A MORNING WITH THE AMATEURS—See page 573

Practical and Amateur Wireless

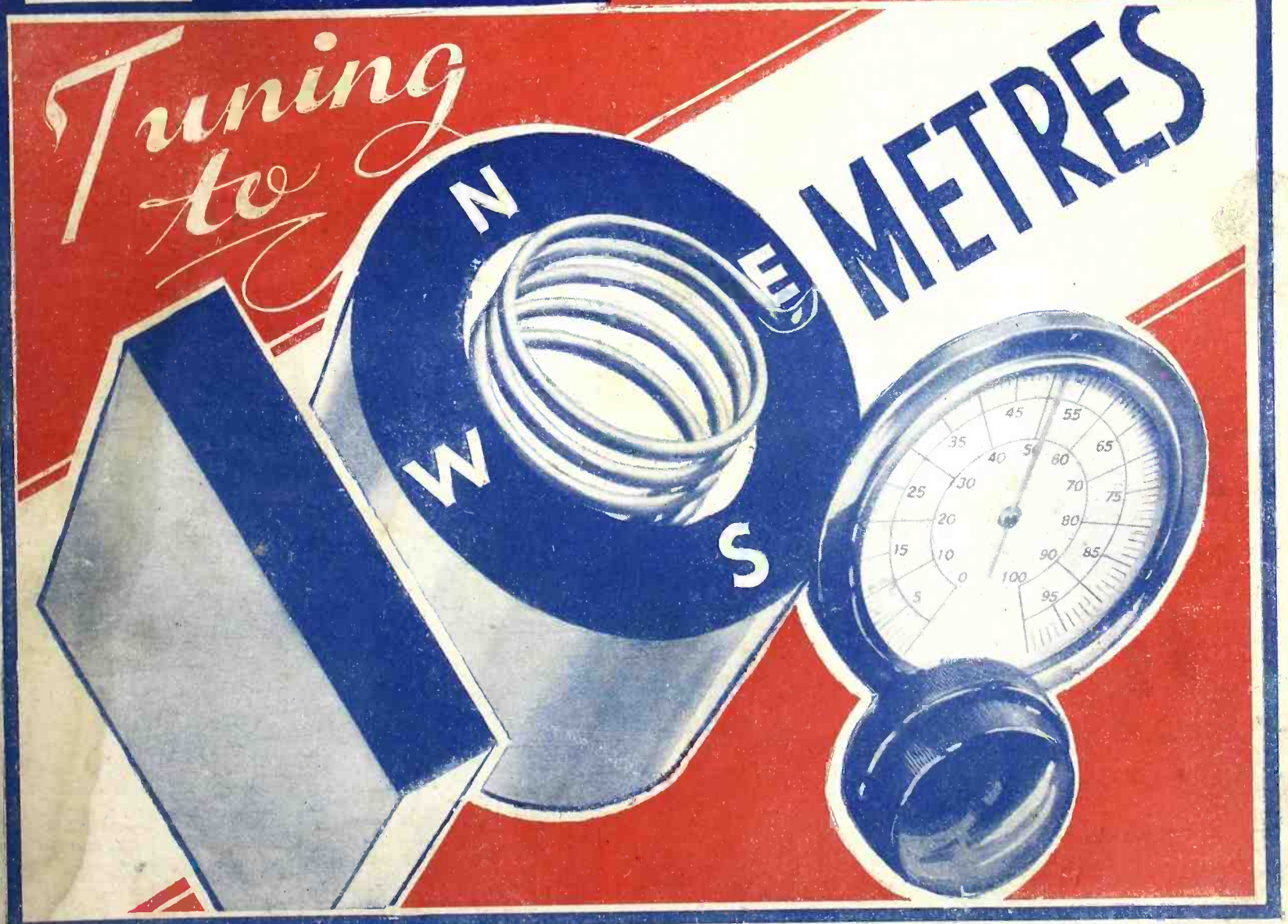
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3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

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



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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

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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.

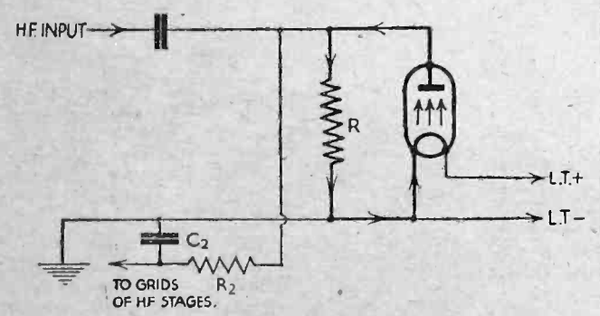


Fig. 1.—The direction of the electron flow is shown by the heavy lines and arrow heads.

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)

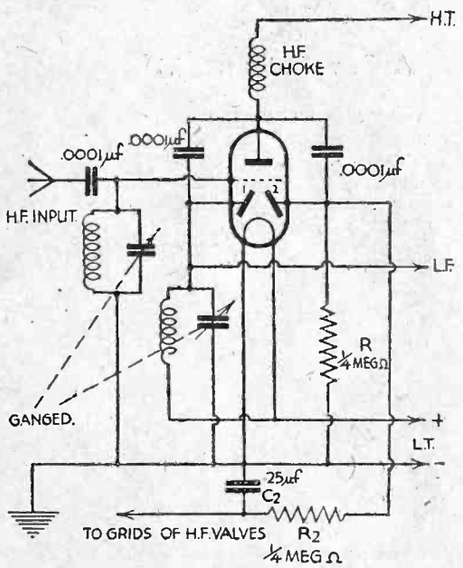


Fig. 2.—The circuit suggested for a battery receiver, based on the ideas expressed in this article.

