out to be *both* the National and Regional programmes (this was proved a few minutes later when the programme changed). Neither tuning nor reaction had any effect on the signal, the same strength being maintained over the entire range of the dial. When I put the coil back it disappeared and vice versa.

"The set itself I had standing on a small table under the shelf on which rests the family broadcast receiver, and thinking that perhaps some kind of inductive effect was going on between the transformers of the separate sets, I altered the tuning and reaction of the ordinary set, but to no effect, when it suddenly dawned on me that such an occurrence was an impossibility, as I was using the valves, batteries, aerial and earth of the big set, e.g., it was completely dead.

"Anyway, I gave it up for the night and resolved to sleep on it. Morning came and I set about testing the set, locating a faulty aerial series condenser which I set right, and then tried the set again with precisely the same results, except that I did not get the National or Regional signals when I pulled the coil out. Messing around again with the batteries, I happened to pull the GB+ plug leading from the transformer out of its socket and, lo and behold, the set worked perfectly!"

Perhaps some of my readers can offer suggestions as to the effects which mystified J. W. There are no prizes!

The "Experimenters"

Discuss Tuning "Pull" by Reaction Adjustment; "Inspector Hornleigh's" Theory

This is the Conclusion of Last Week's Article, which was unavoidably held over due to pressure on our space.

YOU will remember that at the end of the first portion of this article published last week we were dealing with a very interesting transceiver circuit received from a reader.

As Mr. Kettingham points out, one of the chief advantages of this circuit is that there is no need to alter the tuning circuits when changing over from transmit to receive. That is an important advantage and overcomes one of the objections to the transceiver that we mentioned in an earlier article. It will be clear that the valve marked V.2 acts as a detector during reception and as a modulator for transmitting, the modulation being injected into the grid circuit of the oscillator in the same manner as in a single-valve circuit that we described four weeks ago.

Reaction "Pulls" Tuning

And now let us turn to a question raised in an interesting letter from Reader P. Jacobs, of Goodmayes, Essex, this time in connection with a short-wave receiver. Mr. Jacobs sends us a circuit of the fifth short-wave receiver that he has made (reproduced on this page and which is "certainly the most satisfactory so far.") Although the set operates well and reaction is very smooth, there is one point that our reader does not like, which is that reaction adjustment alters tuning a good deal. That is certainly a bad fault when making fine-tuning adjustments on a weak signal, and we think that it might be connected in some measure with the tuning coil.

Some designers like to use a small-capacity reaction condenser in conjunction with a relatively large reaction winding; others prefer a smaller winding and larger condenser. We favour the latter idea, because we find that there is less trouble due to the fault in question: that is, there is less risk of reaction adjustment "pulling" the tuning. There is, however, one mistake in the circuit, which is that the L.F. coupling is taken directly from the anode of the detector, instead of from the junction between the choke and the transformer primary. We have indicated the new connection by means of a broken line and placed a cross on the lead that should be removed.

Blind Spot for South Africa?

We scarcely think that this is the cause of the tuning "pull," however, but it might effect an improvement in that direction. An earth lead is not shown on the original circuit, and we suggest that it should be added. Another possible method of overcoming the trouble experienced is by including a fixed resistor of 100 to 200 ohms in the reaction circuit—between the winding and the detector anode, for example. Throttle-control reaction could also be tried, for this is sometimes more successful with certain coils. For this, the reaction winding is connected in series between the detector anode and the H.F. choke, the reaction condenser being joined between the anode and earth. When this is done, reaction is increased by *reducing* the capacity of the reaction condenser.

Another question set by this reader is as follows: "Do you happen to know if my district (near Ilford) is in a 'blind spot' for South African and South American reception? I have never heard a sound from either of these districts, although all others, including *North* African, come in well." This is a problem that we cannot

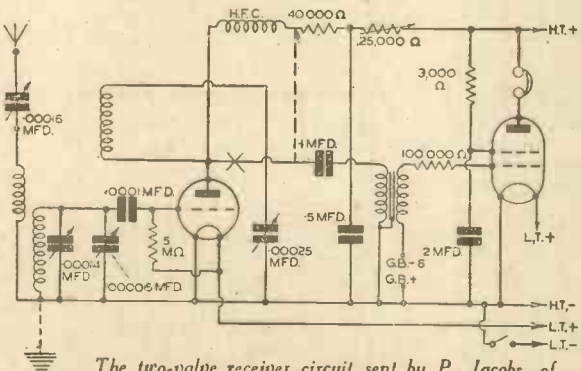
by The Experimenters

answer; we have not had any similar experiences reported from Ilford, but perhaps other readers in that area would be good enough to pass on details of their results.

Superhet Oscillator Instability

Mr. Jacobs' reaction problem reminds us of a similar difficulty sometimes experienced with short-wave superhets. In this case, it is the oscillator tuning circuit that "pulls" the input tuning circuit, causing peculiar forms of "humped" tuning and two tuning points for one station. One of the best methods of avoiding the trouble is by using a triode-hexode frequency-changer, although much can be done by careful experiment with anode and screening-grid voltages. This is because the trouble is in part due to the generation of oscillations which are too strong in relation to the signal strength.

The reverse sometimes occurs when the oscillator frequency produced by the



The two-valve receiver circuit sent by P. Jacobs, of Goodmayes. Although the set is very efficient, trouble is experienced due to reaction "pull."

oscillator section of the frequency-changer is too feeble. In consequence, there might be "dead spots" on the tuning band and "fluttering" on some of the more powerful signals. Probably the easiest method of overcoming the objection is by connecting an additional triode in parallel with the oscillator section; that is, the two grids and two anodes are joined together. No other alterations are normally required and the doubled capacity does not usually produce any deleterious effect. By using two triodes—or, at least, a triode and the triode section of the "double" valve—in parallel a steady oscillator frequency can more easily be maintained over the tuning range.

"Inspector Hornleigh Investigates"

How many of you heard "Inspector Hornleigh" the other night in "Monday at Seven," and how many solved the problem? Frankly we did not, nor did we agree with the solution offered by the B.B.C. You remember that the butler said that he was "a well-known radio amateur," and that he was listening to American short-wave stations between 1.30 and 2.0 a.m. During that time a car was outside the house, its engine running. That was sufficient to convince the popular and famous "radio detective" that the butler must have known that the car was outside and must therefore have some knowledge of the burglary that had been carried out in his master's house by the owners of the car.

The Explanation!

The explanation given was that the ignition system of the car would have interfered with reception. In raising our eyebrows we ask "Would it?" If our villain the butler had been a keen radio experimenter he would have had a modern anti-interference aerial system, or would at least have erected his aerial away from the road. But in any case the interference would be almost certain to be slight on wavelengths above 20 metres—reception would probably be carried out on the 31- or 47-metre band—since the "natural wavelength" of the ignition circuit of the modern private car is generally around 10 metres.

If ignition interference were pronounced on the short waves it would be hard lines on those "fans" who live on a main road.

If the solution had been that the butler was evidently not a "well-known radio amateur," we would have accepted it, because "Inspector Hornleigh" read from his log book that "volume strength" was "R.9." We never heard an experienced amateur use such a clumsy expression as "volume strength, R9," and do not believe that any amateur would write all that in a log book; as an indication of volume he would simply write "R.9." Don't you think?

Pse. QSL. Dah-de-dah.

How the Oscillator Functions, and Preliminary Details of a 10-watt Transmitter

By L. O. SPARKS

TO enable the beginners to keep pace with the more advanced readers, I propose devoting one column, at least, of each article to explain the operation of the essential parts of a complete transmitting circuit.

It is of little use for the beginner to commence his activities by making up apparatus with which he is not familiar, unless he has a fair amount of elementary knowledge of the theory; therefore, as dry as technical descriptions might seem it is essential that they should not be skipped by one's eagerness to get on with the job.

Apart from fundamentals, one might say that the first step towards transmitting is to become familiar with the various forms of oscillator circuits used by the amateur.

It must be appreciated that the first requirement of a transmitter is some means whereby oscillations can be generated, and as most constructors are familiar with the oscillations produced in a receiver by the transference of energy from the anode to the grid of a valve by means of the reaction circuit, it should not be difficult to follow the descriptions given below.

Examining the matter from a practical point of view, it can be said that there are two types of oscillators, namely, those which are classified under the heading of "Self-controlled" and those under the heading of "Crystal-controlled." Actually, the amateur, particularly the beginner, is only interested in the "Crystal-controlled" arrangements; however, it will be wise, at this stage, to deal with the other types as well.

Self-controlled

Oscillators coming under this heading can really be split into two distinct classes: those which depend on inductive coupling between plate and anode for the generation of oscillations, and those which make use of capacity to provide the necessary feed-back.

The most common form of inductive coupling is that employed in the well-known Hartley oscillator circuit, which is shown in Fig. 1. It will be noted that the variable condenser C1 is connected across the whole of the coil L1 which, in turn, is across the plate and grid circuit. The frequency of the oscillations will be governed therefore by the values of L1 and C1, while the amount of feed-back or "grid-excitation" will depend on the position of the tapping point "t" which, in effect, completes the circuit. The small condenser C2 prevents any H.T. voltage from flowing through the coil to the filament and, providing it is capable of offering a low impedance path for the high-frequency currents, its value is not supercritical. An average capacity is in the neighbourhood of .01mfd. There is one important item regarding this condenser, however, and that is, it is very important to use one of the mica-dielectric type.

The closer the tapping point "t" is moved towards the anode end of the coil the greater will be the feed-back, so its actual position usually has to be determined by experiment, as much depends on the type of valve in use. The condenser C3 prevents any D.C. voltage from reaching the grid from the filament while the resistance R allows the valve to receive the bias necessary for satisfactory operation, therefore, its value cannot be fixed definitely as it will depend, like the tapping point "t," on the characteristics of the valve.

If the circuit is examined it will be seen

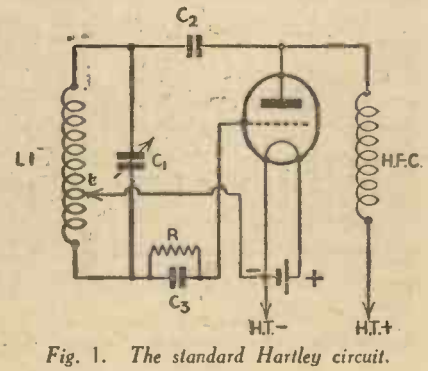


Fig. 1. The standard Hartley circuit.

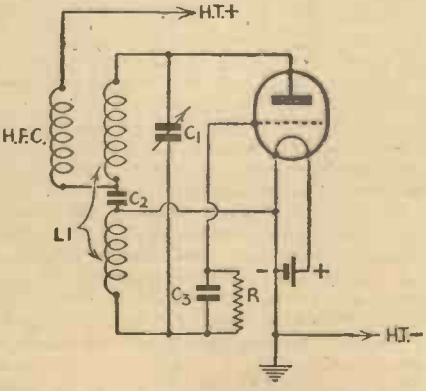


Fig. 2.—A modification of Fig. 1—known as the series-fed Hartley.

that the H.T. is applied to the anode of the valve via the H.F.C., and as the anode is at a high-frequency potential it is obviously essential that the H.F. choke must be really efficient to prevent the high-frequency currents from leaking back into the filament circuit via the H.T. battery. One might say, therefore, that the efficiency of the circuit depends to a very great extent on the efficiency of the choke under consideration. To overcome this little defect another version of the Hartley circuit was devised, Fig. 2, and this is known as the "series-fed" Hartley. By adopting this arrangement and applying the H.T. at a more suitable point, the efficiency of the choke is not so critical; in fact, if so desired, an ordinary resistance H.F. stopper can be used.

Constructing an A.C.-operated 10-watt Transmitter

To enable those with an A.A. or full licence to get busy on making up fresh gear, here are the preliminary details of a Tritet Crystal-controlled Transmitter which will be described in future articles.

Bearing in mind cost and ease of operation it was decided to use the Tritet arrangement as quite a good output can be obtained, at a comparatively low voltage, with one valve, and, what is more, two wavebands can be covered really satisfactorily without the use of additional crystal or frequency-doublers. So much, for the present, of the circuit. To make it a neat and compact arrangement the rack system of construction is used, but unlike the larger transmitting racks the one about to be described is made with timber, likewise, the constructor will not be worried by the work involved by metalwork.

All dimensions and constructional details will be indicated in the illustrations and it will be appreciated that the design lends itself most readily to easy adjustment and experimental work, while the actual space occupied by the complete transmitter is no more than that of, say, an average three-valve receiver.

