TELEVISION, SHORT-WAVE AND BEGINNERS' SUPPLEMENTS

Practical and Amateur Wireless

3d. EVERY WEDNESDAY

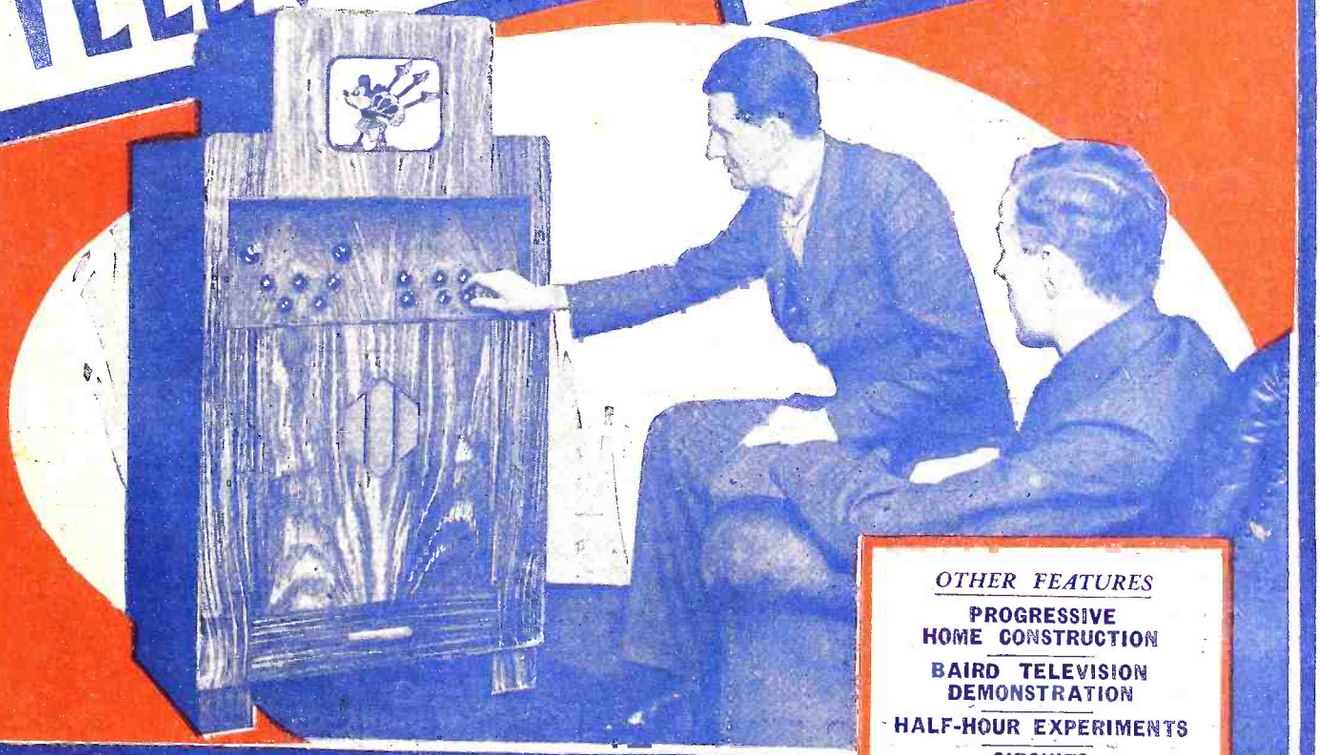
Edited by F. J. CAMM

A GEORGE NEWNES *Publication*

Vol. 5. No. 128.
March 2nd, 1935.

AND AMATEUR TELEVISION

NEW SERIES
TELEVISION *for* BEGINNERS



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PRAC. 2/3/35

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. V. No. 128. March 2nd, 1935.

ROUND *the* WORLD *of* WIRELESS

Great Television Revival

OUR postbag indicates an enormous interest in television. and we have received hundreds of letters from our readers relating to various aspects of the new hobby. Thousands of readers are preparing for the opening of the new station towards the end of the year by reading our new series of articles, specially written in non-technical language for the beginner. Many thousands of readers have already reserved copies of the reprinted edition of NEWNES TELEVISION AND SHORT-WAVE HANDBOOK ,which contains lucid explanations with hundreds of photographs and drawings of the practice and principles involved in the various television systems. The stocks of this reprinted edition are now very low, and you should therefore avail yourself at once of our offer.

The volume is, of course, uniform in style and size with our previous presentation volumes.

Two More Bulgarian Stations

IN view of the increased popularity of broadcasting in Bulgaria, the authorities have decided to instal a 2-kilowatt station at Varna and at Stara Zagora. They will be equipped with studios to permit the transmission of local programmes. As the telephony cable system is not sufficiently developed in Bulgaria for the broadcast of news bulletins and concerts from the capital city, the Sofia transmissions will be taken, when required, by wireless link. The Government has also voted the sum of forty million levas to defray the cost of a station to be built at Ikhtiman, thirty-five miles to the south-east of Sofia.

Temporary Portuguese Station

IN order to carry out the necessary alterations to the Heilsberg transmitter with a view to an increase in the power of the Koenigsberg programmes, the station has been temporarily closed down and replaced for a period, extending until the end of April, by a 17-kilowatt transmitter. As the signals are now weaker, it is an easier matter to pick up the concerts of the CT1GL, Parede (Portugal) station working on the same channel.

On the Free List

IN addition to the granting of a substantial reduction in the cost of receiving licences for schools, free listening permits for the blind, and special dispensations for the unemployed, the German Government has decreed that a further 180,000 persons are to be allowed to possess sets without going to the expense of paying the monthly tax. Lack of means, it is reported, will not be the main consideration for placing those selected on a free list.

London Regional's Unreliable Neighbour

RADIO AGEN (France) which for some time has been seeking a place in the sun, has now moved to 345.6 metres (868 kc/s), a position which, in view of its recent deviations, may not be a source of comfort to London Regional. This channel was allotted to the still non-existent Marrakesh station in French Morocco.

Brussels Will Double Its Power

DURING the course of the year the Belgian Authorities will reconstruct the twin Velthem transmitters with a view to raising the power to 30 kilowatts. The decision to provide 100-kilowatt plants for both Brussels No. 1 and No. 2 is still in abeyance.

Radio Parede (CT1GL)

NOTWITHSTANDING numerous rumours to the effect that the station had closed down, the 5-kilowatt transmitter of the Radio Club Português is still operating nightly on 291 metres, between G.M.T. 21.00 and midnight. Although the greater part of the programme is destined to Portuguese listeners, announcements are frequently made in French and Spanish. The call is heard as *Rah-dee-oh Par-ay-day*, and the name of the Club (Português) often accompanies it.

Listen to Cairo

ALTHOUGH the Cairo station broadcasts on the same channel as Brussels No. 1 (483.9 metres, 620 kc/s), transmissions from Egypt can be picked up in the early mornings and sometimes in the afternoon hours. Cairo is on the air at G.M.T. 06.45 daily with physical exercises followed by readings from the Koran in Arabic. At G.M.T. 16.30 and at 22.00 a time signal is given by dots similar to those relayed by the B.B.C. from Greenwich. The call put out by the station is usually in both English and French.

Manchukuo on the Air

MTCY is the call sign of the new 100-kilowatt broadcasting station at Kuangchengtzu, near Ksinking, the capital of Manchukuo. Transmissions on 535 metres are made daily between 22.00-14.30, an English news bulletin being sent out at G.M.T. 13.40. The station is operated by the Manchukuo Telephone and Telegraph Company.

Still Crystal Gazers

ALTHOUGH Poland possesses a population of some thirty-two millions, and eight broadcasting stations, there are only roughly 324,000 radio receivers in the entire country—of these some 117,000, or 36 per cent., are primitive crystal sets.

"Both Sides of the Shop Window"

THIS is the title of a discussion on modern standards of quality and display which listeners in the West will hear between J. Ralph Edwards, representing potential purchasers, and Crofton E. Gane, representing manufacturers, on March 4th.