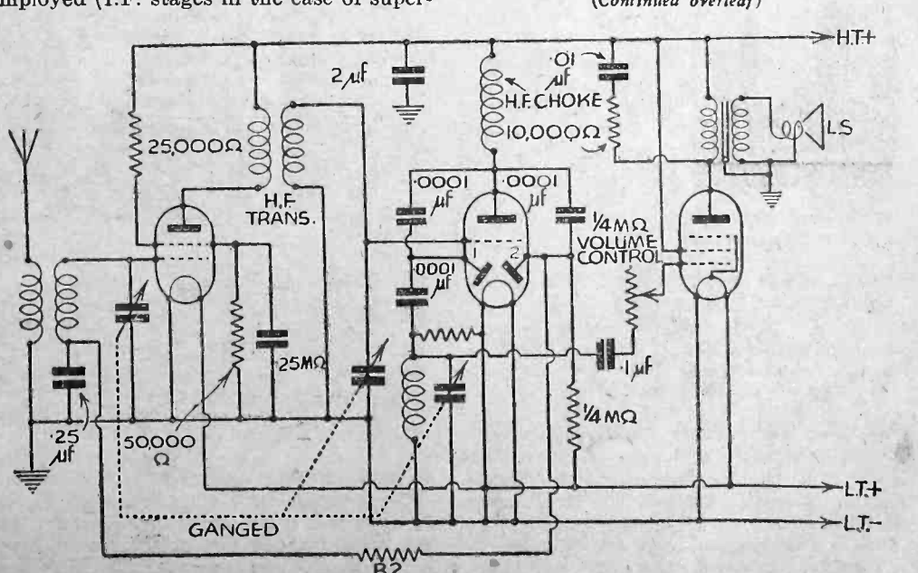


Fig. 3.—Complete circuit of a battery 3-valver incorporating the new double-diode-triode arrangement.

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.

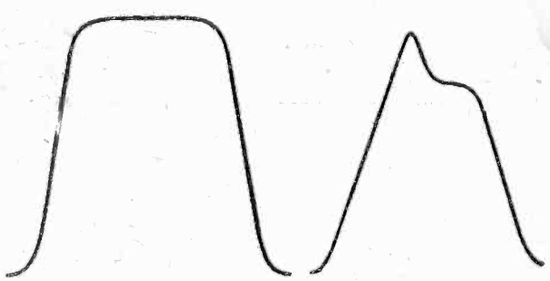
Rectification also occurs at Diode No. 1, but in this case its purpose is to separate the L.F. component from the H.F., and the L.F. voltages being passed to the output stage or stages for amplification until they are applied to the loudspeaker.

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.

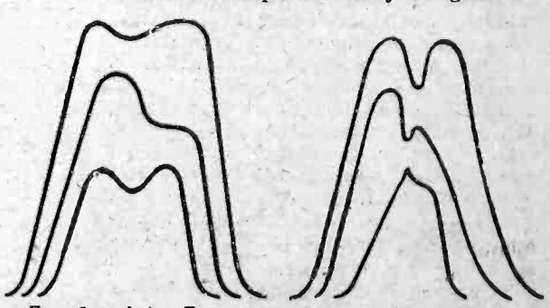
Variation in Frequency Drift

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.

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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

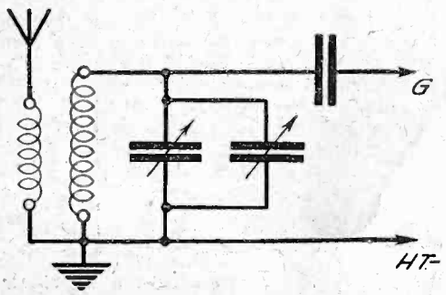


Fig. 1.—This shows how band-spread tuning is arranged, by connecting a small capacity variable condenser in parallel with the normal condenser.

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

(Continued overleaf.)

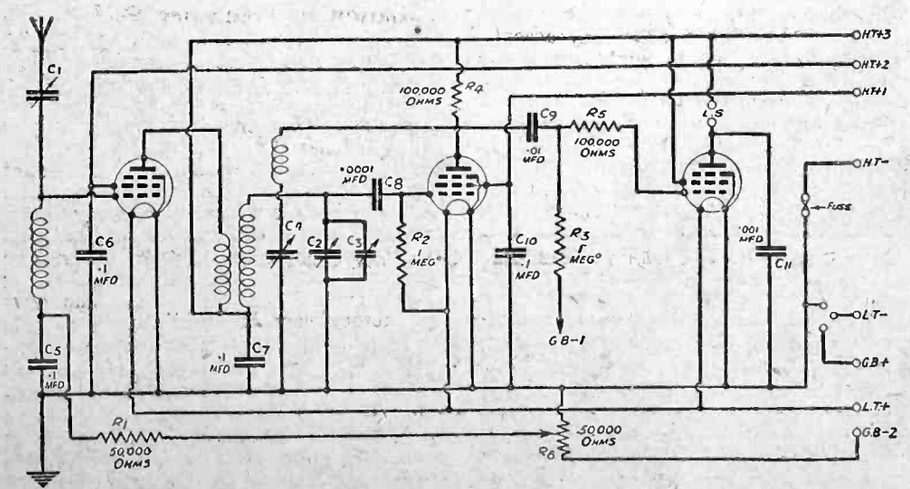
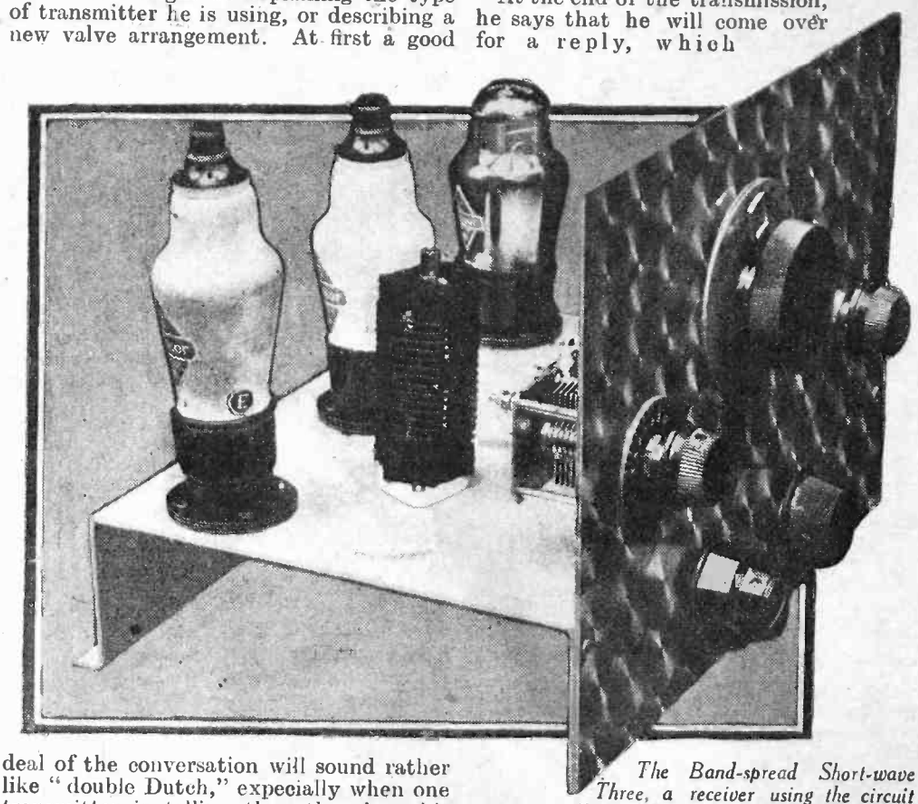