February 26th, 1938. Vol. 3. No. 89.

COLOUR TELEVISION

Complete Details of Mr. Baird's Latest Colour Television Process Were Revealed to the Editor the Other Day, and this Article Describes the Equipment and the Results Seen.

THE first demonstration of colour television undertaken by Mr. Baird was in the year 1928 when, with quite crude equipment and using the low-definition picture scan of thirty lines which was then the standard, the inventor was able to show pictures in colour about half the size of a postcard. The transmitter equipment used an apertured disc with three primary colour filters—red, blue and green—while the receiver had a geometrically similar disc which scanned a double light source composed of a neon lamp and a combined mercury and helium lamp. The connection between transmitting and receiving ends was by line, but the results seen, although of inferior quality when compared with modern standards, established the principles of colour television and pioneered the way to future developments.

As will be seen from the accompanying photograph and pictorial illustrations, the apparatus now employed bears little resemblance to its ten-year-old prototype. The transmitting equipment is located in a modern studio at the base of the South Tower of the Crystal Palace, and a study of Fig. 2 will enable the reader to obtain a good impression of the process involved in producing the picture signals. A combination of mechanical and optical scanning is employed, the apparatus being housed in a specially designed camera (seen clearly in Fig. 1) mounted on a "dolly truck" with all the panning facilities associated with a talking-film studio camera. Carefully balanced on trunnions, the operator is able to keep the person or object being televised in perfect focus. The subject is floodlit by means of two side arc lamps, while back lighting is given by illuminating a translucent back screen from the rear.

The Camera

An image of the person is focused by a large lens accommodated at the front of the camera on to a mirror drum at the back. This drum has 20 facets with an angular spacing of 18 degrees, and is revolved at a constant speed of 6,000 revolutions per minute. By this means a succession of rapidly moving and displaced optical images of the person being televised is focused by an achromatic lens system on to the face of the disc; the exact position being settled by interposing a mirror reflector in the optical path, as seen in Fig. 2.

The disc has twelve staggered slots cut in its face, the slots being covered alternately with blue-green and red filter material. A gear drive with the high-speed drum revolves this disc at 500 revolutions per minute, while in front of the disc is a diaphragm having a rectangular-shaped slot at the centre. Both the mirror drum and slotted disc revolve in a vertical plane, the reflecting mirror ensuring that the optical path is "bent" to enable the optical images to pass correctly over the slot in the diaphragm. The slots in the disc, as they pass in turn over the slot in the diaphragm, form an aperture which moves backwards and forwards as the disc revolves at constant speed. The net result of this ingenious mechanical and optical combination is that an appropriately light-filtered image of the subject being televised is broken up into a scan which passes through the moving aperture as elemental light areas which activate the rubidium cathode surface of a Baird multiplier photo electric cell, mounted in a small screened compartment on the right-hand bottom side of the camera framework.

Fig. 1.—Mr. Baird (on the right) with the new colour television transmitter referred to in this article.

Transmission

The cell converts these variations of light into equivalent electrical currents which are in effect the television picture signals. After being fed through A and B amplifiers, the signal passes to the control room where the engineer in charge "monitors" the picture through the medium of a check seen as a monochromatic picture on the screen of a cathode-ray tube. The electrical arrangement of this chain is shown in Fig. 2, and after further amplification, the vision signal is made to modulate the low-powered ultra-short-wave radio transmitter. The output from this unit passes to the aerial at the top of the South Tower to be radiated in the normal manner on a wavelength of 8.3 metres.

The colour television receiving apparatus is installed at the Dominion Theatre, Tottenham Court Road, London; a special fireproof room having been built to house the equipment at the back of the stage. Elaborate precautions had to be taken to ensure that all the apparatus was enclosed in order to conform to L.C.C. fire regulations; a necessary factor in any place of public entertainment. The actual scanning arrangement employed at the receiver is identical with that of the transmitter, that is a fixed slot diaphragm, a disc revolving at 500 r.p.m. having 12 slots covered alternately with blue-green and red filters working in conjunction with a 20-facet mirror drum revolving at 6,000 r.p.m. This is seen in Fig. 2, which shows in simple pictorial fashion the whole layout.

Modulation

A beam of light from a totally enclosed high-intensity automatic arc lamp is focused on to the diaphragm, behind which revolves the slotted disc. This produces the moving elemental light aperture and the colour-filtered beam which emerges from this combination is intensity-modulated by a Kerr cell interposed in its path. The degree of modulation is controlled by the strength of the television signal received from the Crystal Palace. On the roof of the Dominion Theatre is a dipole aerial mounted on a well-stayed mast, and a concentric feeder passes the signals to an ultra-short-wave superheterodyne receiver. From here the signals are fed to intermediate and output amplifiers prior to being connected to the Kerr cell proper with which is, of course, associated two pairs of nicol prisms. The emerging modulated light beam from the second pair of nicol prisms is deflected by a mirror so as to pass through an achromatic lens on to the rapidly revolving mirror drum, whose angulated facets back project the moving spot of light on to the large screen mounted behind the theatre stage curtains. As the drum revolves the screen is covered by a succession of coloured vertical light strips, the number of disc slots and the number of mirrors on the drum, together with their relative speeds, determining the number of lines in the final picture. By choosing a suitable combination any desired number

(Continued overleaf)

COLOUR TELEVISION

(*Continued from previous page*)

of lines can be secured, but in the Baird colour equipment demonstrated a total field of 120 lines was employed with vertical scanning.

A Large Screen

The screen itself is actually 12ft. high by 9ft. wide, and a reference to Fig. 2 will show the relative proportions when compared to Mr. Baird standing on the left-hand side of the stage where the large loud-speakers are positioned. The screen material presented considerable difficulties, it being found, for example, that a screen which appeared sufficiently brilliant in a laboratory was not nearly bright enough to be seen properly throughout the large auditorium of the Dominion Theatre. Many experiments had to be undertaken before the right type of screen was eventually evolved, and it now consists of a specially-treated canvas which gives a non-directional and brilliantly-coloured television picture, capable of being seen in comfort from every seat in the cinema.

During the course of the demonstration, a compère, with a few well-chosen words, pointed out that this was the first occasion in the world where colour television signals had been transmitted by radio from a point some miles away to be reproduced on a large screen. While agreeing that the process at this stage in its development possessed certain imperfections when compared to the modern high-definition black and white processes, development work was proceeding rapidly towards their removal. In time to come it was anticipated that cinemas would be equipped with colour television screens for the entertainment of patrons and the present experiments would then be looked upon as an important landmark in the progress of the art.

Coloured Television Pictures

The curtains then parted and showed a coloured television picture of the Union Jack. This was followed by a colour demonstration of the latest hat fashions shown to effect by a lady artist in the Crystal Palace studio; various characteristic uniforms by a quick-change artist; one or two cartoons, flags, and a photograph of the King. The colours seen were exceedingly brilliant, flicker was negligible and the result left no doubt as to the progress which had been made in developing colour television to a state capable of providing adequate entertainment value to a theatre audience. In this connection it is interesting to note that the form of multi-mesh scanning employed by Mr. Baird for his colour process is in effect a modification of the scheme he used as far back as 1923. This original apparatus is now housed in the Science Museum, South Kensington; a lens disc then being used in place of the present mirror drum, although the slotted disc was of a similar type. The multi-mesh arrangement built up by the mechanical and optical combination is claimed to have certain advantages over the straight scanning and simple interlacing as used at present. The light efficiency was certainly high, while the optical system was of a fairly simple type, and the show arranged left no doubt that colour television using a radio link and reproduced on a large screen was an accomplished fact.

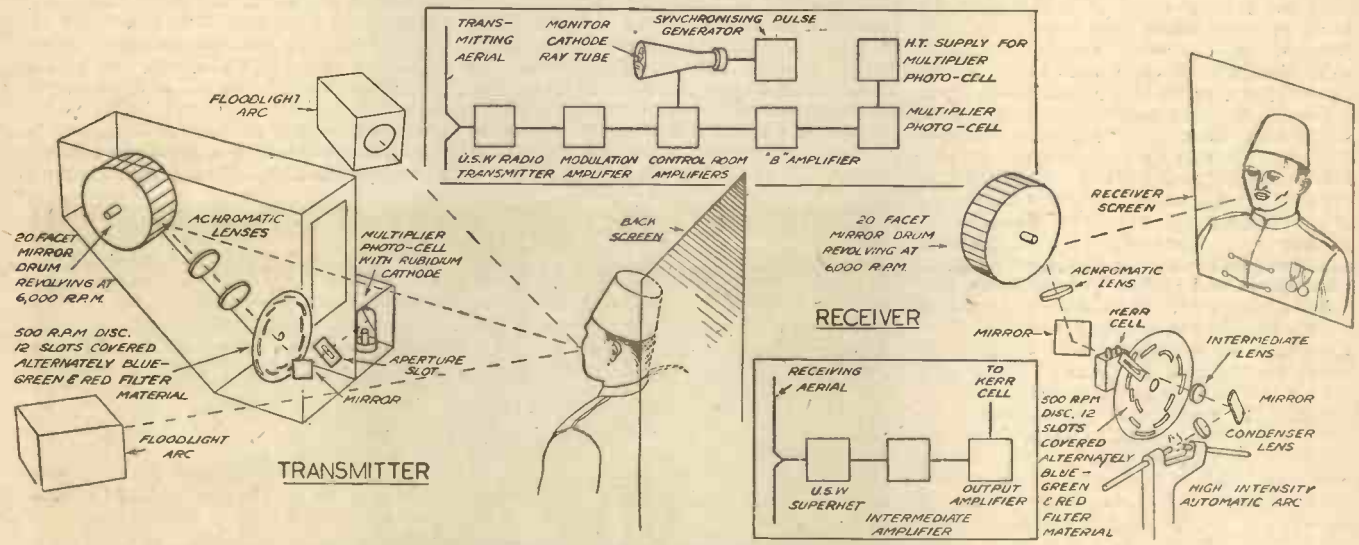


Fig. 2.—Diagram illustrating the process of colour transmission and reception as used in the recent Baird demonstration.

TELEVIEWS

An Australian Honour

TOMORROW (February 24th) Mr. J. L. Baird will leave this country for Australia. He has accepted the invitation of the Australian Institute of Radio Engineers to be their guest of honour at the World Radio Convention, which is being held to celebrate the Australian sesqui-centenary. Mr. Baird is to give an address on television, the science which he did so much to pioneer, and which has always been recognised by the largest island in the British Empire. Among those of the audience who will listen to Mr. Baird's speech will be the wife of the late Senator Marconi, for she has agreed to take her husband's place, and accept the honours which Australia had arranged to confer originally on Marconi himself as the leading radio pioneer.

An Important Point

THE early users of cathode-ray tubes and other electronic devices which had some form of fluorescent screen material coating on the inside of the glass envelope, experienced considerable difficulty as a result of the unsatisfactory adhesion making parts of the coating flake off. In the case of television receivers using cathode-ray tubes mounted vertically for indirect picture observation, this fault was a frequent cause of tube failure since the portions of screen coating which detached themselves from the tube top generally found their way into the electrode system, and ruined the cathode emission or blocked the small anode apertures through which the electron stream passed. A great deal of research has been applied to this problem, and one of the most satisfactory solutions to be found is to cover the fluorescent material after it has been applied to the glass with a solution of water glass, potassium silicate or silicon ester and then bake the whole tube. Using this method one leading television firm has eliminated entirely all its previous troubles, and the C.R. tubes never fail now from flaking screen causes.