Dance Songs from Midland Regional

DANCE songs from eight countries will be sung in a Midland recital on March 9th, by Mavis Bennett-Levin, a well-known Midland soprano, who recently broadcast a programme of Jenny Lind songs.

ROUND the WORLD of WIRELESS (Continued)

A New Wireless Station

A NEW wireless station has recently been completed at Kimberley, in South Africa. This station has two masts 70ft. in height, and will have the latest equipment for long- and short-wave reception and transmissions as well as a direction-finding apparatus.

Listen to North Africa

SINCE January 20, Radio Maroc, at Rabat (Morocco) has increased its power to 25 kilowatts, and may now be heard nightly on 499.2 metres (601 kc/s) between Florence and Vienna. The station, as a rule, works until G.M.T. 23.00, but on some nights will still be found on the air at midnight. Native Arab concerts are usually broadcast towards G.M.T. 19.00. With the exception of these special transmissions, all announcements are made in the French language.

The Re-discovery of America!

EVERY Saturday afternoon, as from February 16th, the B.B.C. will relay a programme from the National Broadcasting Company of America. Hitherto for these purposes the transatlantic telephone service has been used, but, following satisfactory tests, in future the broadcasts are to be taken through the B.B.C.'s own receiving station at Tatsfield. The intention is to give British listeners—and others—an opportunity of listening to the American morning radio entertainments. The relay is timed to take place regularly at G.M.T. 16.45, corresponding to 11.45 a.m. Eastern Standard Time.

A New Wired-wireless System

FOR its radiodiffusion services of the broadcast entertainments, the German authorities have been trying out the superimposing on the telephone network of three separate transmissions on channels varying between 1,000 and 2,000 metres. By this means telephone subscribers may listen to any of these programmes by means of their ordinary wireless set. If desired, an outdoor aerial may still be used for the reception of other radio transmissions. Experiments of this nature are now being carried out in various parts of Germany.

"Theatre Royal"

AN excerpt from "Theatre Royal," Noel Coward's production at the Lyric Theatre, has been chosen for the next programme, on March 1st, in the series called "From the London Theatre." Marie Tempest, Madge Titheradge, Robert Douglas, and a supporting cast will come to a studio to broadcast a scene from the play for Regional listeners.

Carillon Music

CARILLON music will be discussed on March 6th, by George Cadbury, with illustrations by Clifford Ball, relayed from the carillon at Bournville. This carillon was founded by the late George Cadbury, and extended by gifts from his son, who is taking part in this programme, and his widow, Dame Elizabeth Cadbury. It now consists of forty-eight bells, ranging in size from 12lbs. to 3¼ tons, and has the largest compass of any in this country. It was the first carillon to be made by an English bellfounder, the first to be recorded for the gramophone, and the first to be broadcast.

INTERESTING and TOPICAL PARAGRAPHS

BETWEEN THE TURNS

Renee and Billie Houston, the famous radio and stage stars, while away the time before their turn, with their new Cossor receiver.

Novel Dance Music Programme

DANCE music lasting forty-five minutes without a vocal refrain is a novelty which Howard Jacobs and his Orchestra will introduce on March 5th. Solos will be a feature of the programme, but these will be instrumental in place of the usual vocal. The orchestra will play popular music and when the refrain is reached a solo instrument, which may be a saxophone, a violin, or a trumpet, will be heard instead of a voice. Every soloist will be a virtuoso.

Stanton Ironworks Band

IN the Midland Regional programme on March 4th, John Turner conducts the Stanton Ironworks Band in a popular programme, and J. W. Mallard, of Smethwick, tells Black Country stories in the interlude.

"Standard English"

A MOST interesting subject has been chosen for "Conversations in the Train" on March 16th—"Standard English." The cause will be championed by one who is well-known to listeners, and the other characters in the railway compartment will be an American visitor to England and an English countryman speaking in dialect.

Broadcast Plays During March

PLAYS to be broadcast during March include two written specially for the microphone, a Shakespearean comedy, a Tchekov production, and "Ambrose Applejohn's Adventure," a comedy by Walter Hackett which ran for many months at a London theatre with the late Sir Charles Hawtrey in the name part. Peter Creswell will produce "The Taming of the Shrew" on Sunday, March 10th, and in the same week "The Three Sisters," by Tchekov, will be broadcast, Barbara Burnham producing. The plays specially written for broadcasting are a dramatisation of Sir Walter Raleigh's "Last Voyage" and "Charlemagne," by Mirande.

Village Life Broadcast

VILLAGE life of the present day in its various aspects, and the effect upon it of such recent changes as the growth of the motor bus service, will be the subject of a discussion in the Midland programme on March 4th. Those taking part in this broadcast are Geoffrey Boumphrey and Graham Castle.

"Weather Forecast"

THIS is the title of a dramatic talk, by J. S. A. Salt, which will give listeners an impression of how the weather forecast is made. The talk will be broadcast on the National wavelength on March 9th. After a short reconstruction of the history of weather forecasting, listeners will be given a demonstration of how reports come into the Meteorological Office from all parts of Europe, and from ships crossing the Atlantic. An explanation will follow of how from these reports a weather map is prepared every morning, and how the weather forecast, which the announcer reads at the microphone, is compiled. The immense amount of work behind this very important service is full of interest and inherent drama.

SOLVE THIS!

Problem No. 128

The two-valve battery receiver which James was using had suddenly developed a peculiar scratching sound at one point on the tuning scale. He thought that this was, perhaps, due to condenser vanes short-circuits, and accordingly proceeded to test the receiver to that end. He connected a voltmeter in series with a 1.5-volt cell and joined this across the two terminals on his variable condenser. He found that a reading was obtained on the meter, no matter where the condenser was adjusted, and he therefore assumed that the condenser was shorting. What was wrong with his test? Three books will be awarded for the first three correct solutions opened. Mark your envelopes Problem No. 128 and address them to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Entries must be received by the first post Monday.

Solution to Problem No. 127

The choke was of such a size that it had an extensive field. Its position in the receiver caused the field to interact with that of the grid coil and thus caused oscillation, irrespective of that which was caused by the reaction circuit proper. The choke should have been mounted at right angles, or screened. . .

The first three correct solutions opened in respect of Problem No. 126 were from the undermentioned readers, and books are being forwarded to them: M. Eisen, 2, Carlton Street, Liverpool, 3; R. F. Alden, 85, Henley Road, Ilford, Essex; R. Press, 75, Effingham Road, Hornsey, N.8.

IMPORTANT NEW SERIES

TELEVISION FOR ALL—3

Cathode-ray Tube Television

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

LAST week readers were given a general survey of the reception of high-definition television signals, but since this involves so many new conditions, when compared to everyday wireless listening, it is necessary to sectionalise the equipment involved, and in this way appreciate how the individual parts perform their own specific function.

Perhaps the most unfamiliar part of the equipment, which is shown so well as an artist's pictorial impression in Fig. 4 in last week's article, is the cathode-ray tube itself. This component, wholly electrical in its operation, that is to say, it includes no mechanical moving parts, has proved, up to the moment, the only really satisfactory item for reproducing at high efficiency the proposed 240-line television images which are to be radiated from the television station when it is built.

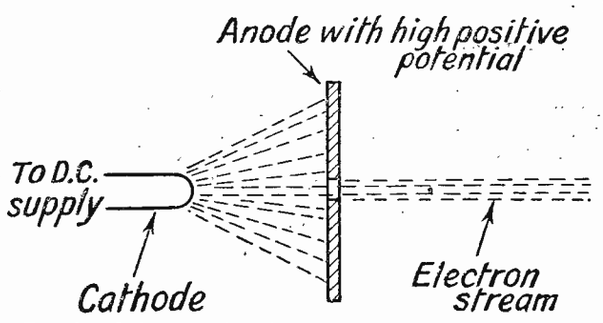


Fig. 1.—Indicating the effect of the anode on the electrons.