Fig. 2.—A circuit of this nature is ideal for 'phone reception of amateur transmissions. It was described in "Practical and Amateur Wireless," dated August 29th, and September 5th, 1936

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

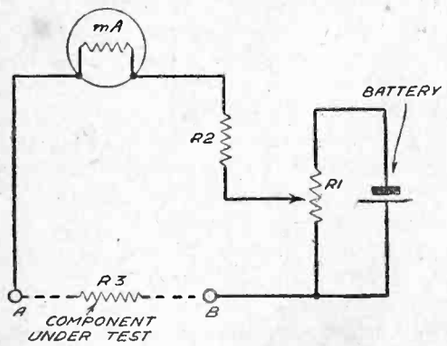


Fig. 18.—How to improvise an ohm-meter for component tests.

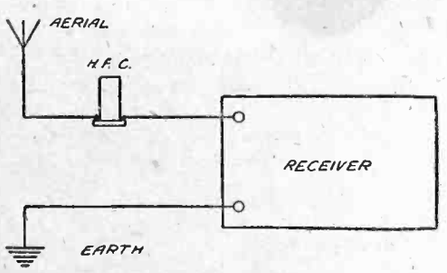


Fig. 19.—Testing the efficiency of an H.F. choke.

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.)

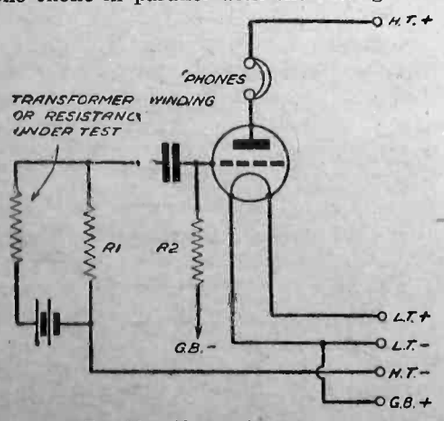


Fig. 20.—Testing for noisiness.

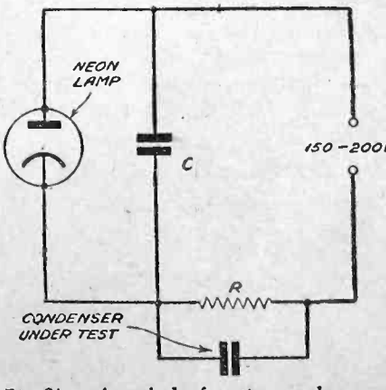


Fig. 21.—A method of testing condensers with a neon circuit.

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.

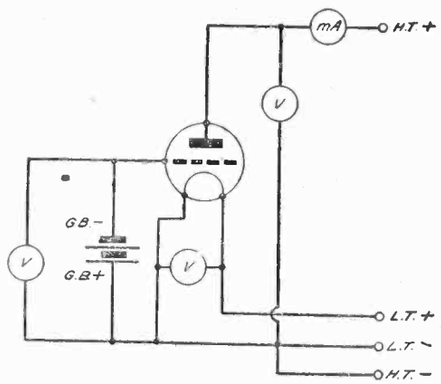


Fig. 22.—Circuit for testing valves.

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!

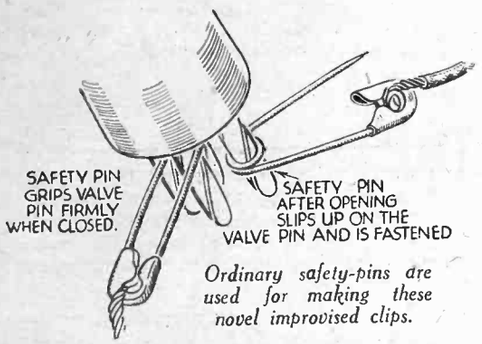
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

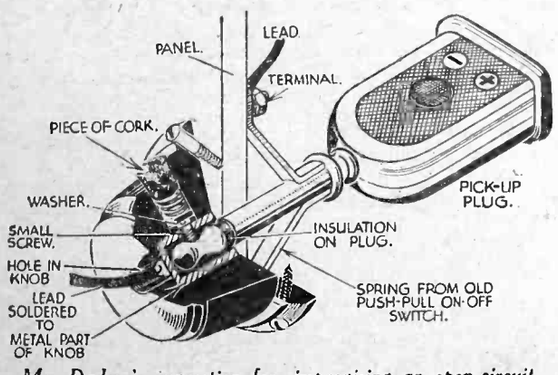
HAVING a plug, but being unsuccessful in obtaining an open-circuit jack, I made the device shown in the accompanying diagram. The chief components used were a knob from an old bakelite reaction condenser, having a ¼in. metal-bushed hole, 2 springs from an old push-pull switch, and a small piece of cork.