The Educational Angle

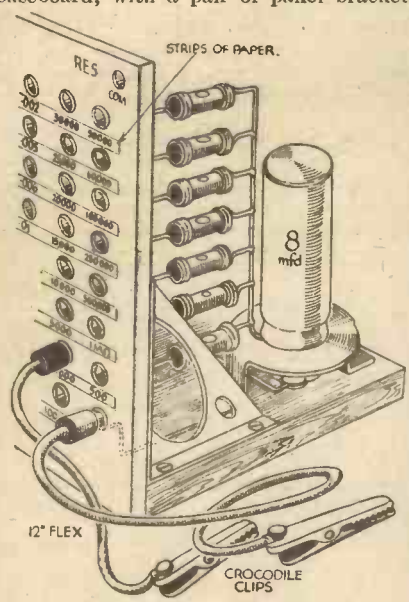
ALREADY the question of television for schools is being earnestly discussed by the authorities closely interested in modern aids to education. While the present programmes are very primarily produced for entertainment in the home, there are several sections which have a highly educational value, particularly the illustrated talks and scientific demonstrations. The rapidity with which wireless developed, and so enabled transmissions to schools to become a regular feature is undoubtedly being borne in mind by the Central Council for School Broadcasting, so that, in readiness for television's anticipated rapid progress, plans will be available to take full advantage of the service for the education of the young and eager mind. The superiority of a television service over that of aural broadcasting for schools is, of course, quite obvious, for nothing impresses a boy or girl more than what he or she can see. Already some of the technical institutes have found television receivers of value in their work. A set has been in use for nearly a year at the Norwood Technical Institute, which, in addition, has a television course included in its part-time teaching curriculum, while a similar state of affairs exists at the Regent Street Polytechnic. In these and other places a close watch is being kept on the programmes, and items known beforehand to have an educational value are viewed by classes studying that particular subject so as to acquire another angle of treatment additional to that followed by the regular teacher.

READERS WRINKLES

A PAGE OF PRACTICAL HINTS

A Useful Test Panel

THE useful piece of apparatus, shown in the accompanying drawing, requires about three dozen small sockets, some strips of paper, a piece of old panel and baseboard, with a pair of panel brackets.



A bank of resistors and condensers neatly arranged for test purposes.

I would advise the use of a combination of the most used resistors and condensers, and you will notice that you can parallel any two required. I would also suggest that the common ends of resistors and condensers are kept separate, so that you could use each separately and at the same time. One word of warning: when substituting resistors or condensers in H.F. circuits you will get a certain amount of instability, which you must allow for, but keep the leads short and you will have little trouble.—G. A. LEE (Balkwell).

An Automatic Record Counter

THE accompanying illustration gives details of a simple device which enables a pick-up needle to be left in the pick-up for the whole of its effective life without the fear of losing count of the number of records played. The device is intended to be mounted on the motor-board of a radiogram in such a position that each time the pick-up is replaced on its rest after playing each record, its arm depresses a small lever which moves a pointer round a dial on the "counting" mechanism.

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., Tower House, 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 wrinkles.

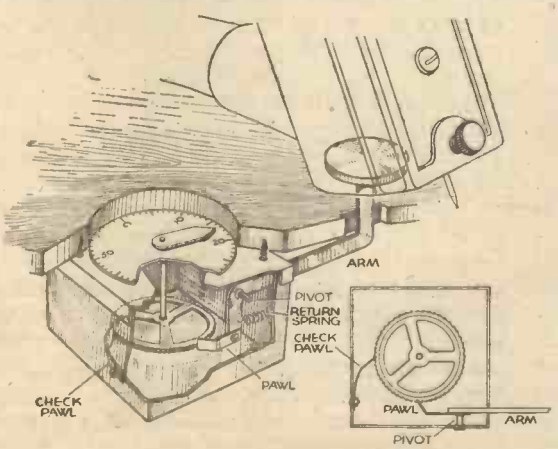
SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page 666

As the accompanying diagrams show, the only requirements are a small box (made from sheet brass or aluminium), a toothed wheel, and some odd pieces of brass for the pivotted arm, etc.

The chief point about the toothed wheel is that it should have the same number of teeth as the number of "sides" (usually about 60), which can be played with one needle of the type in use, and the wheel may be taken from an old clock or similar piece of mechanism. It is mounted as shown, on a verticle spindle in the centre of the small box.

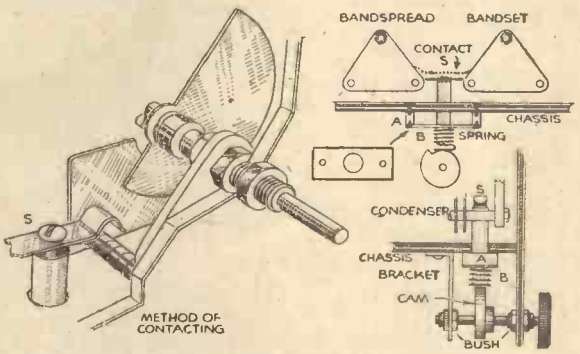
The two pawls are made from springy brass, one being fixed to the pivotted arm, and the other to the side of the box. The pivotted arm itself passes through a slot in the side of the box and has a small disc at its extremity upon which the pick-up arm presses when on its rest, and so turns the wheel one tooth each time.—S. C. BLACKSHAW (Wolverhampton).



A simple counting device for automatically registering the number of records played.

A Low-loss Switching Device

THE accompanying sketches show an efficient low-loss switch, quite easily made, which can be used where extra wiring would cause losses. It is very useful for short-wave listeners, who use their receivers mostly for the amateur bands, but who listen to broadcast now and again. With it the tank condenser can be cut out, then, tuning with the bandspread, the 12-26 m. coil covers the 10 m. band, the 22-47 the 20 m., and so on, thus giving high L/C ratio for greatest sensitivity. This switching arrangement brings signal strength up 3 R points more than when using the coils in the normal way, with the "tank" bandset. The insulating rod (taken from an old short-wave component) has the screw and nuts on top, and the base removed, and a strip of brass (S) ¼in. wide. bent as shown, is screwed on top. The cam is made out of an old ebonite knob, drilled through, and is supported by a ¼in. shaft held in a bush through the panel, and another held in a bracket. The guide (A) can be made of wood or metal and screwed firmly under the chassis. To the bottom of the insulating rod the spring (B) and a piece of thin brass are fitted. After the screw is tightened the piece of brass is bent over to provide a smooth surface to slide on the cam.—K. W. HOLYLAND (Harrogate).



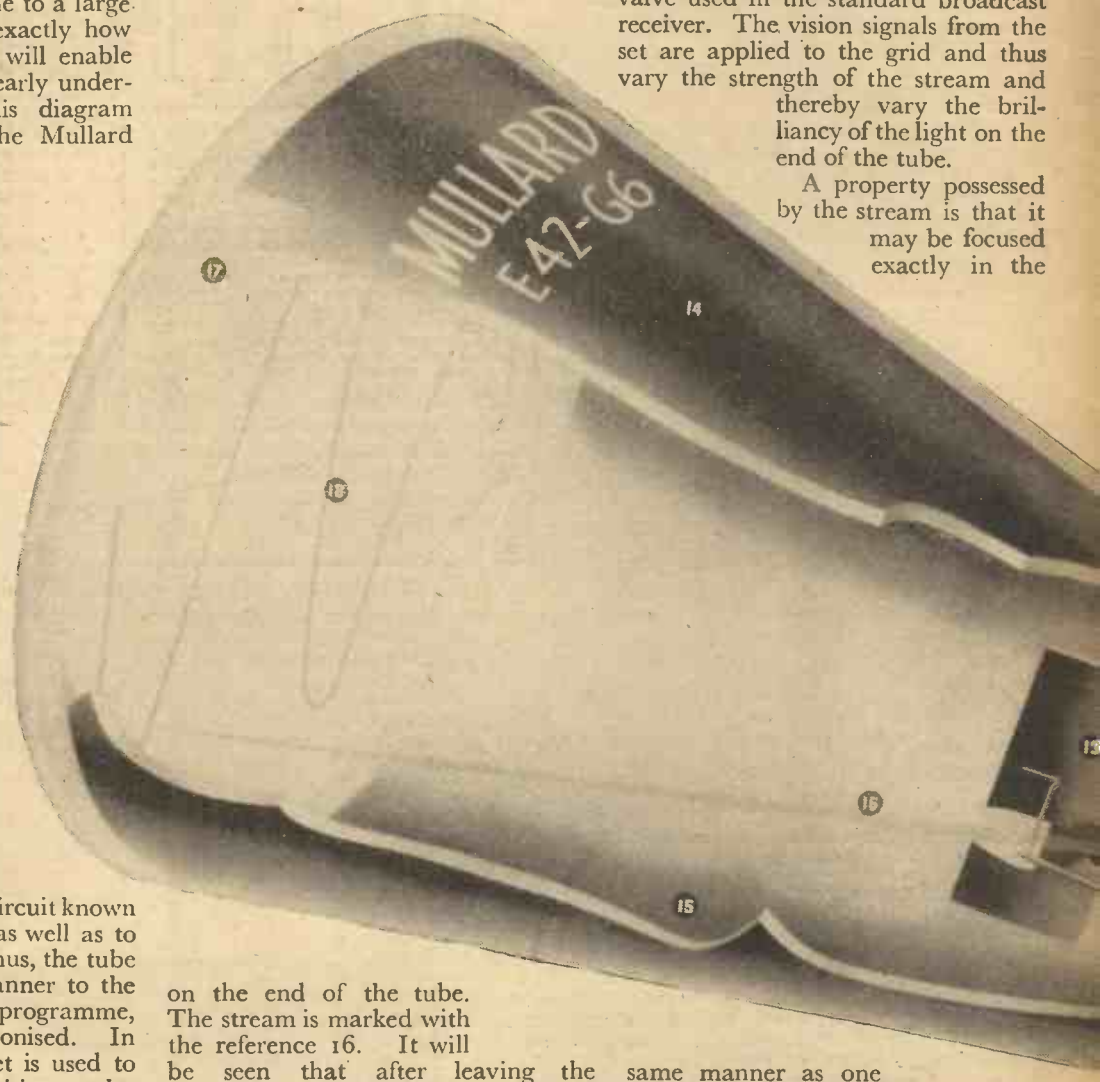
This low-loss switching device is suitable for short-wave work.

THE HEART of a T

An Interesting Description of the Worki Tube, with Especial Reference to the

AS the majority of listeners know, the modern television receiver employs a cathode-ray tube, and this is a component of mystery to many. It is, of course, a very old and well-established device which has only of recent times been developed for the reception of television pictures, and the accompanying illustration will reveal for the first time to a large number of our readers exactly how the tube is built up and will enable the working of it to be clearly understood. Incidentally, this diagram has been prepared by the Mullard Company, and a large reproduction, in colour, is available for the use of clubs, schools, and similar institutions. The chart measures just over 3ft. by 2ft., and bears, in addition to the large reproduction of the tube, a number of diagrams illustrating the many wave-forms and patterns which may be obtained and their use in modern science.

In the modern television receiver an ordinary wireless receiver, designed to provide high-quality on the ultra-short wavelengths, is connected to a loudspeaker in the ordinary way. This provides the sound component of the television programme. A similar set is also employed to receive the picture component, and this is connected to a circuit known as a time-base generator as well as to the cathode-ray tube. Thus, the tube acts in a very similar manner to the loudspeaker of the sound programme, and the two are synchronised. In some receivers a single set is used to pick up both sound and vision, and a special arrangement separates the two and feeds them to the tube and the speaker.



Object of the Time-base

The main vision signal controls the strength of the electronic beam in the tube and gives the light and shade of the picture, but the most interesting part of the working of the tube is the movement of this beam to build up the picture. In our illustration the electron stream is shown by a grey shadow extending from the point 5—which is the cathode, up through the electrode assembly and then bending down to form a pattern on the end of the tube. The stream is marked with the reference 16. It will be seen that after leaving the cathode it passes between two sets of parallel plates, one set being arranged at right-angles to the other. These deflector plates, as they are called, are marked with the reference numbers 11 and 13. If these deflector plates are left unconnected the electron stream will shoot from the cathode and impinge directly on the end of the tube, and the inside of this is coated with a special chemical which, upon impact of the electron stream, glows with a brilliance depending upon the strength of the stream as regulated by the voltage applied to the control electrode (or grid), numbered 6. In this respect the tube is very similar to the ordinary valve used in the standard broadcast receiver. The vision signals from the set are applied to the grid and thus vary the strength of the stream and thereby vary the brilliancy of the light on the end of the tube.

A property possessed by the stream is that it may be focused exactly in the same manner as one focuses the light from a magic lantern, and the design of the tube and the voltages used at the focusing anode (number 7) enable the light on the end of the tube to be made in the form of a very small spot or a large spot. In use the tube is adjusted to give a very small sharply-focused dot, although for some types of picture it is advisable to put the spot slightly out of focus in order to break up the lines seen in the picture. The time-base generator is connected to the two sets of deflector plates and the voltages vary in a definite manner according to the number of lines required in the finished picture. The effect of these varying

ELEVISION SET

of the Modern Cathode-ray
esent-day Television Receivers

This is the latest Baird receiver, in which the picture on the end of the tube is viewed by reflection in the mirror inside the lid.