In Passing

It should be said straight away, however, that while cathode-ray tubes hold a rather undisputed position for this work now, it is not a natural corollary to assume that this will always be so. It certainly is difficult to conceive how a mechanical substitute can carry out a similar task with the same results, but I am sure that this condition will not pass unchallenged by protagonists of other mechanical or electrical methods. This form of healthy competition will stimulate further improvements in every direction, so that lookers will in this way reap considerable benefit and hasten the day when "perfect" results will give complete satisfaction to the greatest majority.

It must not be imagined that a cathode-ray tube takes only one form. Just as in the case of wireless valves, so there are several types manufactured for certain specific purposes, and every tube is not suitable for building up high-definition television pictures. Some tubes are filled with gas to give internal ionisation, while others are completely evacuated. The *general* principles of operation are the same, however, so these will be discussed first and suggestions can then be made for the choice of the best types of tube which can be employed to give really good results.

Electron Emission

In the ordinary course of events a specially-shaped glass envelope encloses the whole electrode assembly. The shape of this is such that a long cylindrical section encloses the individual electrodes (there are several of them) and at the end it takes on a pear shape to terminate in an almost flat circular end which acts finally as the viewing screen.

The essential electrodes of these tubes are shown in the top compartment in Fig. 4 (previously referred to), and taking these separately the first is the cathode or filament. This is a thick oxide-coated filament through which is passed a steady direct current of just under an ampere as a general rule. This brings about an action identical to that taking place in the receiving valves of your own radio set. The flow of current is really an electron movement (it is as well to remind readers that electrons are really minute particles of negatively charged electricity) in the wire, and this movement is so violent that many of the electrons overcome the wire's surface tension, and are "boiled off" or escape, just the same as vapour will rise from the surface of a boiling liquid.

Producing an Electron Beam

If left in this condition the electrons would merely return to the filament surface, this agitation or movement continuing all the time a current is made to flow through the cathode. It is necessary to remove some of these electrons, however, and here again we "borrow" from valve technique by placing in front of the filament an anode in the form of a circular disc, to which is applied a high positive potential. This will attract the free electrons to its surface just the same as the anode or plate of a receiving valve, as shown in Fig. 2.

The real function of this electrode is, however, not a "collector" of electrons, but really an accelerator of electrons. That is to say, it attracts these negative particles of electricity away from the filament not with the purpose of making them flow in any external circuit, but to direct them forward with an extremely high velocity towards the belled out front end of the tube.

Now it is essential that the beam or stream of electrons which pass forward in this manner should be of narrow section, or, what is a better way of expressing the condition, they must be "focused" to a small "point" sectional area on the front screen. This is done in a dual way. First of all, the anode is pierced at its centre with a small orifice so that electrons can pass right through it, as shown in Fig. 1. The diagram shows, however, that many of the electrons are lost in so far as their passage through the hole is concerned.

Focusing

To neutralise this a focusing electrode or gun (often referred to as the Wehnelt cylinder, after the first scientist who developed the idea) is interposed between the filament and the anode. Actually, this cylinder surrounds the filament as a shield, and if a negative potential is applied to it the effect will be to produce a "repulsive" field as far as electron divergence is concerned. The electrons are in this way concentrated or directed in a stream towards the anode aperture (see Fig. 3) where they immediately come under the influence of the positive potential applied to it, and are thereby accelerated at an enormously high speed through the orifice to pass towards the front screen as a beam.

The front screen is the large, nearly flat, glass surface, the interior of which is sprayed carefully during the course of manufacture with a chemical preparation, which, when dry, gives the appearance of a light greyish paint. Owing to the extremely high velocity of the electrons they cause the screen to fluoresce or glow brightly at the point of impingement. Provided the potentials applied to the shield and anode have been adjusted correctly in relation to one another, then the glow is limited to a minute area of light where the beam is focused on to the screen.

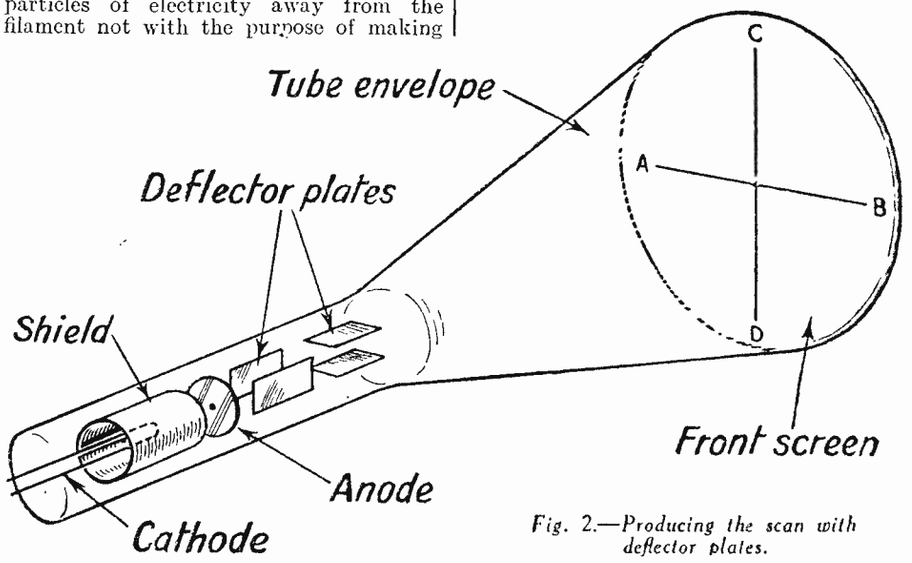


Fig. 2.—Producing the scan with deflector plates.

Moving the Spot

This is really the scanning spot, whose function is to carry out a movement geometrically similar to the scanning operation at the transmitting end, and so build up a picture in terms of light intensity variations. The next thing to consider, therefore, is the method employed to control the position of the spot throughout the whole scanning operation. In practice this is effected by static or magnetic deflection. Each method has its own particular advantages (and disadvantages), but for the purpose of explanation the static deflection scheme will be described.

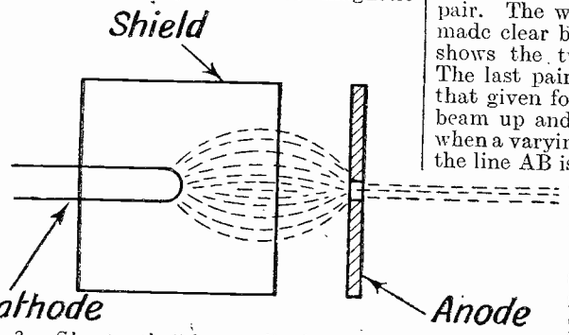


Fig. 3.—Showing the "focusing" effect produced by the shield.

Consider for a moment what the cathode-ray tube is doing with the arrangements we have just detailed. The cathode shield and anode have brought into action a steady stream of electrons moving at high velocity towards a screen which fluoresces at the point where the electrons strike the interior surface. This is equivalent to a water hose with a fine nozzle, where the high pressure of water forces it out of the nozzle orifice so that it can be directed in a straight stream, say, against a wall. To cover the wall with water it would be necessary to move the nozzle with the hand so that section by section the water impinged on the wall surface, these sections being chosen haphazardly or in well-defined "lines."

Static Deflection

Reverting to our electron stream we could, of course, move the electrode system bodily within the tube to give this screen coverage in the same way as our garden hose, but the complications introduced by a scheme of this character would be enormous. The very nature of the electron stream, that is, moving negative particles of electricity, provide the clue to the easy solution of our problem. Suppose that near the anode, but between the anode and the screen, is placed vertically a pair of metal plates so that the electron stream passes between the plates on its way to the screen. Without any potential applied to the plates, and hence no field of static lines of force between them, the stream of electrons will be undisturbed and continue to pass to the same point on the screen.

A potential applied to the plates, however, will cause the beam of electrons to move to the left or to the right according to the direction of the static field. If, therefore, the potential is varied continuously (say, for example, by the application of a sine wave voltage) the beam will move to and fro in a horizontal direction in sympathy with these voltage variations. This will cause the spot on the screen to trace out a horizontal line, and if the voltage variations are fast enough, the spot will move to and fro so rapidly that the eye will receive the impression of a continuous line of light owing to the phenomena known as persistence of vision.