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).

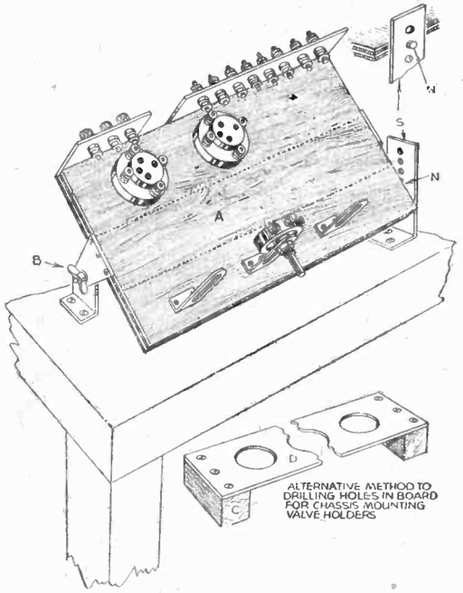


Mr. Dadson's suggestion for improvising an open-circuit jack.

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.

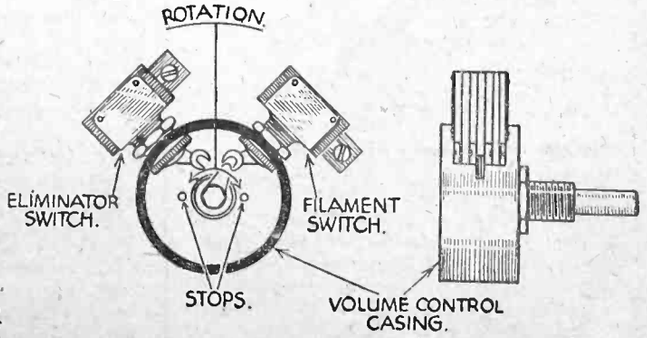
The adjustment is very simple, aluminium hinge pieces being screwed to each end and pivoted by two small wing nuts and bolts "B." The board elevation adjustment is arranged by fixing at one end of the board a springy piece of metal (brass will do) drilled to accommodate the end of a nail "N," and this 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.

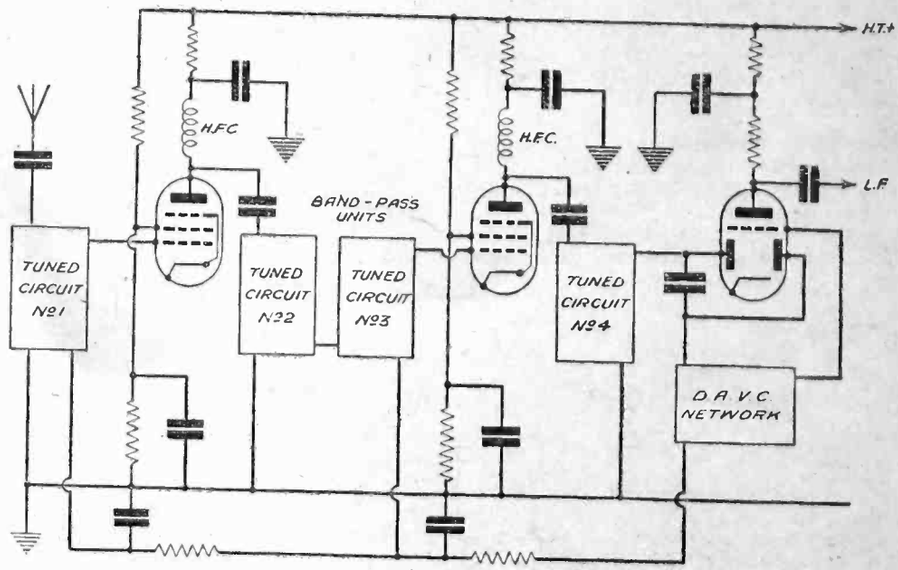
Selectivity

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

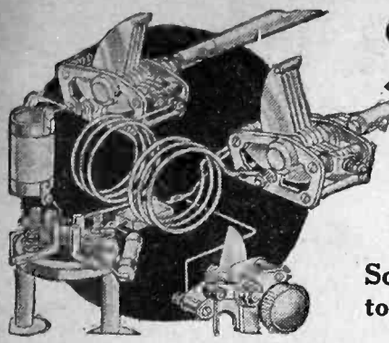
We have described two or three high-quality amplifiers, and described radio units for them. A unit built on the type of straight circuit just mentioned could easily be built and would justify the use of a quality amplifier such as the Paraphase unit described in our issue dated January 18th, 1936, and 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.

NOW READY!

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

By F. J. CAMM.

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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.

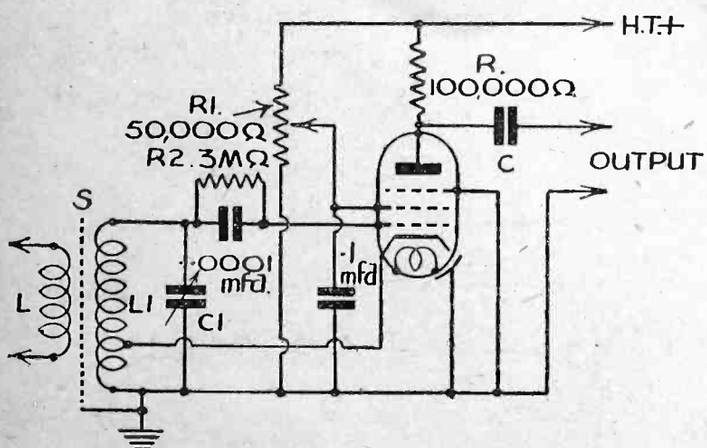


Fig. 1.—An electron-coupled circuit for a 10-metre converter.