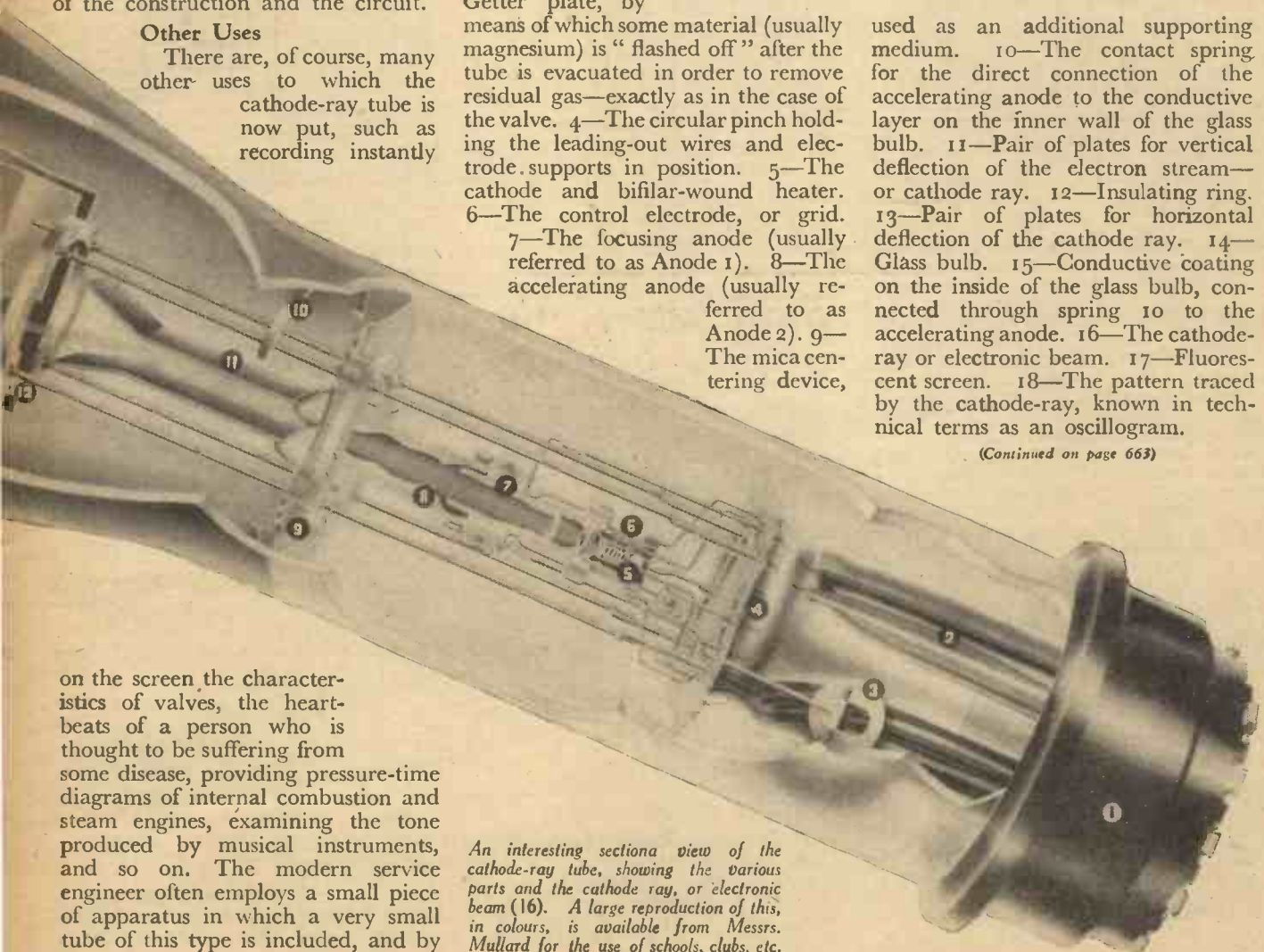
voltages is to bend or deflect the stream as shown in the illustration, and the time-base unit for the present television system causes the spot formed by the stream to travel from one side of the tube to the other and at the same time to travel slowly downwards so that a rectangle of light is built up. This is repeated so that the next rectangle is formed by interlacing the lines between those of the first scan, and the process is repeated very rapidly. It will thus be seen that in addition to the rectangle of light, the variations caused by the signals on the grid will build up a picture in light and shade and thus the process is really quite a simple one in spite of the many intricacies of the construction and the circuit.

Other Uses

There are, of course, many other uses to which the cathode-ray tube is now put, such as recording instantly on the screen the characteristics of valves, the heart-beats of a person who is thought to be suffering from some disease, providing pressure-time diagrams of internal combustion and steam engines, examining the tone produced by musical instruments, and so on. The modern service engineer often employs a small piece of apparatus in which a very small tube of this type is included, and by means of this circuits may be matched, and the performance of a modern wireless set may be checked.

The various sections of the tube are as follows: 1—the base, provided with 10 or 12 contacts, usually of the side-contact type, and designed for use with a special tube holder. 2—Insulated leading-out wires. 3—the Getter plate, by means of which some material (usually magnesium) is "flashed off" after the tube is evacuated in order to remove residual gas—exactly as in the case of the valve. 4—The circular pinch holding the leading-out wires and electrode supports in position. 5—The cathode and bifilar-wound heater. 6—The control electrode, or grid. 7—The focusing anode (usually referred to as Anode 1). 8—The accelerating anode (usually referred to as Anode 2). 9—The mica centering device, used as an additional supporting medium. 10—The contact spring for the direct connection of the accelerating anode to the conductive layer on the inner wall of the glass bulb. 11—Pair of plates for vertical deflection of the electron stream—or cathode ray. 12—Insulating ring. 13—Pair of plates for horizontal deflection of the cathode ray. 14—Glass bulb. 15—Conductive coating on the inside of the glass bulb, connected through spring 10 to the accelerating anode. 16—The cathode-ray or electronic beam. 17—Fluorescent screen. 18—The pattern traced by the cathode-ray, known in technical terms as an oscillogram.

(Continued on page 663)

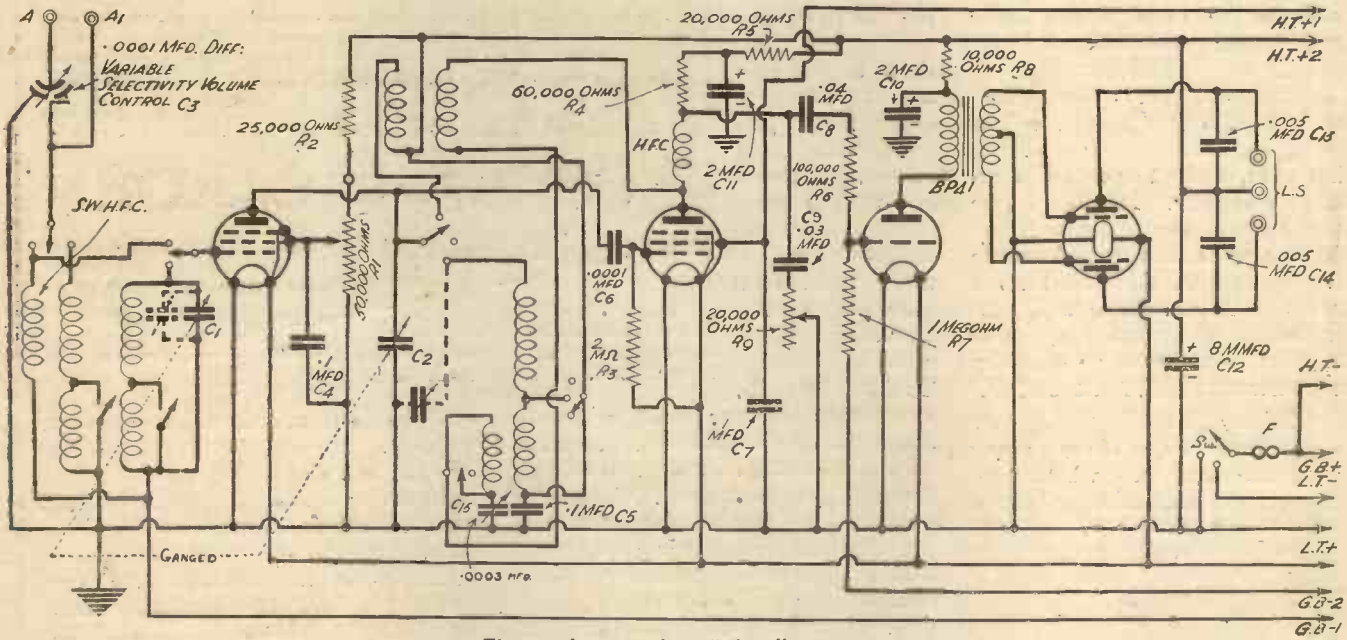


An interesting sectiona view of the cathode-ray tube, showing the various parts and the cathode ray, or electronic beam (16). A large reproduction of this, in colours, is available from Messrs. Mullard for the use of schools, clubs, etc.

THE "ACME" ALL-WAVE 4

IN our issue dated February 12th we gave constructional details of this new all-wave battery receiver and included a theoretical circuit diagram and Free Blueprint. We have to point out, however, that our draughtsman made a slip or two in these, and we are accordingly giving herewith a corrected theoretical circuit. It will be noted on comparison with the original diagram that he had linked together one anode and grid of the Class B valve, and had connected the filament of the third valve to the G.B.—2 line instead of to the L.T. positive line. These errors do not. of course, appear in the Blueprint and thus should the receiver be wired from the latter, or, as is usually done, the theoretical circuit be used as a check when wiring the receiver, these points will have been noted and no mistakes in the wiring should occur.

It will also be seen on some of the Blueprints which have been sent out that the positive and negative signs attached to two leads taken to the fuseholder on the top of chassis view have been transposed. These two leads are also shown on the under chassis view and are there correctly marked as H.T.— and G.B. positive. On the upper view, however, the draughtsman had reversed the two signs to read H.T. positive and G.B. negative, but this discrepancy does not appear on all the Blueprints, and, of course, a cross check with the theoretical circuit will remove any doubt which may exist in this connection.



Theoretical circuit of the "Acme" receiver.

Important Broadcasts of the Week

***NATIONAL* (261.1 m. and 1,500 m.)**

Wednesday, February 23rd.—Symphony Concert, from Queen's Hall, London.
Thursday, February 24th.—Scrapbook for 1900, feature programme.
Friday, February 25th.—Concert Party programme.
Saturday, February 26th.—A running commentary on the International Rugby Union Football match, Scotland v. Ireland, from Murrayfield, Edinburgh.

***REGIONAL* (342.1 m.)**

Wednesday, February 23rd.—Variety from the Alexandra Theatre, Hull.
Thursday, February 24th.—Hallé Society's Concert from the Free Trade Hall, Manchester.
Friday, February 25th.—Scrapbook for 1900, feature programme.
Saturday, February 26th.—B.B.C. Ballroom, feature programme.

***MIDLAND* (296.2 m.)**

Wednesday, February 23rd.—Variety from the Empire Theatre, Peterborough.
Thursday, February 24th.—Sportsman's Variety programme.
Friday, February 25th.—La Bohème, Act I, from the Memorial Theatre, Stratford-on-Avon.
Saturday, February 26th.—Compton Wynyates, feature programme.

***NORTHERN* (449.1 m.)**

Wednesday, February 23rd.—Variety from the Alexandra Theatre, Hull.
Thursday, February 24th.—The Cold Yeare, 1614: talke betweene a London shopkeeper and a North-countryman.
Friday, February 25th.—Variety from Her Majesty's Theatre, Carlisle.
Saturday, February 26th.—Dramatis Personæ: some unfamiliar aspects of the work of a Repertory Company.

***WELSH* (373.1 m.)**

Wednesday, February 23rd.—Choral and instrumental programme.
Thursday, February 24th.—The National Welsh Festival from St. Paul's Cathedral, London.
Friday, February 25th.—At Random: Border Dialects.
Saturday, February 26th.—Programme of music by Welsh composers.

***WEST OF ENGLAND* (285.7 m.)**

Wednesday, February 23rd.—They Made the West, a chronicle of English History—6, The Bible and the Sword, a talk.
Thursday, February 24th.—Dance Band programme.
Friday, February 25th.—Should old houses be reconditioned, and can they be made fit to live in?—a discussion.
Saturday, February 26th.—Band concert.