Double Movement

To give a complete scanning motion, however, it is necessary to impart a vertical movement to the spot of light. This is effected very simply by placing a second pair of small rectangular metal plates between the first deflector plates and the anode, the mounting of these plates being horizontal or at right angles to the first pair. The whole scheme of things will be made clear by a reference to Fig. 2 which shows the two pairs of deflector plates. The last pair, from a reasoning similar to that given for the first pair, will move the beam up and down in a vertical direction when a varying potential is applied. Hence, the line AB is derived through the medium of the vertical deflector plates, while the line CD results from the horizontal deflector plates.

In television parlance we say that the vertical plates give the high-frequency scan or line definition, while the horizontal plates bring about the low-frequency scan which is equivalent to the number of pictures per second used in the television system. To take the concrete case of the proposed high-definition television service recommended by the P.M.G. television committee we have 240-line definition and 25 pictures per second. The frequency of the L.F. scanning potential is therefore 25 per second, this being applied to the horizontal plates, while in the case of the high-frequency scan this becomes 240 by 25, that is 6,000. Ways and means for bringing about this double effect must be devised and this will be explained in next week's issue.

CATHODE-RAY TUBE COATING

THE new and specialised technique which is now being developed in connection with cathode-ray tube manufacture and use is intensely interesting. Coupled with this is the fact that at the moment it seems highly probable that these electron image devices will serve as the medium for producing the initial high-definition television pictures. Any special feature in connection with them, therefore, should be studied by readers so that when the appropriate time comes they will at least be familiar with the devices, if only from a theoretical standpoint.

With ordinary thermionic valves it is not possible to see the electrode assembly with most types, owing to the silvered appearance of the inside of the glass envelope resulting from the process known as "gettering." If a cathode-ray tube is examined a similar opacity will be observed, but for an entirely different reason. It is quite a common procedure in C.R. tube manufacture, the internal coating of the glass walls extending from the narrow neck of the tube at the base right up to the bell-shaped mouth at the far end to the edge of the screen of fluorescent material. This coating is actually a conducting layer, being brought into play frequently in connection with the focusing on to the screen of the stream of electrons emitted from the incandescent cathode.

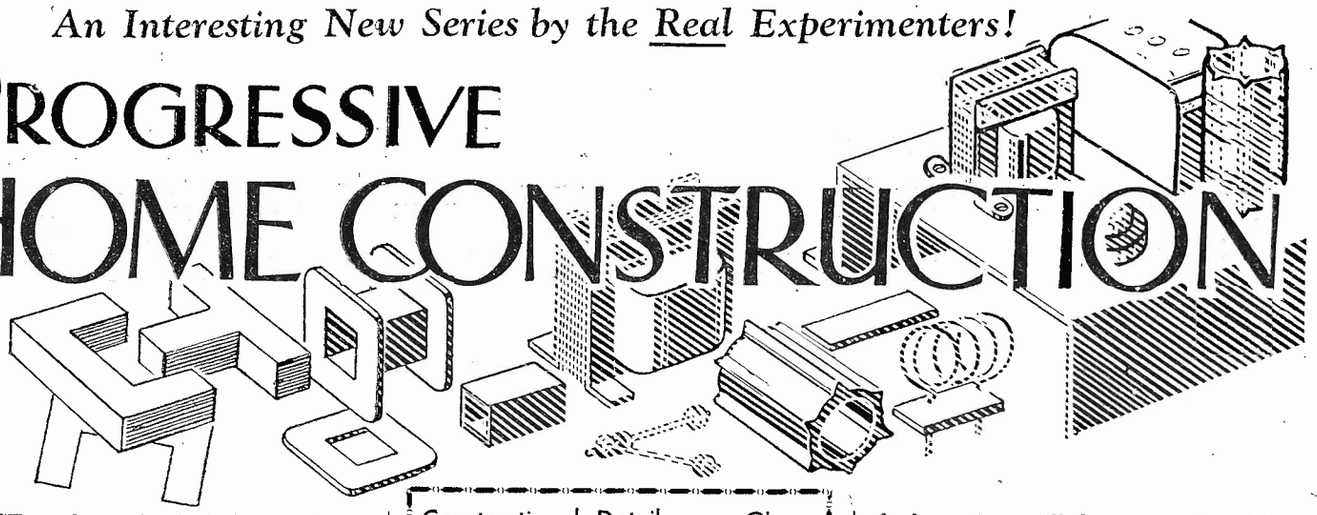
If this internal layer has a bright surface it can quite frequently cause trouble, owing to the light reflections which inevitably occur. It is for this reason that recourse is made to a proprietory product called "Aquadag," which in effect is colloidal graphited water containing about 20 per cent. by weight of graphite. This is deposited on the glass of the tube, and results in a rather dark matt surface, which is quite opaque but electrically conductive.

When used in this colloidal form it adheres very readily to the glass in the form of a film of uniform thickness, the desired depth being governed very easily in the coating operation by controlling the concentration of the graphite employed (the Aquadag in use is generally diluted with a quantity of electrolyte-free water) and also the number of coatings applied.

The process of coating is really quite a simple one, although of course due precautions must be taken to see that the solution is quite free from impurities. Each film on the glass is formed by syphoning the liquid from a chamber into the C.R. tube, having suitable air vents and overflow pipes to govern exactly the height to which the liquid will rise. When more than one coating is to be applied it is best to let each layer dry before another is given, the drying process being carried out by passing warm filtered air into the tube. Quite apart from the electrical properties imparted by this dark matt coating it is generally conceded that the appearance of the cathode-ray tubes are enhanced also.

An Interesting New Series by the Real Experimenters!

PROGRESSIVE HOME CONSTRUCTION



Constructional Details are Given for a High Tension Battery Eliminator for D.C. Operation, all the Chief Components being Home-made

by The Experimenters

LAST week we finished the description of the L.F. amplifier, and before going on to describe the construction of the parts for an H.F. unit, we thought it better to deal with the construction of an H.T. battery eliminator. There will naturally be some readers who require an eliminator for operation from D.C. mains, whilst others will wish to feed the unit from an A.C. supply. So that both requirements may be met we will start by describing a D.C. unit, later dealing with the additional parts needed to convert it for A.C. In order to make this matter perfectly clear, perhaps we ought to explain that an A.C. unit actually comprises a D.C. unit with the addition of a mains transformer and rectifier; consequently, all of the parts specified for the simpler model will be required for the other one.

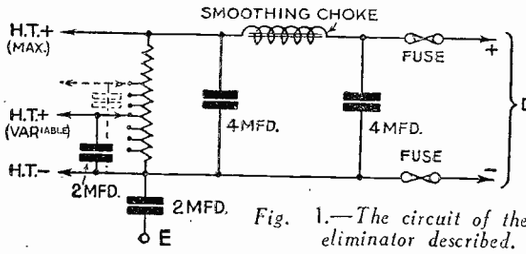


Fig. 1.—The circuit of the D.C. eliminator described.

An H.T. battery eliminator to operate from direct current is a particularly simple piece of apparatus, consisting of nothing more than a smoothing choke, two or more smoothing condensers and the necessary resistances for providing different output voltages. The circuit of the simple unit to be described is given in Fig. 1, where the parts are marked for easy identification by those readers who are as yet unfamiliar with theoretical diagrams.

Alternative Voltages

It will be seen that a tapped resistance is connected in parallel with the output leads, and the purpose of this is to provide any particular voltage that may be required between the maximum and zero. This tapped resistance is generally referred to as a potential divider, for obvious reasons; and although this system of variable voltage supply is not now widely employed, it is the best for our particular purpose, since it simplifies the constructional work. As shown, the circuit has provision for one variable tapping only, this being in addition to the maximum voltage point for feeding large power valves, but any number of additional tappings could easily be provided by using the extra connection shown in broken lines.