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.

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.

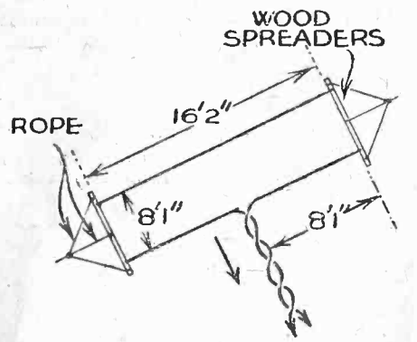


Fig. 3.—A half-wave aerial system for 10 metres. The aerial should face in the direction of the received signal, as indicated by the arrow.

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 [illegible] early attempts to design a receiver of the

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By F. J. CAMM.

2/6, *or* **2/10** *by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.*

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

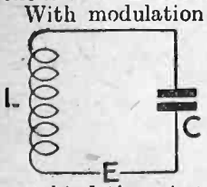


Fig. 3.—A tuned circuit in which L represents inductance, C represents capacity, and E the electromotive force operating in the circuit.

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

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.

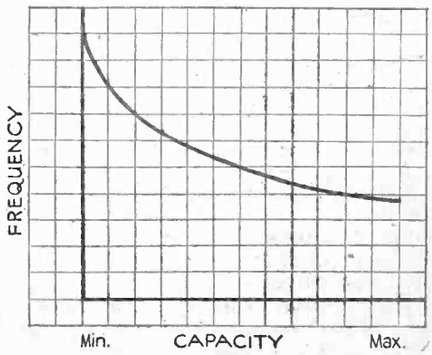


Fig. 4.—Graph showing the effects of reaction at various frequencies.

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?

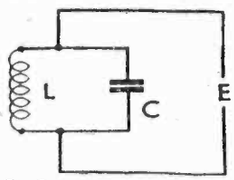


Fig. 5.—An external voltage applied to a tuned circuit as met with in standard radio circuits.

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

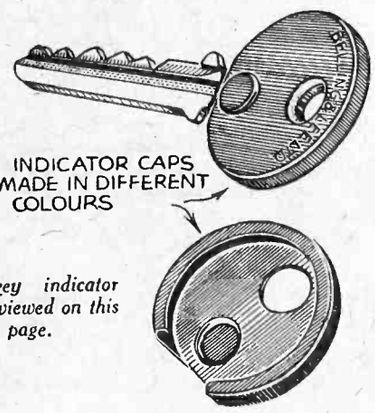
A NEW version of the H.M.V. Model 119 record player is now available, capable of handling either 10in. or 12in. discs with an automatic changing mechanism. It is slightly larger than the Model 119 and costs 9 guineas.

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.

LRS S.T.900

To "Practical Wireless" Readers who may not be familiar with Mr. Scott-Taggart's latest Receiver, we would like to draw their attention to the wonderful performance and quality of the All Wave S.T. 900, a worthy successor to previous outstanding successes of this famous designer. L.R.S. offers immediate delivery of comprehensive 'Designer' kit for cash, C.O.D., or on the best and easiest terms.

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KIT "B" Complete kit with 10 Coils for medium, long and 3 short-wave bands. No extras except valves. 8/- with order & 11 monthly payments of 7/10. Cash £4/5/0

KIT "C" Absolutely complete including everything as KIT "B," but with all valves. No extras whatsoever. 10/- with order & 11 monthly payments of 10/7. Cash £5/15/3

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" " Junior 377	1 12 6	2/6	11 of 3/-
Garrard A.C.6. Radiogram Unit	3 15 0	5/6	11 of 7/-
Garrard A.C.6. Motor only	2 2 6	4/-	10 of 4/3
Rothermel Piezo-Electric Pick-up	2 2 0	4/-	10 of 4/3
Avominor Test Meter	2 5 0	5/-	10 of 4/6
Goodman's L.S. Twin-Cone Unit	3 10 0	6/6	11 of 6/5

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3 Ferranti AF3C PP Intervalve Transformers (LIST PRICE, 27/6). SALE PRICE, 16/-.

1 Large Switchboard Voltmeter, Moving Coil, 0-150 volts (new). (LIST PRICE, £2/0/0). SALE PRICE, 17/6.

1 Large Switchboard Ammeter, 0-10 amps (new). (LIST PRICE, £2/0/0). SALE PRICE, 17/6.

Gambrell Novotone. Vastly improves base in gramo. records. (LIST PRICE, £3/3/0). SALE PRICE, £1/5/0.

2 BTH Needle Armature pick-ups (as used by B.B.C.) (new). (LIST PRICE, £2/0/0). SALE PRICE, £1/5/0.

3 Cosmocord Pick-ups with tone arm and V-control. (LIST PRICE, 17/6). SALE PRICE, 10/6.

1 WB Duplex super unit in cabinet. (LIST PRICE, £6/6/0). SALE PRICE, £3/10/0.

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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.