***SCOTTISH* (391.1 m.)**

Wednesday, February 23rd.—Ballad Days: another musicale in the Victorian manner.
Thursday, February 24th.—Variety from the Theatre Royal, Edinburgh.
Friday, February 25th.—Scots songs.
Saturday, February 26th.—Lewis: an impression of Island Life in the most Northerly of the Outer Hebrides.

***NORTHERN IRELAND* (307.1 m.)**

Wednesday, February 23rd.—Country Concert: Killough, County Down.
Thursday, February 24th.—The King of Spain's Daughter, a play by Teresa Deevy.
Friday, February 25th.—Organ recital from the Ritz Cinema, Belfast.
Saturday, February 26th.—First Prize-winners (Senior) North of Ireland Bands' Association Championship Contest held in the Ulster Hall, Belfast, November, 1937.

THE HEART OF A TELEVISION SET

(Continued from page 661)

Tube Sizes

In the larger types of television receiver the diameter of the end of the tube is such that a picture just over 10in. by 8in. may be obtained, and this is, of course, not the full area of the tube end. Owing to the curvature of the tube, which has to be maintained in the interests of strength, the picture is accommodated in the central portion in order to keep a fairly flat field. The tube is made in various other sizes, the most usual for television receivers being 10in. and 12in. For the new types of large-screen television sets a very small tube is employed and the screen of this is coated with a special material giving high luminosity, whilst the picture is less than two inches in width. This tube is placed beneath a lens assembly and the picture is thereby projected on to a mirror placed at an angle behind a ground glass or similar screen, and thus a larger picture is obtainable than with the directly-viewed tube. Much higher voltages are, of course, needed to obtain the desired brilliancy to enable the picture to be projected. This small type of tube (usually having a three-inch end) is also used in the small oscilloscopes used for servicing purposes and in special types of electrical equipment which are now used for medical and other purposes.

The end of the smallest tube so far available commercially is only 3ins. diameter, whilst, as already mentioned, the largest (manufactured by Baird, Cossor and Mullard) is 15ins. The fluorescent coating in all tubes is available to produce approximately seven different colours —white, blue, green, light blue, red, blue-green, and sepia.

A Long-wave Rejector Unit

In this Article Details are Given of a Double-tuned Unit for Improving Reception on the Long-wave Band - - - - By G. V. COLLE

FOR many listeners throughout the British Isles the morning concerts from some of the long-wave stations represent one of the few sources of entertainment open to them during the early hours of the day. Housewives particularly look upon the broadcasts as a pleasant background to their morning toils.

Unfortunately, these concerts are practically wiped out, at least in most parts of the North, by occasional barrages of interference. This interference is not due to heterodyne whistles caused by overlap, because on the average receiver most of the long-wave stations can be easily separated without mutual interaction. The noises which cause the "wipe-out" are apparently created by a broadly tuned spark transmitter operating on the C.W. (continuous-wave) principle.

The "mush" created by the interfering transmitter blankets adjacent stations and creates such an intolerable din that one is forced to switch off. With a view to assisting listeners whose reception is spoilt in the manner described, and by the heterodyne whistles, the following description of a double-tuned rejector unit should prove of interest.

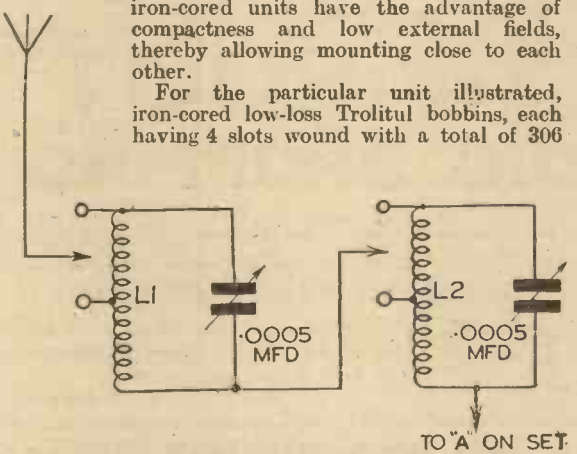


Fig. 1.—Circuit diagram of the long-wave rejector unit described in the text.

Circuit Arrangements

Fig. 1 shows the theoretical circuit arrangement of the rejector, which merely comprises two simple centre-tapped long-wave coils, each separately tuned by a small bakelised-paper dielectric or preset .0005-mfd. condenser. The use of the former variable type allows the rejector to be employed for all long-wave stations, whereas preset capacities, although as effective once adjusted, are more suited for permanent setting on the one station.

It will be seen that the unit connects in series with the aerial lead to the receiver, and in actual fact can be fitted at any convenient point where it will be readily accessible.

Each tuned circuit, when in use, is adjusted to the wavelength immediately above and below that of the desired transmission. If the resonance point of each circuit is sharp enough, little or no loss of signal strength will be noted, but any other signals or interference of a C.W. type on the adjacent wavelengths will be demodulated, and thereby reduced or eliminated. The rejector cannot suppress electrical static because it is not tunable.

Iron-cored Coils

Much of the success of the device depends on the efficiency of the coils, which must have a low H.F. resistance, and be capable of tuning as sharply as possible. Damping due to the loading effect of the aerial can be obviated to a large extent by connecting it to the tapping on the first coil. The same remarks are true of the second coil; it is best to connect the bottom end of the first coil to the centre tapping on the second when initially installing the unit.

If the tuning on either of the condensers is too critical, then it is possible to broaden the effect merely by employing the high tappings. Adequate selectivity can be achieved by using iron-cored coils, or some wound on about 3in.-diameter slotted formers. Air-cored coils, on the latter style, need to be arranged a few inches apart, and at right-angles to each other, so that their fields do not interact. The iron-cored units have the advantage of compactness and low external fields, thereby allowing mounting close to each other.

For the particular unit illustrated, iron-cored low-loss Trolitul bobbins, each having 4 slots wound with a total of 306 turns of No. 34 s.w.g. D.S.C. wire, are employed. Winding is commenced in the wide end slot with 100 turns, continued with 53 turns for the next slot, a tapping brought out by doubling about 6in. of the wire, carried on for 100 turns in the next wide slot, and finally completed with 53 turns in the narrow end slot. Those readers who desire to purchase the coils complete can obtain them from Ward and Goldstone, at 2s. 6d. per pair.

Assembling the Unit

Assembling the complete unit is extremely simple, the variable condenser being mounted on an ebonite strip or panel about 5in. by 2¾in. by $\frac{3}{16}$in. or ¼in. thick. The coils are mounted, as shown, on a plywood baseboard about 5in. by 3½in. by $\frac{3}{16}$in. or $\frac{3}{8}$in. thick. Pieces of fibre strip or any other insulating material $\frac{1}{16}$in. wide are passed over the coils, being held rigidly in position by small wood screws passing through holes in the strip, and into the baseboard.

Four sockets, or terminal sockets, capable of taking wander plugs are required. One wander plug will connect to the aerial lead-in, and the other to the flex lead on the unit. A flex lead is permanently joined to the unit for connection to the aerial terminal on the receiver, and can be made any convenient length. Its extremity can be finished by a wire hook, wander plug, or spade, to suit the particular mode of aerial connection provided on the receiver.

To avoid the introduction of noises, and to prevent tuning drift in the rejector unit, the use of good quality tuning condensers with permanent pigtail leads to the moving electrodes are recommended. Provided that sockets and tuning condensers are fitted with terminals, the need for soldering is obviated.

Nothing is said here about the construction owing to its simplicity, and the fact that the connection of the unit is self-explanatory from Fig. 2. Before proceeding to describe the method of operating the unit, it is as well to remind prospective users again that it will do nothing to eliminate electrical man-made static. These noises comprising clicks, crackles and bangs are only curable by means of a high noise-proof aerial system, and perhaps the additional use of a mains filter.

Operating Notes

Assuming the set is accurately tuned to the desired long-wave station, and the rejector connected in the aerial lead with the wander plugs in the left-hand terminals (see Fig. 2) for L1 and L2, the operator should turn both rejector condensers anti-clockwise so that they are at minimum capacity.

Now slowly rotate one condenser (preferably the left-hand one for L1) until a point

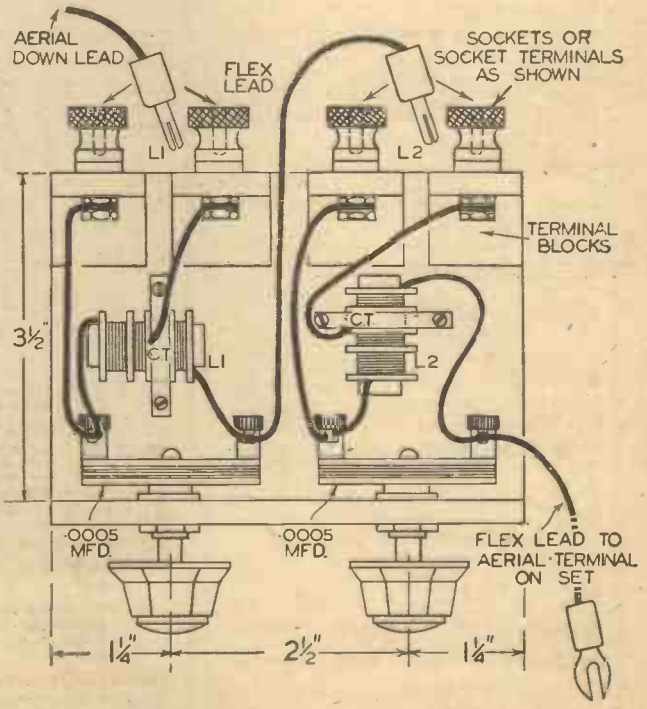


Fig. 2.—Wiring diagram. If required, engraved scales and pointers may be used in place of the knobs shown.

is reached where volume is suddenly reduced. The condenser should then be retarded by a fractional amount to barely regain volume. Repeat the process for the right-hand condenser, but even more slowly, as this time the drop in the volume will not be so discernible. When the second point where volume is affected is reached, *advance* the condenser by a similar fractional amount to regain it. Both sections are now tuned immediately above and below the desired transmission, and should considerably reduce "mush," and heterodyne whistles. If the receiver itself incorporates input and output volume controls, it is also worth while readjusting the relationship of these to see if a further improvement in the signal-to-noise ratio can be effected.

Reducing the treble by the receiver tone control will aid results in removing very severe radio interferences, but this should only be a last resort, since one of the objects of the rejector is to avoid spoiling reproduction by eliminating high-note response.

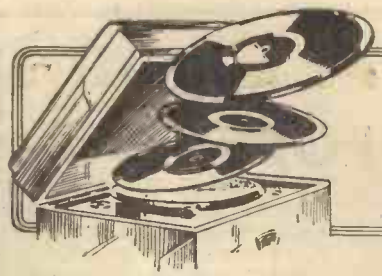
LIST OF COMPONENTS

1 Ebonite or paxolin panel 5ins. long by 2¾ins., or 3ins. high by 3/16in. or ¼in. thick.
1 Plywood baseboard 5ins. long by 3½ins. deep by 5/16in. or ⅜in. thick.
4 Terminal blocks (or 2 double blocks).
4 Sockets or socket-terminals.
2 Long-wave iron-cored coils (see text).
2 Wander plugs (to fit sockets).
2 .0005 mfd. bakelised paper dielectric variable condensers with knobs (or pointer-knobs and scales).
Miscellaneous wood screws, flex, wire, Systoflex, and fibre strip.

Where adjustment of the right-hand rejector condenser does not appear to affect volume despite critical operation, the wander plug for L2 should be transferred to the "C.T." socket (extreme right).

In the Manchester area, where the unit was tried out, Berlin (between Droitwich and Paris) was completely freed from side-splash interference, and Huizen increased in volume. The latter effect was due no doubt to the rejector tuning the aerial, although "mush" on this station was decreased owing to the larger signal-to-noise ratio.

It will seem, therefore, that the rejector can act in a number of ways, such as (1) demodulating transmissions above and below a desired station, thereby reducing side-splash, (2) rejecting in two stages radio interference above a desired wavelength, (3) as in (2) but in two stages below, (4) increasing the signal-to-noise ratio by tuning the aerial and thereby increasing the signal input.



Impressions on the Wax

MOST readers will remember the famous records made by Ernest Lough, the Temple Church choirboy, over 10 years ago. He now makes his re-appearance for H.M.V. as a baritone, and has recorded the Bach-Gounod "Ave Maria" and the "Vesper Hymn" on *H.M.V. B* 8697. Derek Oldham's voice shows up to great advantage in two old-time ballads, "Come Sing To Me" and "The Sunshine of Your Smile" on *H.M.V. B* 8682.