Making the Smoothing Choke

But it is time we started to consider the constructional work, for there is a good deal to be done. The components that we shall have to make are the smoothing choke, potential divider, and fuses, since it will be practically essential to buy the smoothing condensers ready made, for reasons explained last week. Suppose we start with the choke, because this is made in almost exactly the same manner as the L.F. transformer described last week. The choke requires to have an inductance of approximately 25 henries when carrying the full output current—in the present instance about 20 milliamps will be ample, this being sufficient for the average three-valve battery receiver. The choke can therefore be made by using three dozen No. 5 stalloy stampings, like those for the L.F. transformer, for the core. A winding spool like that described last week, but without the central "cheek," will also be required, and this should be filled with 40-gauge enamelled wire, of which a total of about 6oz. will be required. There is no need to describe the method of winding, since this is exactly as in the case of the transformer. The same remarks apply to the fitting of the core stampings and the provision of a terminal plate, although in the present instance only two terminals will be required.

We should mention in passing that the whole of the current passed through the smoothing choke will not be available for high-tension purposes, since there will be a "waste" of about 8 milliamps across the potential divider. If, therefore, it is desired to have an output in excess of about 12 milliamps it will be necessary to use a choke of larger size, and this might well be made round a core consisting of No. 4 stalloy stampings. The method of making such a choke was fully described in the issue of PRACTICAL WIRELESS dated December 23rd, 1933, and we would ask those readers who are interested to turn up that back number; if it has been misplaced, a copy can be obtained from The Back No. Dept., Geo. Newnes, Ltd., Exeter Street, Strand, London, W.C.2, for 4d. post paid.

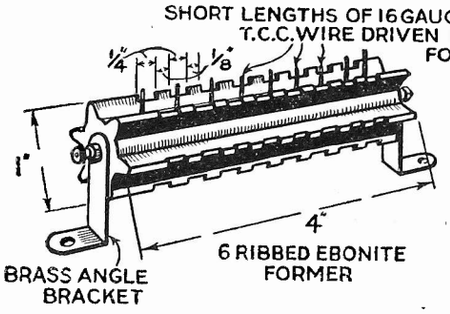


Fig. 2.—Showing how the former is prepared for the potential divider.

The Potential Divider

Attention can now be turned to the potential divider, and this component can be made fairly easily by winding approximately 1oz. of 40-gauge silk-covered nickel chrome resistance wire on a ribbed ebonite coil former. The ribs must be slotted, as described three weeks ago in connection with the H.F. choke, but there should be eight slots instead of six; dimensions are given in Fig. 2. Terminals are fitted to the ends of the former exactly as for the choke, but these are used as a means of mounting the component on small angle brackets made from strip brass, or taken from a Meccano set.

A number of tappings are required, and

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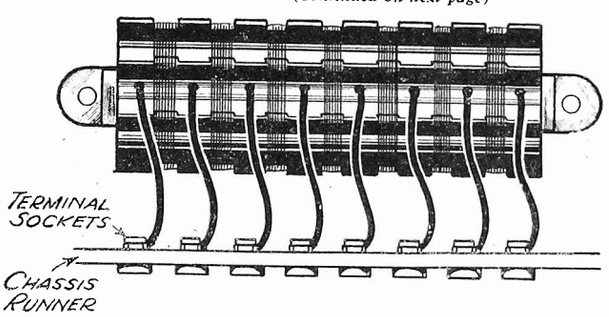


Fig. 3.—Showing how the potential divider is mounted on the underside of the chassis and flexible leads taken from the tappings to terminal sockets mounted on the chassis runner.

PROGRESSIVE HOME CONSTRUCTION

(Continued from previous page)

some simple and reliable method must be devised for making these, especially since the fine wire we are using is so easily broken. The best method is to fit a number of short lengths of 16-gauge tinned copper wire into the former at various points, as shown in Fig. 2. This is done by drilling 1/32in. holes into the ebonite, roughly tapering the ends of the short lengths of d.c.c. wire, and driving these into the holes. It will be found that a tight fit can be obtained in this way, and that the tapping leads will remain firmly in position, even when connections are subsequently soldered to them.

With regard to the winding of the resistance wire, this is quite simple by comparison with the winding of the L.F. transformer and smoothing choke. If the slots in the former have been made about ⅛in. deep the wire will just about fill the eight of them, but there is no need to count the turns, provided that approximately the same amount of wire is wound in each section.

Winding and Tapping

Start by carefully baring the end of the wire, either with the blunt edge of a knife blade, or by burning off the silk covering with a lighted match, and then bind the bared end round the first projecting length of 16-gauge wire. Do not solder it yet, but proceed to wind on the resistance wire until the first slot is nearly full. Then, *very carefully*, bare the wire for about 1in., without cutting or breaking it, and wind the bared portion round the second projecting lead. Again continue with the winding, repeating the tapping process at the end of each section. It might be found as the end of the former is reached that too much or too little wire has been wound in the earlier slots; even if this is so it does not matter very much, and the remaining wire can be divided out among the later slots.

When the winding is complete apply a trace of non-corrosive flux (Fluxite, for example) at the points where the resistance wire has been bound round the tapping leads and then *quickly* touch each of these points with a well-tinned, hot soldering iron.

The resistance unit can next be mounted on the eliminator chassis as shown in Fig. 3. As may be seen, leads are next taken from the tappings on the potential divider to terminal sockets fitted to one of the chassis runners. These sockets may be Clix or Belling Lee, and should be provided with insulating washers. Connections from the tappings to the sockets are made by means of short lengths of flex soldered to the projecting leads on the potential divider.

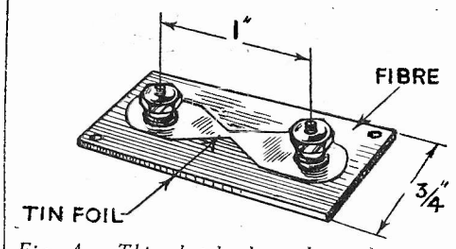


Fig. 4.—This sketch shows how the mains fuses can easily be made.

Here again, care must be taken in soldering the leads to ensure that the iron is hot and is applied only for a few seconds.

Mains Fuses

The two fuses in the mains leads may be made next—unless the constructor prefers to buy them in ready-made form, or to employ a couple of flash-lamp bulbs mounted in suitable holders. They can easily be made, however, by using a strip of tinfoil held between two terminals mounted on a strip of fibre, as shown in Fig. 4. The tinfoil should be cut away in the centre until the junction is as thin as possible, and to ensure that it will melt should the current rise to more than ¼ amp. or so. These fuses are only to protect the smoothing choke and mains supply in case of a short circuit, and should be additional to any safety fuse fitted in the receiver itself.

The method of connecting the various parts is shown in Fig. 5, the components are not shown mounted, since the size of the chassis will depend upon whether or not the A.C. portion (mains transformer and rectifier) is to be added later. If the unit is for D.C. use only, a chassis measuring approximately 10in. by 8in., and having 1½in. side runners will be suitable, but the complete A.C. eliminator will require a chassis just about twice this size, if the rectifier units to be described next week are employed. Alternatively, the present unit may be made up as shown, and the A.C. section added later as a second small unit.

It will be seen from Figs. 1 and 5 that a fixed condenser is included between the negative H.T. lead and earth; this may not be essential, if the negative lead is earthed, but it is always desirable as a safety measure. When the condenser is included, the earth lead should be transferred from the terminal provided on the receiver to the appropriate terminal on the condenser.

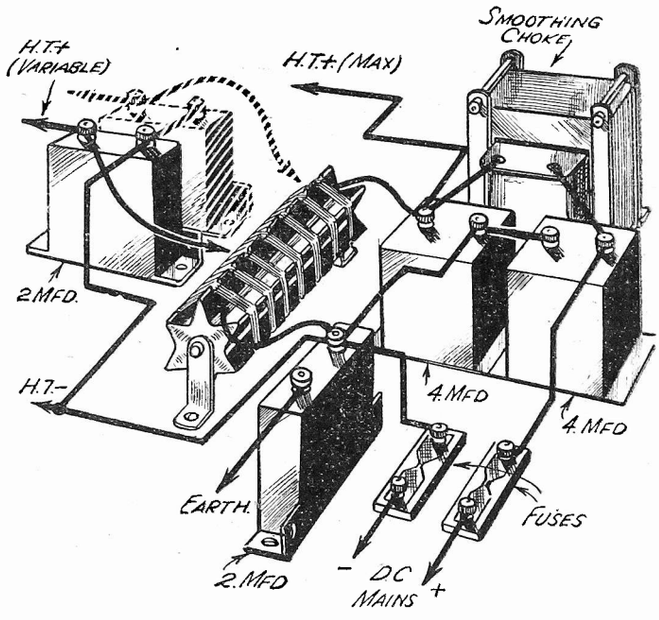


Fig. 5.—A pictorial diagram of the circuit shown in Fig. 1, showing the connections to the various components.