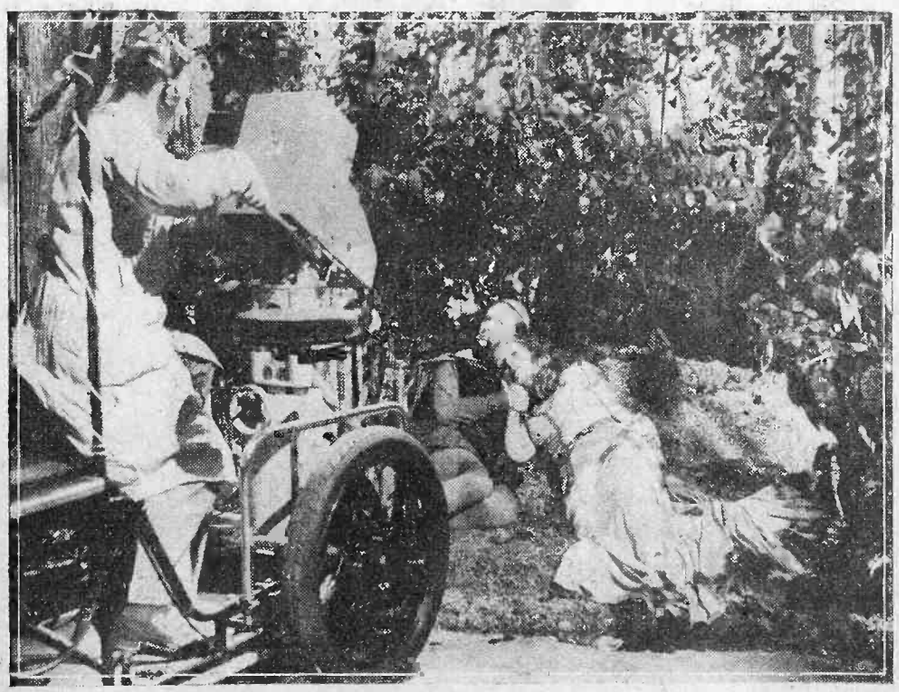
New Television Technique

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.

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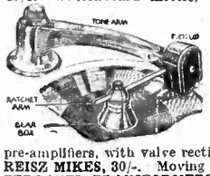
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The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

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.

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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.

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—B.T.S. TROPHY RECEIVERS—

More Records are being Broken with these Wonderful Receivers

F. Lanaway, World's Champion station logger, used the Trophy 2 when he won the World Trophy . . . every Trophy 2 is an exact duplicate of the receiver he used . . . and the Trophy 3 for Battery and A.C. Mains use . . . these Receivers represent the last word for reception on the Short Waves from every corner of the world.



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Employs highly efficient 3-valve circuit (Mains model 2+1), providing unique results on 12-52 metre waveband. World-famous specially wound One-shot Inductors available for tuning from 6.2-550 metres. Wavelength calibrated scale. Moving coil speaker fitted and provision for headphones. Steel cabinet in beautiful crackle finish. Complete with 2 coils (12-52 metres) and fully tested.

BATTERY MODEL (Less Batteries) **£5 : 15 : 0** *Or 9/6 deposit and 12 monthly payments of 9/11.*

A.C. MODEL 200/250 v. 40/100 cycles. **£6 : 6 : 0** *Or 10/- deposit and 12 monthly payments of 10/9.*

TROPHY TWO



An exact duplicate of the model employed by F. Lanaway. Two valves are used in this wonderfully efficient circuit, essentially designed for headphone use, although the output pentode provides loudspeaker results under suitable conditions. Complete with 2 coils covering 12-52 metres, pair of headphones. Housed in beautiful black crackle finished steel cabinet. Size only 7¼" x 7¼" x 7¼". Dial and scales engraved in degrees. Ready for immediate use.

Cash or C.O.D. **£4 : 15 : 0** or **7/6** down

Balance in 12 monthly payments of 8/3.

Apart from the One-shot Inductors supplied with the B.T.S. Trophy receivers others are available to enable you to cover a complete waverange from 6.5 metres (Television) to 550 metres. Full details will be found in the Trophy Leaflet, sent FREE on request.

SPECIAL OFFER: B.T.S. Lightweight Headphones for use with Trophy 3, complete with plug. **7/6** *Post 6d.*

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KIT "A" *Cash or C.O.D. Carriage Paid* **£4:4:0**

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Comprising Author's Kit of first specified parts including Peto-Scott fitted chassis, but less valves, batteries, cabinet and speaker.

KIT "B." As for Kit "A," but including set of 3 specified valves only. Cash or C.O.D. £5/10/4 or 10/- deposit and 11 monthly payments of 10/3.

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Type 9/M.W. (178 to 580 metres)	per pair	5/6
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Type 9/S.1. (9.5 to 27 metres)	,, ,,	5/-
Type 9/S.O. Television Sound		5/6

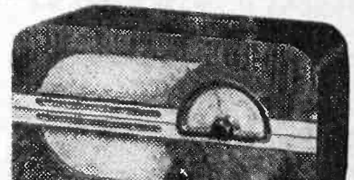
KIT "A.10" *Cash or C.O.D.* **£4:5:0**

As KIT "A," but with KONECTAKIT and 10 B.T.S. COILS. **8/6** *deposit and 11 monthly payments of 8/-.* Down

S.T.900 VALVES. 5 Specified Valves, £1/10/3 *or 3/6 down and 11 monthly payments of 2/9.*

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Never before in the history of radio has it been possible to offer to the public such wonderful Bargains in All-wave receivers . . . it is left to Peto-Scott to put before you such magnificent offers as these. Brand new 1938 All-wave Receivers, supplied in sealed manufacturers' cartons and guaranteed for 12 months. **Buy now while the opportunity lasts!**



DECCA 1938 Model 33:

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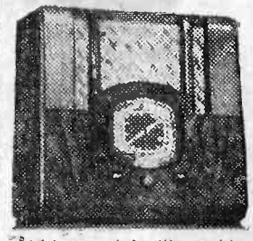
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DECCA 1938 Model 99:

6-valve All-wave A.C. Superhet. 12 to 2,000 metres. Seven tuned circuits. A.V.C. Beautiful hand-polished cabinet. Decca commonsense tuning. . . . No complicated trouble-causing mechanism. Bold station-named dial. Spread-tuning, 4 separate, easy-to-read wave-bands. Oversize elliptical cone dynamic speaker. Provision for external speaker and gramophone pick-up.

List Price 13½ gns OUR PRICE **9½ gns** or **10/-** down

Balance in 18 monthly payments of 12/6.



BRUNSWICK 1938 Model BPU/1: 6-valve All-wave

Portable Receiver. Six-valve super-het for A.C. or D.C. Mains 100-250 volts (40-60 cycles). Six tuned circuits. Three colour, individually illuminated, All-world wavebands. 19-49, 200-550 and 1,000-2,000 metres. Station-named dial. Internal frame aerial incorporated with provision for external aerial if desired. Automatic volume control. Brunswick High Fidelity Dynamic Speaker.