An interesting record is that of the Comedy Harmonists singing two German folk songs, "How Can It Be" ("Ach, Wie Ist's Moglich") and "Must I Then" (Muss I denn) on *H.M.V. B* 8688. They are both excellent examples of well-balanced part singing.

From the Films

FILMS and shows supply most of the material for the new records. Jack Hulbert sings "In a Paradise for Two" and "When You Hear Music," from his new film, "Paradise for Two"—*H.M.V. BD* 494. Elsie Carlisle is heard in "Little Old Lady" and "I Still Love to Kiss You Goodnight," the latter from the film "Fifty Second Street"—*H.M.V. BD* 487, and on *H.M.V. BD* 490 she sings two songs from the film "Mr. Dodd Takes the Air," "Here Comes the Sandman" and "Remember Me."

The big hit of the moment is "Bei Mir Bist Du Schoen." This, with another popular number, "Marie," is sung by Al Bowlly on *H.M.V. BD* 493. Revnel and West "oblige" with two of their laughable numbers, "We Do See Life" and "Looking After Baby," on *H.M.V. BD* 492, and Issy Bonn makes his first recording for the H.M.V. Company with "Issy Goes to Lunch" and "My Best Friend" on *H.M.V. BD* 498.

Other newcomers are the Three Musketeers who have recorded two songs from the film, "Lovely To Look At." These are "There's a Gold Mine in the Sky" and "My Swiss Hilly Billy," on *H.M.V. BD* 497. There is also a selection from the new show, "Venus in Silk," with Hella Foros and Jan Van Der Gucht with the New Mayfair Orchestra—*H.M.V. C* 2990. Marek Weber and his Orchestra play one of the loveliest of the waltzes, that from Tchaikovsky's Ballet, "The Sleeping Beauty," and with it is coupled the ever popular Liebestraum No. 3 (Liszt)—*H.M.V. C* 2948.

Another famous Continental orchestra, that of Barnabas Von Geczy, is represented by "Red Lips" and "Southern Skies"—*H.M.V. B* 8696, and the Victor Concert Orchestra plays "Salut d'Amour" (Elgar) and "Chanson Indoue" (Hindu Song) on *H.M.V. BD* 496.

Lively marches—"Spirit of Youth" and "Liberator's"—are played by the London Palladium Orchestra on *H.M.V. B* 8662 and Anton and the Paramount Theatre Orchestra contribute an attractive medley of Paso Dobles on *H.M.V. BD* 495.

Dancing Time

THERE is a fine array of new issues, including the new hit, "Bei Mir Bist Du Schoen." This, coupled with "Once in a While," is played by Jack Harris and his Orchestra on *H.M.V. BD* 5321. Roy Fox's four new titles this month are "True Confession" and "There's a Gold Mine in the Sky"—*H.M.V. BD* 5315, and "Trusting my Luck" and "Souvenir of Love"—*H.M.V. BD* 5319. Two titles from the new show, "Me and My Girl," now playing to packed houses at the Victoria Palace, are recorded by Ronnie Munro—"Me and My Girl" and "Lambeth Walk"—*H.M.V. BD* 5324.

Parlophone

FOR his latest record Richard Tauber has chosen "Still as the Night" and "Calming of the Tempest," both sung in German on *Parlophone RO* 20379.

In the historical series of famous voices of the past appears "The Flying Dutchman" (Senta's Ballad) and "Tristan and Isolde" (Isolde's Liebestod) sung in German by Emmy Destinn, with orchestral accompaniment. Both of these songs were originally acoustically recorded in 1911. The number is *Parlophone PXO* 84.

On the humorous side we have that popular comedian Ronald Frankau, accompanied by Monte Crick at the piano, singing "Kick It About Until It's Lost" and Dolara, the Daughter of Bo-Bo the Great," on *Parlophone R* 2471. Murray and Mooney also talk "A Lot of Nonsense" on both sides of *Parlophone F* 1023.

Leslie A. Hutchinson ("Hutch") sings that popular song "My Gypsy Dream Girl," from the film "Command Performance," coupled with "Please Remember," on *Parlophone F* 1016, and "A Foggy Day," and "By the Sweat of Your Brow" on *Parlophone F* 1017.

If you enjoy pianoforte solos you should hear Patricia Rossborough playing a selection of tunes from the film "Damsel in Distress" and "Popular Medley," on *Parlophone F* 1019, and Billy Thorburn playing a waltz and foxtrot medley of tunes with drum accompaniment on *Parlophone F* 1015.

Then we have Ivor Moreton and Dave Kaye on two pianos with drums playing "Midnight in Mayfair" and "Four Hands on a Piano," on *Parlophone F* 1004.

Harry Roy and his Orchestra have made two new records this month, "Swing is Here to Sway," from the film "Ali Baba Goes to Town," and "Got a New Pair of Shoes," on *Parlophone F* 1006, and "Home Again Blues" coupled with "Popcorn Man," on *Parlophone F* 1007.

Nat Gonella and his Georgians also have two records, "Big Chief 'Swing It'," from the film "The Joy Parade," and "Goona Goo"—*Parlophone F* 1008, and "Blues in my Heart" and "Cocktail Swing," on *Parlophone F* 1009.

Massed Military Bands have recorded "Gasparone" and "Fatinitza," two marches, on *Parlophone F* 1018, and Victor Silvester and his Ballroom Orchestra have coupled "Once in a While" and "Giamina Mia" on *Parlophone F* 1013.

Leaves from a Short-wave Log

New Station in Dominican Republic

HID, Trujillo City, to which reference was made in these notes (PRACTICAL AND AMATEUR WIRELESS, issue February 12th), has altered its call-sign to HI2D, and also its wavelength to 43.48 m. (6.9 mc/s). The programme schedule is now as follows: G.M.T. 11.30-13.30; 15.30-19.30, and from 21.30-02.00 daily. The studio opens the broadcast with the playing of a gramophone recording of Gounod's *Ave Maria* on the violin. The call is coupled with the slogan: *La Voz de la Asociacion Catolica Dominicana en Ciudad Trujillo.*

Good Signals from Mozambique

The broadcasts from CR7BH, Lourenço Marques, on 25.6 m. (11.72 mc/s) are occasionally well received in the British Isles between G.M.T. 17.30-21.00 on week-days, and on Sundays from G.M.T. 19.00-21.00. Interval signal consists of a single chime, and announcements are made in a female voice. You may hear sponsored programmes, including publicity for commodities sold by firms in Bulawayo, Mafeking, Pretoria, Johannesburg, and so on, in both Portuguese and English. The programmes are S.B. on 48.88 m. (6.137 mc/s) through CR7AA in the same city.

South African Broadcast Schedule

Daily on week-days ZRK, Cape Town, is on the air between G.M.T. 04.45-16.45 on 31.23 m. (9.6 mc/s), and ZRH, Pretoria, from G.M.T. 04.45-12.30 on 31.5 m. (9.523 mc/s). On the longer channels the programme times are as under: ZRH, Pretoria on 49.94 m. (6.007 mc/s), on weekdays between G.M.T. 15.00-21.00, and on Sundays from G.M.T. 08.30-10.00 and from 15.30-20.15. ZRK, Cape Town, on 49.2 m. (6.1 mc/s), works on weekdays from G.M.T. 17.00-21.00, and on Sundays from 08.30-10.00 and 13.20-20.30. ZRJ, Johannesburg, using the single channel, 49.2 m. (6.1 mc/s), works daily (exc. Sundays) from G.M.T. 04.45-16.30, and on Sundays from 08.30-10.00 and 13.00-16.30. ZRD, Durban, on 48.8 m. (6.15 mc/s), although a small station, has been heard in the British Isles, so I am told. It operates on week-days from G.M.T. 04.45-05.45; 08.30-12.30, and 14.00-21.00; on Sundays from G.M.T. 13.00-20.00.

New Channels for Radio Colonial

Tests are being carried out with a new transmitter by Radio Colonial (Paris) on 49.67 m. (6.04 mc/s), 31.41 m. (9.55 mc/s), and 25.32 m. (11.85 mc/s). The call emanates from Essarts-le-Roi, near the French capital.

League of Nations Broadcasts

Every Friday and Saturday transmissions in English describing the workings of the League of Nations during the preceding week are made through HBO, Prangins, on 26.31 m. (11.4 mc/s), and HBL, on 31.27 m. (9.595 mc/s). The times are: G.M.T. 19.00-19.15 for Great Britain; Scandinavian countries and South Africa through HBO; and at G.M.T. 00.30-00.45 for the United States of America and Canada through HBL.

Proposed Yugoslavian High-power Station

It is reported from Belgrade that a contract has been placed with a German concern for the supply and erection of a 10-kilowatt short-wave transmitter in the vicinity of Batajnice, with a view to the relay of special broadcasts to Yugoslav nationals resident in North and South America. Listeners report that a station giving the call-sign YUA, Belgrade, is already testing on about 49.5 m.

And a 50-Kw Station for Austria

Following a series of tests, the Ravag authorities have decided that the two most favourable channels for their short-wave world broadcasts are 25.42 m. (11.8 mc/s) and 49.41 m. (6.072 mc/s). In order that the programmes may be available to their nationals all over the world it is proposed to build on Mount Bisamberg, close to the site of the present high-power medium-wave transmitter, a 50-kilowatt short-wave transmitter equipped with beam aerials. The work is to be started without delay, and it is hoped that the station may be ready by the end of 1938.

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.

PROPOSED CLUB FOR SUTTON

ANY readers interested in the formation of a Radio Club in the Sutton district are invited to get in touch with Mr. Norman H. Hanton, 6, Manor Court, Benhill Avenue, Sutton, Surrey.

SPEN VALLEY LITERARY AND SCIENTIFIC SOCIETY: RADIO SECTION

THE above newly formed club welcomes new members, who are invited to attend meetings. Arrangements for morse practice are being made, and a club receiver is in course of construction. Further particulars can be had on application to the secretary, J. Clegg, 38, Shirley Grove, Gomersal.

THE CROYDON RADIO SOCIETY

ON Tuesday, February 8th, the above society was joined in St. Peter's Hall by the Short-wave Radio and Television Society of Thornton Heath, the meeting being presided over by Mr. G. A. Hoskins, vice-chairman. The subject discussed was "Electrical Interference as Applied to Broadcast Reception," given by Mr. H. J. Walters, of Belling and Lee, Ltd. Of interfering voltages, he said there was the conducted component travelling along the mains cable, and also the radiated component entering the receiver by the aerial and earth system. Regarding suppression at the receiving end, he dealt with the use of condensers and the choke filter method, while the Doublet aerial was popular. A transmission-line aerial, however, had no real drawbacks, as it was not directional nor did it cause much loss, and was efficient on all wavelengths.

Suppression at the source was a fascinating part of Mr. Walters' lecture, and he discussed how earthed and unearthed appliances were treated. In a commutator motor, for instance, a condenser was inserted between the brushes and frame. Neon signs were a big problem, and here condensers were connected in the middle of the tubing. Interference from motor-car engines chiefly came from the ignition system, and resistances effected a cure in the plug leads. Mr. Walters felt sure that legislation would be introduced for the compulsory suppression of interference. On Tuesday, March 1st, Mr. G. A. Hoskins, vice-chairman, will give another musical programme on records.

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

THE DERBY SHORT-WAVE RADIO AND EXPERIMENTAL SOCIETY

MR. L. JACKSON (2AJM) gave an interesting lecture to a good attendance of members on Tuesday, February 8th, the subject chosen being rectification. On Tuesday, March 1st, a talk on aerials will be given by the President, Mr. E. V. R. Martin (G2TL). A hearty welcome will be extended to any radio amateur attending any of our meetings.

H. Turner, Secretary, Nunsfield House, Boulton Lane, Alvaston, Derby.

BRADFORD SHORT-WAVE CLUB

THE Bradford Short-wave Club have now commenced construction of the new transmitter. On most previous occasions constructional work has been done at members' homes, only experiments with completed apparatus being conducted on the club premises. This time the work is to be done at the club, and therefore anyone interested will be able to see the transmitter in course of being built. All enthusiasts in the district are therefore invited to Bradford Moor Council Schools, the club headquarters, any Friday evening, or are asked to communicate with the secretary, S. Fischer, Edenbank, 10, Highfield Avenue, Idle, Bradford, Yorks.