The Smoothing Condensers

All the smoothing condensers shown should be rated at not less than 250 volts working when the unit is for D.C. only, or not less than 350 volts working when the A.C. unit is being made. Any good make of condensers may be used, but it is important that they should be of reputable British make—"cheap and nasty" foreign condensers will rarely stand up to their rated voltages.

With regard to the voltages to be obtained from the various tappings, it can be taken that the voltage from any particular tapping point will be very approximately in proportion to the distance of that point from the positive and negative ends of the potential divider. For example, the middle tapping would provide about half the total (mains) voltage, the third tapping from the positive end (after the second winding section) would provide a voltage of about two-thirds the mains voltage, and so on. The tappings may be used for feeding the anodes of detector, H.F. or L.F. valves, as well as for feeding the screening grids and auxiliary grids of S.G. valves and output pentodes.

CIVIL AVIATION WIRELESS PLANS

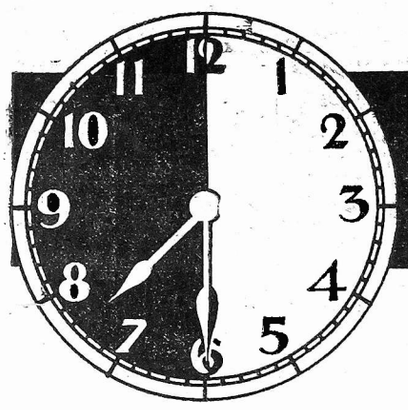
ACCORDING to a recent announcement by the Air Ministry, plans have been approved for the establishment of new civil aviation wireless stations in this country which will provide openings for a substantial number of experienced wireless operators. For the present, applications will be entertained only from time-expired wireless operators of the Royal Air Force who have extensive practical experience of direction-finding, ground stations, radio telephony and telegraphy, and general maintenance of wireless. Good rates of pay are offered. Applications should be addressed to the Secretary, Air Ministry, Kingsway, London, W.C.2. The detailed plans referred to provide for the establishment of a chain of wireless stations throughout the country so as to afford full facilities for direction finding, for communication with aircraft, and between airports.

Six More!

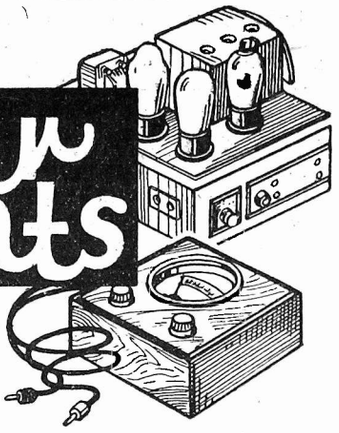
Three new stations came into operation last year at Hull, Portsmouth, and Newtownards (Belfast). A further six are under construction and will be placed at suitable sites during 1935. These sites are being chosen with the object of providing a direction-finding network covering the new internal routes, as well as to serve the needs of individual aerodromes. As the exact course of the development of new air lines in Great Britain cannot at this stage be accurately predicted, the wireless equipment will be mounted on vehicles capable of being easily moved from place to place.

At Heston

In addition to these mobile stations, a limited number of permanent stations of higher power are to be erected. The first of these will be established at Heston Airport to relieve the growing congestion at Croydon. It is also the intention of the local authorities to build a station in the Channel Isles.



Half-Hour Experiments



The Subject of this Week's Article is Automatic Volume Control

By Frank Preston

ALTHOUGH there have been several previous articles dealing with the subject of automatic volume control, there is still plenty to be written on this subject, especially for the experimenter. It is well known that there are many different methods of fitting A.V.C. to a receiver, and it is interesting to try the various systems and to compare the results obtained, preferably making notes of these

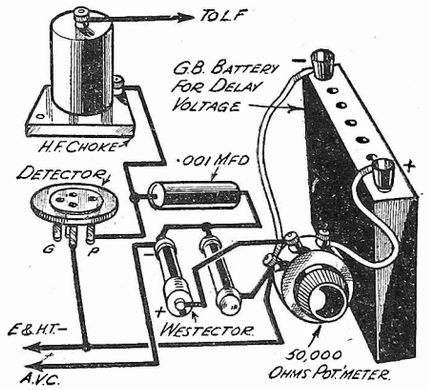


Fig. 2.—This skeleton pictorial circuit shows how the arrangement illustrated in Fig. 1 can be modified to provide delayed A.V.C.

in the log book which every experimenter should keep.

In this series the aim has been to describe interesting tests and experiments that could quickly be made, and so the present article must not be considered as a complete guide to A.V.C., but rather as an attempt to show where experiment is desirable, and to show how some of the simpler forms of A.V.C. may be tried out.

Limitations of A.V.C.

In the first place it should be pointed out, mainly for the benefit of the less-experienced experimenter, that automatic volume control can only be applied to receivers having at least one stage of high-frequency or intermediate-frequency amplification. It is, in fact, not possible to get a very valuable amount of A.V.C. action without the use of two H.F. stages. Nevertheless, the principle of automatic volume control can be applied to the simplest of sets in which a variable-mu valve is fitted. The most convenient arrangement for the preliminary trial is that shown in Fig. 1, where it will be seen that a fixed condenser and a WX6 "Westector" are connected in series between the anode of the detector valve and earth, a fixed "load" resistance of 100,000 ohms being connected in parallel with the high-frequency metal rectifier. A lead is then taken from the "top" end of the rectifier to the lead (from the tuning coil) that previously was joined to the slider of the variable-mu potentiometer.

How the Circuit Functions

This circuit arrangement is well known and is by no means new, but there are doubtless still many constructors who have not tried it for some reason or other. The principle of operation is very straightforward and simple, being as follows: A certain amount of the high-frequency energy in the anode circuit of the detector valve passes through the .001-mfd. fixed condenser to the "Westector"; here it is rectified in the normal manner, so that one end of the rectifier becomes negative with respect to the other. In other words, a D.C. voltage is developed across the

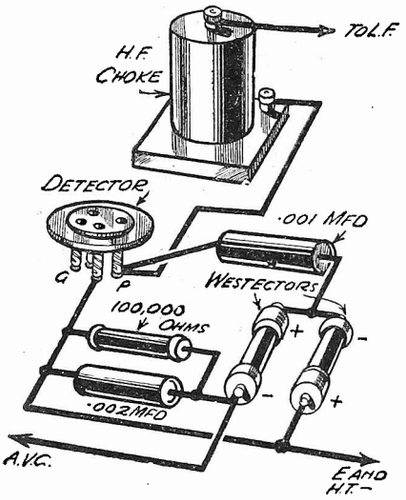


Fig. 3.—A greater measure of A.V.C. can be obtained in a single H.F. receiver by using the "voltage-doubler" rectifier circuit shown here.

rectifier, and the extent of this voltage depends upon the intensity of the signal currents in the detector anode circuit. Thus, as the signal intensity increases, the voltage between the ends of the rectifier increases, and *vice versa*. And since the latter voltage is applied to the grid of the variable-mu valve in the form of negative bias, the bias increases in the same proportion as does the output from the detector valve. It is known that the amount of amplification provided by the variable-mu valve varies inversely as the grid-bias voltage, and it can therefore be seen that the function of the circuit is to reduce the degree of amplification on stronger signals.