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Or 2/6 down and 11 monthly payments of 4/9. A super model that is justly famed as one of the best on the market, this outstanding unit incorporates a Trickle Charger, which re-charges a 2-volt L.T. accumulator at 0.5 amp. For A.C. Mains 200/250-v. 50/100 cycles. Westinghouse Metal Rectifier. Four H.T. tappings: Screen, Detector, Medium Power, High Power. Output 20 m/a. at 120 volts.



CHARGE your L.T. for ½d. A WEEK

Charges 2v. Accumulator at ½amp.

● Nothing to wear out or go wrong. ● Modern metal rectifier. ● Air-cooled mains transformer.



Never be "left without your Radio" because your L.T.'s run down. The new Peto-Scott ½-amp. Trickle Charger will charge your 2-volt accumulator at ½ amp. while you sleep. 12 months' guarantee. 7 days approval against cash. A.C. Mains, 200/240 volts, 40/100 cycles. Overall dimensions: 3½" high, 2½" diam. **CASH 10/- PRICE**

All Postal Orders must be crossed and made payable to the Peto-Scott Co., Ltd. All currency must be registered.

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Est. 1919

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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.

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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.

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Blueprint, 6d.		
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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
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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
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Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
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A.C. Leader (HF Pen, D, Pow) ..	7.4.34	PW35C
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Ubique (HF. Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
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"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
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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).

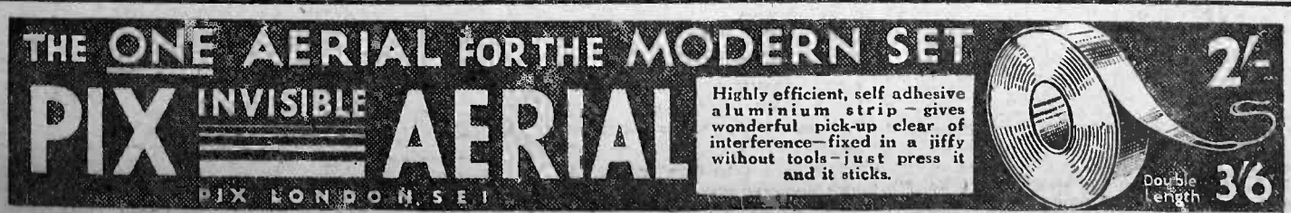
IF the driving cord is ordinary fish-line or similar undressed material it would probably be sufficient to damp it in order to obtain the necessary tightening. In the case of a dressed material (which may be waterproof), the best plan would be to rub powdered resin on the cord to obtain the necessary 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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Now Ready. Our New 1938 Enlarged Illustrated Catalogue, Handbook and Valve Manual. Price 6d.

VALVES! We hold a comprehensive stock of all types of British and American valves. Replacements for any receiver can be supplied from stock.

BATTERY VALVES, 2 volts, H.F., L.F., 2/3. Power, Super-Power, 2/9. Var-mu-S.G., 4- or 5-pin Pentodes, H.F. Pens, V-mu-H.F. Pens, 5/-. Class B, 5/-. Freq. Changers, 7/6.

EUROPA MAINS VALVES. 4v. A.C. Types, A.C./HL, A.C./L A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P, and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens. I.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. changers, 8/6; Double Diode Triodes, 7/6; Triode H. ex. Freq. Ch., 8/6; Tri. Grid. Pen., 10/6; 3½ watt I.H. Triode, 7/6.

UNIVERSAL TYPES. 20v. .18a. S.G., Var.-Mu. S.G., Power, H.F. Pen., Var.-Mu. H.F. Pen., 4/6 each.

13v..2a. gen. Purpose Triodes, 5/6; H.F. Pens. and Var.-Mu. H.F. Pens, Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

AMERICAN VALVES. We are sole British Distributors for TRIAD High-grade American Valves. All Types in stock. Standard types, 5/6 each. All the new Octal base Tubes at 6/6 each. 210 and 250, 8/6 each; 81 and 2A3, 8/- each.

3-VALVE SHORT-WAVE KIT. S.G., H.F.; Det. and Pentode. Covers 14-170 metres, with 4 pairs interchangeable 4-pin coils. Complete kit of parts, with metal chassis and set of 3 matched 2-volt valves, 42/-; suitable metal cabinet, 7/6 extra.

NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT. 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE!**

DE LUXE MODEL, 14 to 170 metres, complete Kit with Chassis, 4 Coils and all parts, 17/6.

SUPERHET CONVERTER KIT, 15/-. De Luxe Model, 20/-.

S.W. SUPERHET CONVERTER KIT, for A.C. Mains Receivers, 22/6. A.C. Valve given **FREE!**

NEW 2-VALVE S.W. KIT, 13 to 86 metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE!**

DE LUXE MODEL, 14 to 150 metres, complete Kit and Circuit, 4 Coils and all parts, 25/-. **VALVES GIVEN FREE.**