RADIO, PHYSICAL AND TELEVISION SOCIETY

AT a meting of the society held on Friday, February 11th, Dr. C. G. Lemon delivered another of his interesting lectures. The subject was "Ultra-short-wave Receivers." In the course of the lecture various types of receivers suitable for use between the wavelengths of 1½ and 5 metres were described, including several suitable for use on the society's proposed 2½ metres field-days to be held at dates to be announced later. Superheterodyne receivers being not yet of great utility on the ultra-high frequencies on account of the poor quality of amateur transmissions, the greater part of Dr. Lemon's lecture dealt with super-regenerative sets. Various types of self-quench receivers were described in detail, although it seems probable that the set which will be most used on the occasions of field-days is a three-valve separate-quench set. A receiver of this type was demonstrated and found to be satisfactory, the degree of hiss, unavoidable in all super-regenerative sets, was found to be insufficiently loud to spoil reception, even of weak signals, with a carrier not strong enough to cause complete cessation of hiss.

Meetings of the society are held at 72a, North End Road, West Kensington, London, W.14, every Friday evening during the winter months. Further particulars may be obtained from the Hon. Secretary at the above address.

THE NORTH LONDON RADIO SOCIETY (Incorporating The Tottenham Short-wave Club)

THE Tottenham Short-wave Club are forming a new society to be known as the North London Radio Society in order that persons interested in all fields of radio may be taken as members and not only those interested in short waves, as has been the principle in the past. The society are holding three Visitors' Evenings at the New Trades Hall, Tottenham, N.17, on the 24th, 25th and 26th inst., and tickets may be obtained on receipt of a stamped-addressed envelope to the Hon. Sec., Edwin Jones, 60, Walmer Terrace, Firs Lane, Palmers Green, N.13.

BRENTWOOD AMATEUR RADIO SOCIETY

AT the last meeting of the above society, held on Friday, February 11th, a very interesting demonstration was given by Mr. B. A. Pettit (2CRJ) of his short-wave receiver.

A welcome visitor at this meeting was Mr. R. C. Beardow (2BZB), Hon. Sec. of the Chadwell Heath Amateur Radio Society. The two societies are now co-operating and propose holding several joint meetings. At the conclusion of the meeting the usual morse practice was held.

The society will soon be on the air under their call-sign, G8HV. The Post Office have recently consented to Mr. A. H. S. Scott (G6UP) as a second operator. Mr. H. N. Tweddell is now 2DJB, and is building a TX, whilst Mr. K. R. Acton is a new member.

The journal of the society has now been reorganised and is being published quarterly. The Editor is Mr. S. Duniam Jones (G8KM).

The following future programme has been arranged:

February 25th: Demonstration of 56 Mc. transmitting and receiving apparatus.
March 11th: Demonstration by the M.P.R. Electrical Company of their 7-watt amplifier and double button microphones.
March 25th: Lecture. Details to be announced later.
April 8th: Lecture and demonstration by Mr. S. R. Walker of the Automatic Coil Winder and Electrical Company.
April 22nd: "The Equation X-X-O," Cinematograph film showing in a practical form the construction of Harmonics.

Readers of this journal who would like further particulars of the society are invited to communicate with the Hon. Secretary, Mr. J. R. Deane Sainsbury (2CYW), "Brunook," Crossways, Shenfield, Essex.

EALING AND DISTRICT SHORT-WAVE CLUB

ON January 26th the above club held a very interesting meeting at their headquarters, when Mr. Hathrill (2CCK) gave a description of the receiving aerials at his QRA (two half-waves in phase).

On February 2nd, a Junk Sale was held, which as usual proved a great success. The proceeds of this sale are going towards the production of the new club magazine, "The Monitor," which we hope to publish for the first time early in March. Copies may be had by non-members for 3½d. each, post free. It contains World Friendship Society of Radio Amateurs, and British Short-Wave League notes.

All enquiries concerning the club and magazine should be made to the Secretary, and a stamped-addressed envelope would be appreciated. Hon. Sec., W. Colchang (2CKL), 31, Lancaster Gardens, Ealing, W.13.

THE EXETER AND DISTRICT WIRELESS SOCIETY.

AT the meeting of the above society held on Monday, February 14th, Mr. E. Gibbs, of Bristol, gave a lecture on "The Evolution of the Superhet." Mr. Gibbs traced its growth from the early days, and stated that the first one was made in 1917, long before broadcasting was thought of. Each stage of the superhet was analysed, and the talk made more interesting in view of the personal experience which Mr. Gibbs had in the putting into practice of the theories which were formed in the early days.

At the next meeting a talk is being given jointly by Mr. and Mrs. Rumball on "Electricity in the Home."

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Radiation Interference

SIR,—I was interested to read Mr. K. Smith's letter in the February 12th issue of PRACTICAL AND AMATEUR WIRELESS because I have had a similar experience. About eighteen months ago I built an all-mains receiver consisting of a "straight" H.F. pentode, triode detector, and pentode output. Single-circuit tuning was employed in both the aerial and H.F. stages.

During daylight there was no interference, but after darkness had fallen both medium- and long-wave bands were interfered with, by a background of morse. This was subject to slow fading, and was more prominent on some evenings than on others. Sometimes, also, an Italian broadcaster could be faintly heard. This background affected the long-wave band most. I cured it by fitting a short-wave H.F. choke in the aerial lead.

Later, when rebuilding the set, I replaced the H.F. pentode with one of the variable-mu type, and fitted a band-pass filter in the H.F. stage, whereupon the trouble disappeared altogether.

Recently I built a short-wave converter, and picked up a morse station on about 25 metres, but which of the Italian stations came with it I do not know.—F. HAWKINS (Edgware).

Aerials for Television: A Correction

SIR,—I wish to point out a slight error in my article, "Aerials for Television," which was published in the February 12th issue.

The formula: $Z=276 \log D/d$ should be: $Z=276 \log 2D/d$. It occurs twice in the article—once on the first page in the third column, and once over-page—as $Z=276 \log d/d$, thus in the following calculation, D=3.26in., not 1.63in. as stated.

Also, the sentence at the bottom of the second column on the first page should read:

"It is advisable to use tube, or at least a fairly heavy gauge of wire, in order to have sufficient bandwidth for good definition and to give adequate input on sound, for the same aerial is invariably used for both vision and sound.—A. HASTINGS (Highgate).

Logged At Mablethorpe

SIR,—Since my last letter to you regarding the stations I had logged on 20 metres, I have received some particularly good DX stations, which I give below. They were logged on February 9th, on 'phones.

VU2CQ, KA1JR, KA1ZL, FI8AC, FR8VX and ZB1L.—W. H. RUSSELL (Mablethorpe).

"The Superhet's Rival"

SIR,—I was very interested to read the article in PRACTICAL AND AMATEUR WIRELESS about the use of two R.F. stages. I have used sets of this type for some time now, and I definitely prefer them to superhets for use on the long and medium waves.

I found that if I connected a S.G. valve between the two coils of my band-pass tuner, the selectivity was greatly improved. Since, for reasons of stability, the magnification of this stage had to be kept very low, I rebuilt the set to incorporate two R.F. stages of medium-efficiency. I have already experimented with a further low magnification stage as before, and results have been, if not successful, at least encouraging.

I see that four tuned circuits are shown in the skeleton diagram of the proposed set; and so I ask: "Why not use three R.F. stages?"

The use of three stages would not materially increase the R.F. amplification of the set, but it would improve the selectivity and the action of the A.V.C., thus reducing (i.e., improving) the effective sensitivity of the set. I think that when greater selectivity than that given by such a circuit is required, a tone control in the L.F. circuits has the necessary effect.

I shall await with some impatience the description of a "straight" set in PRACTICAL AND AMATEUR WIRELESS.—"O. L." (Kings Lynn).

CUT THIS OUT EACH WEEK.

Do you know

—THAT erratic tuning effects in a superhet may often be traced to vibration of the condenser plates when powerful signals are received.
—THAT excessive scratch from a pick-up may be due to dirt or dust on the record.
—THAT when instability arises in a new receiver and screening is tried out, the anode or other leads should be screened in preference to the grid leads.
—THAT serious "breakthrough" effects may often be traced to direct pick-up on the wiring or leads in a receiver.
—THAT a speaker field may be used as a resistor either for biasing an L.F. stage or for providing delay volts in an A.V.C. circuit.
—THAT screening cans, chassis and other metallic surfaces may be protected by paint or enamel, provided that it is of a non-corrosive nature.

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., Tower House, 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.

A Short-wave Log from Bordon

SIR,—I have read with interest the short-wave logs of other readers, and enclose my log of stations received from January 13th to February 9th.

Being in the service, my listening hours are very limited; usually from 5p.m.-10 p.m. in the evening and 8 a.m.-10 p.m. on Sundays, so that I miss the late evening and early morning DXers. At present I am using a commercial receiver (5v. superhet), with aerial N-S 35ft. high and 50ft. long, including lead in.

All the stations were heard at good loudspeaker strength.

American amateurs (20 m. band): W2AIM, W4IS, W2JO, W1SLH, W2AH, W3UH, W1COY, W8GJ, W3HEA, W4CQG, W3FMY, W1IED, W8CLY, and W3JKQ.

Canadian: VE3MB and VE2FO.

Indian: VU2CQ.

Various (20 m. band): SU1CH, SU1RK, ES5D, F8MG, ZE1JA, CT1QE, ON4QA, IV1DK, CT1QG, LA1F, I1KN, F3EQ, LA1G, and EA3SI.—L. W. BROWN (Bordon Camp).

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.

L. B. (Withington).—The double valve could be used, but obviously would not be so desirable as the two separate valves referred to.

S. B. (E.).—The trouble may be due to microphony, and the only cure would be to use a different detector valve, or screen this to prevent it from being affected by the sound waves from the speaker.

J. B. (Dundee).—Unless there is some unusual fact not revealed by your description, we can only conclude that the device is acting as a capacity aerial, which often gives exceedingly good results, being non-directional and in many cases better than the orthodox aerial wire.

G. T. (Padstow).—The Prefect S.W. Three could be used for the range you mention, using suitable plug-in coils. We have not designed a set giving continuous tuning over that band.

H. C. (Bradford).—The capacity of the condenser may not be critical in your set, and a value from .1 mfd. upwards may be used. It is sometimes found worth while to use an 8 mfd. electrolytic, and you should therefore experiment with a view to finding a suitable value for your particular case.

W. F. M. (Llangorse).—You could use your storage supply, and tap off the necessary low voltage in the same way as in an H.T. battery. Alternatively, you could obtain the lower voltage by means of a 30,000 ohm resistance in series with the H.T. 1 feed connecting the other end to the H.T. 2 lead, and joining a 2 mfd. fixed condenser from the H.T.1 side of the resistance to earth.

W. J. M. (Mumbles).—Difficulty is sometimes experienced when using an eliminator for a short-wave set, and you may find it necessary to introduce additional smoothing circuits.

R. M. (Portull).—We regret that the receiver is not one of our designs and accordingly we are unable to assist you in obtaining better results. The paper in which it was described is no longer on sale.

T. B. (Haltwhistle).—The fact that you are using a permanent type of detector is an improvement, and your lack of results may be due to your particular locality, or to the fact that you are using an inefficient aerial-earth system.

P. K. (Tankerton).—You could not use the rectifier for the purpose outlined as the current delivered is too small. You must obtain one of the special rectifiers designed for accumulator charging.

T. A. T. (Rhos).—Your best plan is to get into touch with a good Patent Agent who will be able to advise you and carry out the necessary filing, etc.

E. R. P. (Sth. Croydon).—A breakdown in the cathode insulation of a valve can give rise to the trouble mentioned. We advise you to have all of the valves tested.

F. J. W. (Leamington Spa).—Write to J. J. Laker & Co., Kent House Lane, Beckenham, Kent, who specialise in tubular and other metal masts.

D. F. A. (Camberley).—So far as we can trace, there is no book on the market dealing with the subject.

J. A. S. (Grimsby).—It would be better to use a metal rectifier of the type specially designed for trickle charging. A transformer giving an output of 8 to 12 volts would be needed, according to the type of rectifier you obtain.

Practical and Amateur Wireless

BLUEPRINT SERVICE

These Blueprints are drawn full size.

Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless	4d. Post Paid
Amateur Wireless	4d. ,, ,,
Practical Mechanics ..	7½d. ,, ,,
Wireless Magazine ..	1/3 ,, ,,

The Index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, P.M. to *Practical Mechanics*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS	Date of Issue.	No. of Blueprint.
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D,Pen)	—	PW36B
The Signet Two (D & LF)	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen,D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW30
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D, (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
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 (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	20.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-wave Three (HF, Det, Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW46
Fury Four (2SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	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 "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
"Acme" All-wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	—	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)	—	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 (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
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)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four	6.11.37	PW81
SUPERHETS		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
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	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE		
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	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 Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
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
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	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)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
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)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	—	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.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D,Pen)	10.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2HF,D,QP21) (Pentode and Class B Outputs for above: Blueprints, 6d. each)	18.8.34 25.8.35	AW445 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 (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*Apr.* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	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)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)	—	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	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	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)	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome 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 (SG, D, Pen)	*Jan.* 19, '35	AW463
The Carrier Short-waver (SG,D,P)	*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-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver 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.	—	WM363
"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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan* 5, '35	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Record Wear

"I have recently fitted a pick-up to my set and am now keenly interested in gramophone record reproduction. I find, however, that every time I play a record there is a heap of fluff and stuff around the needle and I wonder if this is wear on the record due to the needle or weight of the pick-up. Perhaps you could give me some indication as to how to stop this or whether it is detrimental?"—F. E. (Gt. Yarmouth).

THERE is always a certain amount of dust removed from the grooves when the record is played. A special brush or felt pad should be used to keep this at a minimum, as, when piled under the needle, a record can become damaged—especially if the dust is gritty. If possible, you should examine the dust removed under a microscope or high-power magnifying glass in order to make certain there is no record surface material. If there is, the needle is either bearing on one side of the groove due to the pick-up being wrongly mounted, or is pressing too heavily on it, and in this case it should be counterbalanced.

Station Name Dials

"I have built up a set comprising a 3-gang condenser, and as the stations do not fall in their proper place on the dial, and some not at all, could you give me some idea as to the adjustment and how to trim same?"—E. E. M. (Salcombe).

THE station name markings are intended when a certain type of gang condenser is used in conjunction with coils of a certain inductance value, and only when the combination is correct will the name indications come in their right place—provided that the receiver is properly trimmed. If you are using the condenser and coils specified for use with the dial then the set must be trimmed by adjusting the trimmers on top of the gang condenser until the pointer falls in the correct position. If the set is a superhet it may also be necessary to adjust padders or other adjustments in connection with the oscillator coil.

Short-Wave Sets

"Please can you tell me where I can obtain a circuit for a short-wave 2- or 3-valve set employing 4-pin coils, and if possible tuned by a .00025 mfd. condenser. I already possess the latter and also a .0001 mfd. reaction condenser and set of 4-pin coils and would like to use these up if possible."—G. B. (Northampton).

WE receive many requests of a similar nature to this, and would point out that in a simple set of the detector type the grid winding must be employed and reaction is practically essential. This gives two complete windings and thus four terminals or pins would be needed for this. Unfortunately, on the short waves the effects of damping due to the aerial-earth system are very marked, and it is advisable to remove the damping effect by taking the aerial connection away from the grid circuit, and although this may be done by using a condenser in series with the aerial much better effects are possible by using a separate coupling winding for the aerial which introduces the need for at least one further pin. Thus, the most suitable coil for a simple detector circuit for short-waves is that having three windings, and this necessitates the use of a 6-pin type of coil. This was the type used in our Prefect S.W. Three and we suggest you follow this, although if you intend to retain your 4-pin coils you will have to omit the aerial coupling coil and connect the aerial, via a small variable condenser, to the grid end of the grid winding.

American Dial Markings

"I have an all-wave American radio and I wish to know what the dial is calibrated in. The following are the numbers on the dial—short, medium and long, respectively: 5.8–18, 55–170, 14–36. Could you also tell me what the farthest distance is that television *pictures* have been clearly picked up? I disagree with my brother, who told me 200 miles."—E. C. I. (Liverpool 9).

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.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

THE markings on your dial are undoubtedly in megacycles and kilocycles. The short-wave band is in megacycles, corresponding approximately to 16.9 to 51.72 metres, and the medium waveband is marked in an abbreviated form of 550 to 1,700 kilocycles, corresponding roughly to 172 to 540 metres. The long waveband is from 140 to 360 kilocycles, corresponding roughly to 840 to 2,100 metres. The farthest distance, so far as we can trace, over which good pictures have been obtained from the B.B.C. transmitter at Alexandra Palace is at Moston, Manchester, by the Ferranti Company. The vision signal has, however, been heard in America and in South Africa, although in each case a picture could not be resolved.

Open Aerial Circuit

"I have constructed a set similar to the Experimenters' quality set for local reception, with an untuned stage. The point is—whether the choke is in circuit or not (that is, aerial connected direct to grid of valve and choke removed) makes no difference to quality or volume. Is this as it should be; if so, why use it? If not, can you give me some idea as to what might be wrong. Volume is not quite what it should be?"—H. M. (Cawthorne).

THE choke is an untuned device and therefore it will not make any difference to tuning. However, if the choke is removed, and nothing is joined across the grid circuit, you should find that the H.F. stage will not pull the same weight. If the choke may be removed without any effect whatsoever, it indicates either that the choke is open-circuited or that there is a high-resistance leak across your aerial and earth.

Field Replacement

"Recently I purchased a W.B. Junior speaker and I wish to substitute it for a mains energised model on my set. The latter has a field of 5,000 ohms, with an output valve Mazda Pen 3520. What components are necessary for the replacement? I have seen this query answered in a previous issue, but cannot trace it."—H. G. N. (New North Road, N.1.).

THE field is the only part of the speaker which is missing in your new model and therefore all that has to be replaced is that winding. Special L.F. chokes for this purpose are readily available from firms such as Sound Sales, of Marlborough Road, Upper Holloway, N.19, and these have a very high inductance value (60 or 70 henries) with a resistance (D.C.) similar to the resistance of the speaker field. These chokes are known as "Speaker field replacement chokes."

Component Suppliers

"Can you tell me the address of the firm which makes the Ferrocart coils recommended for the 'Four-range' set in Fifty Tested Circuits. Is the transcoupler a standard component?"—P. R. G. (Stapleton, Bristol).

THE Ferrocart coil is made by Messrs. Colvern, of Mawneys Road, Romford, Essex. The Transcoupler referred to is a special resistance-fed transformer, that is, an L.F. transformer plus a resistance and condenser, used in the parallel-fed circuit. If difficulty is experienced now in obtaining this component you may use a standard transformer and separate resistance and condenser, the latter components having values of 20,000 ohms and .02 mfd.

Coil Design

"I have been given a set of screened coils and one of them has a lead sticking through the top of the screen. I assumed this was for the anode, but the wireless fan who passed these parts on to me said that he thought it was for the grid. As neither of us is certain, I wonder if you could tell me, to avoid disappointment when I use the coils?"—U. D. (Harrow).

YOU may both be right, as it is possible to obtain coils of the type mentioned, with an external pigtail connection for either grid or anode. It is essential before you use the coils to know the pattern and this will enable you to ascertain the type of valve to use with them. The majority of H.F. valves are now available with either grid or anode top cap, but the anode is most usual. On the other hand, the frequency changer is generally made with the grid as the top cap and this may enable you to identify your coil connection.

The coupon on page 666 must be attached to every query.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

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63, HIGH HOLBORN, W.C.1. Holborn 4631.

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Special Speaker for above, fitted Pentode Transformer, 600 ohm Field, 7½" cone, etc., **12/6 each.**

Aerodyne 5-valve Battery Superhet, a really magnificent job, listed at 8½ gns. The Chassis is contained in a handsomely finished walnut cabinet of upright design. The Dial is really attractive and is station named. Tuning is indicated by means of a rotating light. The Valves used are as follows: FC2A, VP2, 2D2, PM2B, and Cossor 220 PA. Speaker large type P.M. Rola. **Our price to clear, £4 4s. each.**

Aerodyne 5-valve Battery Superhet Chassis, ex. above, Brand new, **LESS VALVES. Few only, 30/- each.**

Huge purchase Philco 3-valve Battery Short-wave Receivers. A really splendid model, fitted in handsome contrasted walnut cabinet, 2 speed dial, large P.M. Speaker, with the added attraction of a Short-Wave Band. Listed 8½ gns., our price to clear **£4 12s. 6d. each.**

We would emphasize that the above are in all instances Brand New as from the makers.

Huge purchase Electric Trouser Presses, made for a Pall Mall firm to sell at 3 gns. Brand new, boxed. The Press that steams and presses your trousers in one operation. **12/11d. each.**

Quartz Piezo Crystals, 125 k/c. A unique opportunity to obtain a reasonable and costly crystal at a fraction of the original price. Ideal for Wave Meters, Standard Frequency Test, or could be reground for other frequencies. **Now, amateur transmitters and others, here is your chance at 4/6d. each.**

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Hunts Cardboard Electrolytics, 4 mfd., 350-volt working, **1/3d. each.**

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S.P.S.T. Toggle, 7d. each.

Speaker Transformers, Pentode Type only, **2/6d. each.**

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Bryce Mains Transformers, standard for the season. These Transformers are British made, and are fully guaranteed for 6 months.

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500-0-500, 150 m.a., 2-0-2 volts 2.5 amp., 2-0-2 volts 4 amp., 2-0-2 volts 2 amp., 2-0-2 volts 2 amp., **17/6d. each.**

All Windings Centre Tapped.

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30 Hys, 40 m.a., 500 Ohms, **4/6d. each.**

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40 Hys, 150 m.a., 400 Ohms, **10/6d. each.**

50 Hys, 60 m.a., 2,500 Ohms, for speaker replacement, etc., **6/6d. each.**

Huge purchase of Wet Electrolytic Condensers, by well-known manufacturer. Following types available:—

8 Mfd., Metal Case, single-hole fixing, wet electrolytics, complete with Locking Nut, 450-volt working, **2/- each.**

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25 Mfd., ditto, **1/10d. each.**

32 Mfd., ditto, **2/3d. each.**

50 Mfd., 35-volt working, One-hole Fixing, Metal Can, **1/6d. each.**

Tubular Condensers, Wire End type, by well-known manufacturer. Sizes up to 0.1: **4½d. each, 4/- per dozen.**

Push-back connecting wire, 10ft. lengths, **3d. each.**

Bell Transformers, British made, **2/9d. each.**

P.M. Speakers, by well-known manufacturer, 7½in. Cone, Pentode Transformer, **9/6d. each.**

Ditto, Less Transformers, Ideal Extension, etc., 7/11d. each.

1 watt resistances, by well-known manufacturer, **3½d. each, 3/- per dozen.**

Special purchase ex Aerodyne Mains Transformers, Unshrouded, **350-0-350, 100 m.a., 4 volts 4 amp., 4 volts 2 amp.,** all Centre Tapped, **5/- each.**

Lissen R.C.C. Units, Brand New, Boxed, **6d. each.**

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Lissen Class B Hypernik Transformers, ratio 1-1, Brand New, Boxed, **1/3 each.**

Lissen Universal Iron Cored Coil, with Reaction, Brand New, **2/11d. each.**

Set of four 4-pin Short-Wave Coils, 13 to 26 metres, 22 to 47 metres, 41 to 91 metres, 79 to 170 metres, **4/11d. per set.**

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Centralab Volume Controls, Long Spindle, fitted with Switch, Brand New. 1,000, 5,000, 10,000, 25,000, 50,000, 250,000, 500,000, **2/6d. each.**

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OUR 1937-8 Catalogue contains much information on Transformer Design. Post Free.—Lumen Electric Coy., 1A, Scarisbrick Avenue, Liverpool, 21.

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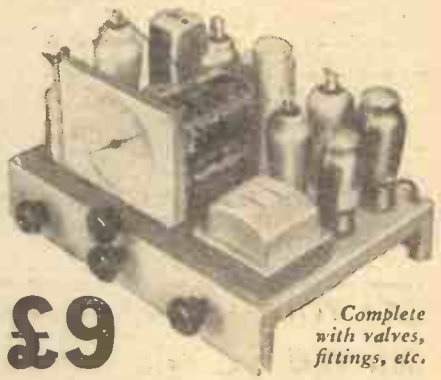

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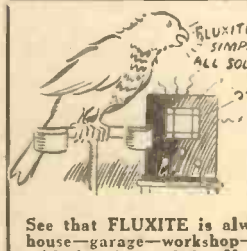

Said the parrot they call Willie Walker, "They say I'm a pretty good talker, Which they can't say, I'll bet, Of their FLUXITE-LESS set, Which at best is a terrible squawker."

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