The main objection to this, however, is that the rectifier causes a certain loss of energy due to its by-passing a certain amount of the useful signal current in the detector anode circuit to earth. It does this on all signals, whether strong or weak, and thus affects the range of the receiver to a certain extent. At the same time this loss may not be very great, and probably no more than that which occurs when a fixed anode by-pass condenser of about .0003 mfd. is employed. The A.V.C. circuit does, however, cause the H.F. valve to be biased on all signals, and thus limits the degree of amplification available on weak stations.

Delayed A.V.C.

This trouble can to a large extent be overcome by arranging that the A.V.C. action is delayed, or not applied until the output from the detector reaches a certain value. To delay the application of additional negative bias to the variable-mu valves it is only necessary to con-

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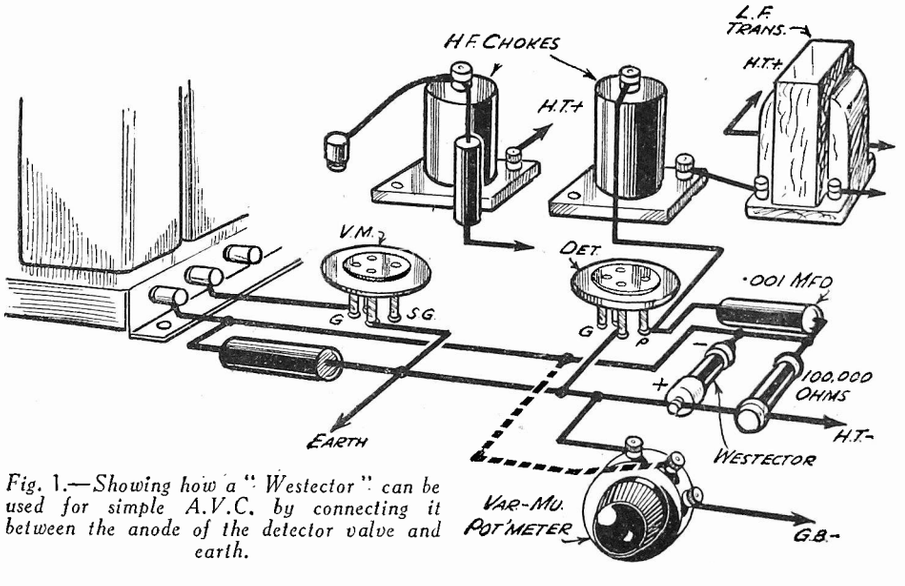


Fig. 1.—Showing how a "Westector" can be used for simple A.V.C. by connecting it between the anode of the detector valve and earth.

(Continued from previous page)

nect a battery of suitable voltage in series with the "Westector," the poles of the battery being so connected that the voltage "opposes" that provided by the rectifier. The idea is shown in Fig. 2, where a potentiometer is wired in parallel with the "delay" battery, so that the exactly-correct voltage may be found by trial.

In trying out the two simple arrangements described above, it is important to

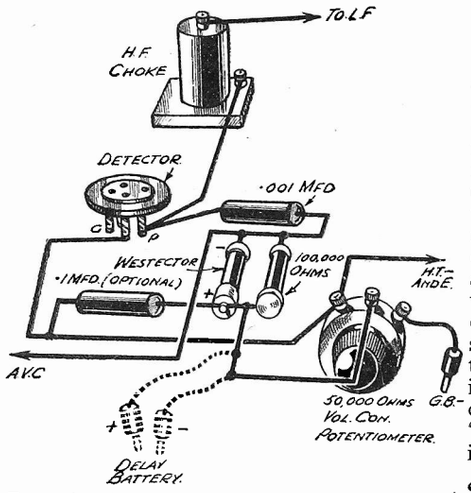


Fig. 4.—Manual and automatic volume control can be obtained by using the connections shown here.

disconnect any by-pass condenser connected from the anode of the detector to earth, and to disconnect one set of fixed vanes of the differential reaction condenser, where this is provided. If this were not done the condenser would be in parallel with the rectifier and would therefore "rob" the latter of the H.F. current which should feed it.

The very simple A.V.C. circuits described above will not prove very satisfactory in the case of a receiver having only a single H.F. stage, because the bias voltage developed will be insufficient to reduce the amplification of the valve by the necessary amount. A somewhat greater bias voltage may be obtained by using the circuit shown in Fig. 3, and in which two "Westectors" are used in series to provide a "voltage-doubler" arrangement. The bias voltage obtained by using this circuit is nearly twice as great as that provided by the previous arrangement, so that fairly satisfactory control can often be secured even when only a single variable-mu valve is employed, provided that this is of the high-amplification type. In this circuit arrangement, as in those previously mentioned, a delay action can be introduced by inserting a grid-bias battery between the positive end of the "lower" H.F. rectifier and earth.

Combined Automatic and Manual Control

One of the objections to adding A.V.C. by one of the methods described above is that the manual variable-mu volume control is dispensed with. There is no reason why this should be so, however, for it is possible to combine the manual and automatic controls quite easily. In the case of a mains set, of course, the manual control is provided by means of a variable resistance connected in the cathode lead from the variable-mu valves, and therefore that portion of the circuit remains unaltered when A.V.C. is added. The position is rather different in a battery receiver, but one method of combining the manual and automatic controls is that shown in Fig. 4, where it will be seen that the positive end of the "Westector," and also the corresponding end of the load resistance, is joined to the slider of the bias potentiometer instead of directly to earth. When it is desired to have a delayed action, the "delay" battery may be inserted as indicated by broken lines.

Superhet Arrangements

The particulars given above and the circuits suggested may be used equally well with either a "straight" receiver or

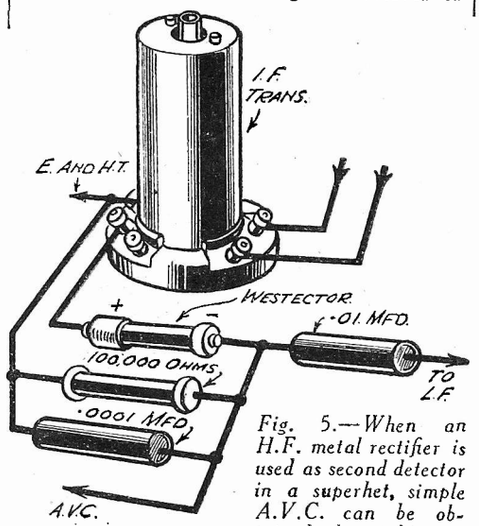


Fig. 5.—When an H.F. metal rectifier is used as second detector in a superhet, simple A.V.C. can be obtained by taking a lead from the negative end to the grid circuits of the V.M. valves.

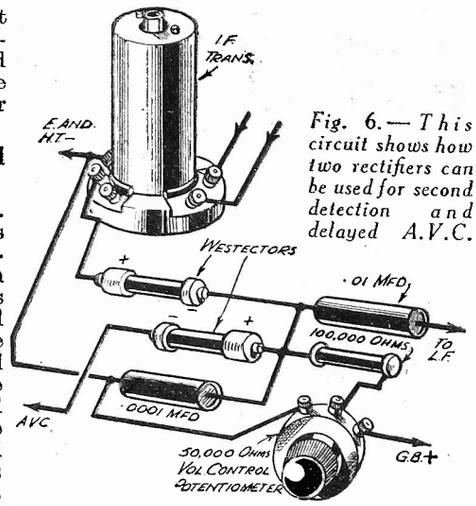
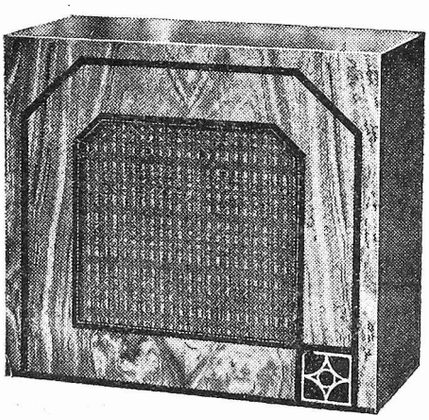


Fig. 6.—This circuit shows how two rectifiers can be used for second detection and delayed A.V.C.

with a superheterodyne, although in the latter case an even simpler circuit arrangement is possible, for the H.F. rectifier can be used in place of the second detector valve, the circuit being as shown in Fig. 5. Here the "Westector" acts as both the second detector and the A.V. control, thus effecting an economy. The A.V.C. may be applied to the intermediate-frequency valves and also to a pre-detector H.F. stage, or to the pentagrid (where such a valve is used). It will be obvious that, when two or more valves are controlled from the same source, the A.V.C. lead to each must be decoupled, and it will be found that a .25 megohm grid leak used in conjunction with the usual .1-mfd. fixed condenser connecting the earth terminal of the coil to H.T.— will give all the decoupling that is required to prevent all possibility of interaction.