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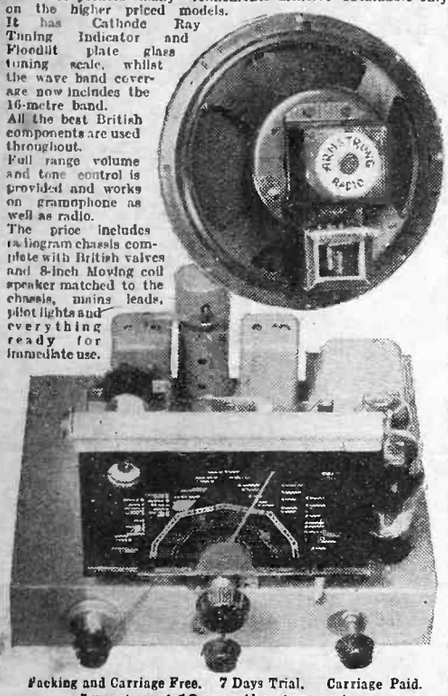
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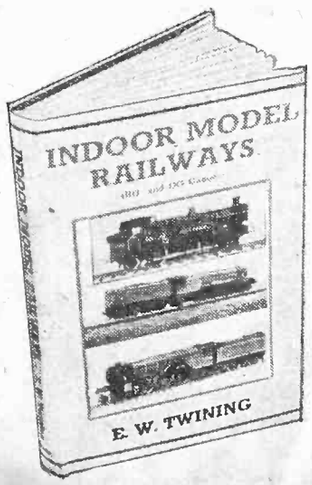
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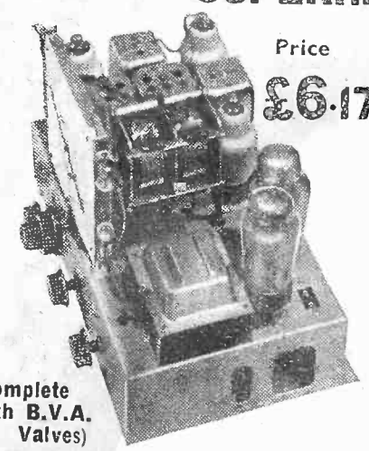
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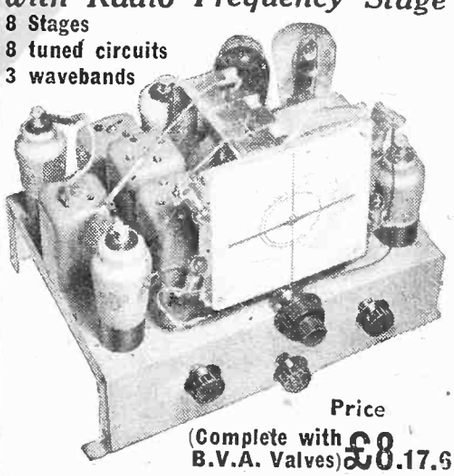
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8 Stages
8 tuned circuits
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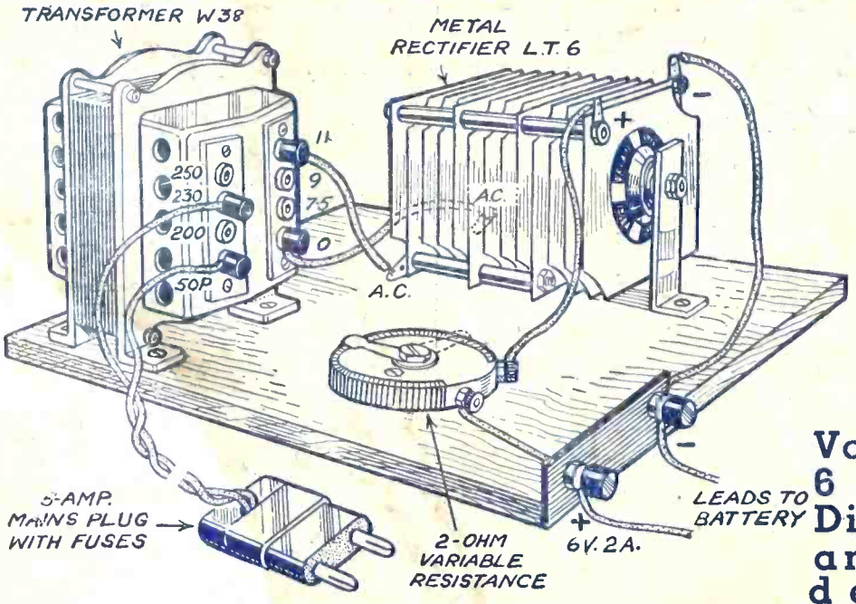
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CHARGING METHODS FOR CAR BATTERIES



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



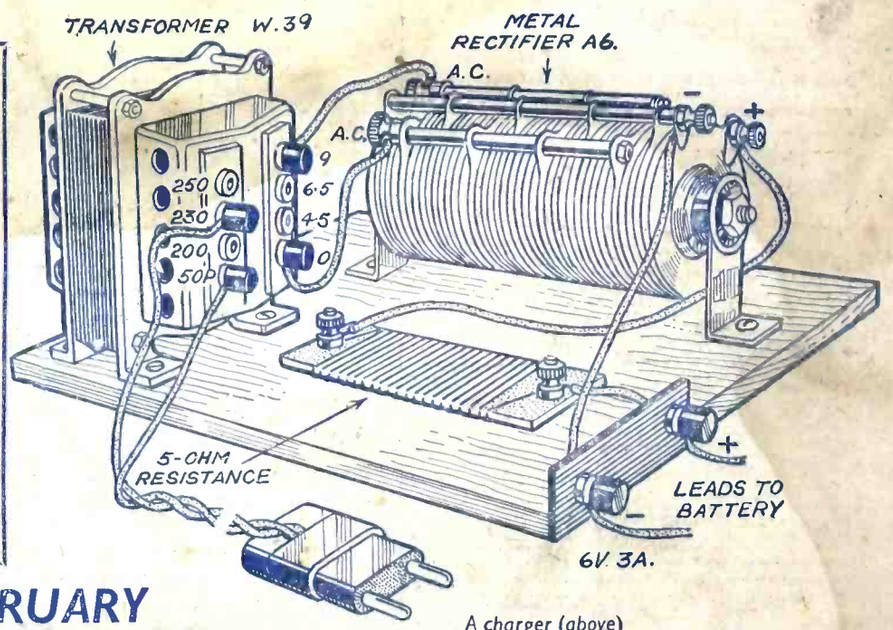
The method (on right) of testing an accumulator by means of a hydrometer. A reading of about 1.300 should be obtained when the battery is fully charged.

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.
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The world of science in 1937 reviewed.
Building a 1 c.c. engine.
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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

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6D.

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