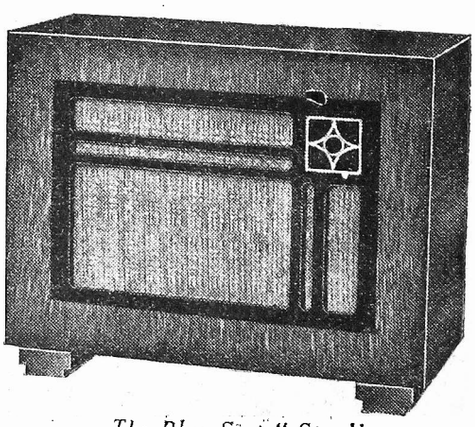
The circuit shown in Fig. 5 might well be elaborated to that given in Fig. 6, when a greater measure of A.V.C. action is required, and when it is desired to include a delay control. Here two "Westectors" are employed, and the most suitable degree of delay may be controlled by means of the potentiometer shown. The same idea may be applied to a mains receiver by using the voltage drop across a variable resistance included in the main H.T.— lead for delay purposes. The resistance should be chosen to give a total voltage drop of about 10 volts, so that if the H.T.— current consumption of the receiver were, say, 30 milliamps, the resistance should have a maximum value of approximately 300 ohms. If the consumption were 20 milliamps, a resistance of 500 ohms would be correct.



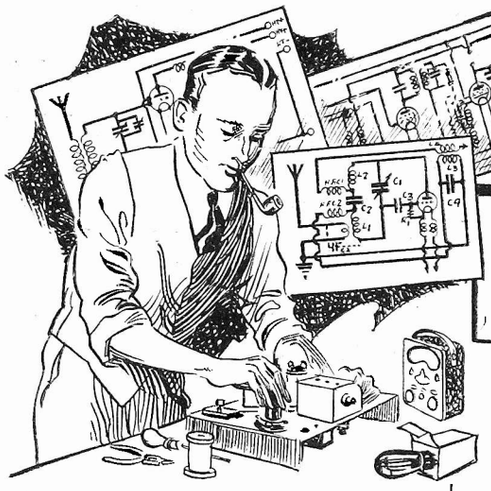
The Blue Spot "Junior."

BLUE SPOT EXTENSION LOUD-SPEAKERS

ON page 754 of our issue dated February 9th, we illustrated and commented on "Blue Spot" extension loud-speakers. The photograph supplied to us for the purpose of illustrating our remarks applied to earlier models which are not now in production. We reproduce herewith photographs of the "Blue Spot Star" (which retails at 98s.), and the "Blue Spot Junior" (which retails at 48s. 6d.). Fuller details are available from British Blue Spot Company.



The Blue Spot "Star."



CIRCUITS AND SETS FOR ALL

Practical Details are Given for the Construction of a Two-valve Self-tuned Receiver with Q.P.-P. Output

ALTHOUGH the average constructor seems to be more interested in the number of stations he can receive with his set than in the ease with which they can be tuned in, there are occasions when he wishes to make a simple receiver for "family" use and which may be as nearly "automatic" as possible. Generally speaking, a semi-automatic receiver must be of complicated design if it is intended for the reception of a large number of transmissions, but if the user is content to listen to the local Regional and National programmes, with the addition of Droitwich, a perfectly simple instrument will suffice.

Simple Station Selection

The circuit given on this page represents a remarkably efficient, simple, and inexpensive two-valve battery receiver by means of which three (or more in some cases) stations can be received merely by inserting a wander-plug into different sockets. Thus it is only necessary to mount three Belling Lee sockets on the panel and to have a plug, attached to a length of flex, which can be transferred from one to the other. If small labels are glued to the panel above the sockets the names of the particular stations to be received can be indicated on these so that station selection is entirely automatic and foolproof.

It will be seen from the circuit that each of the sockets is connected to one side of a pre-set condenser, the other terminal of which is connected to the "grid" end of the tuning coil. Each pre-set condenser is adjusted in turn so that it tunes the coil to the wavelength of one of the stations to be received. If it were desired to have the set so that it could be tuned to any other wavelength at will, it would only be necessary to fit an extra socket and connect this to one terminal of a normal variable tuning condenser.

Special Features

Apart from the unusual tuning arrangements the circuit has other interesting features, such as the H.F.-pentode detector, double pentode for Q.P.P. amplification, and a variable tone control acting upon the output stage. Reaction is provided for use when necessary, but normally it will be possible to set the reaction condenser to about its midway position and then to leave it alone unless a little extra volume is required on some particular programme. It is for this reason that the reaction condenser is shown as being of the pre-set type; it can be then mounted inside the set so that a minimum number of controls are required on the panel. The same remark applies to the tone control, for here the W.B. control unit is mounted on the baseboard or chassis; normally it will require to be adjusted only at occasional intervals.

The Components

With regard to the components required, it will be desirable to follow the specification given in the panel on this page, but there is no reason why slight modifications and simplifications should not be introduced.

LIST OF PRINCIPAL COMPONENTS REQUIRED

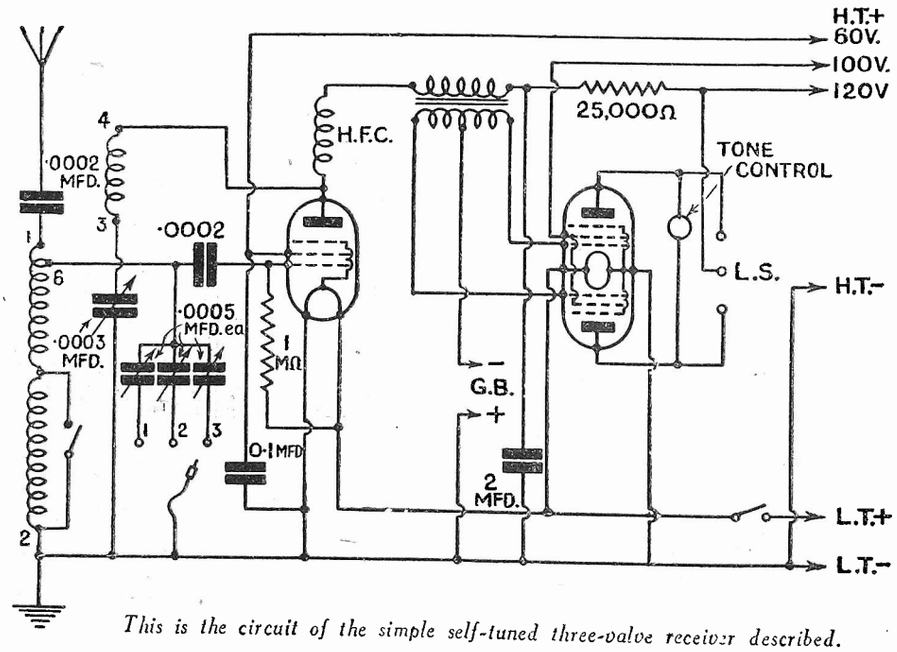
- Two valve-holders, one 4-pin and one 7-pin (Clix)
- Two .0002-mfd. fixed condensers (Dubilier, type 670)
- Four pre-set condensers, three .0005-mfd. and one .0003-mfd. (Polar)
- One .1-mfd. tubular condenser (T.M.C.).
- One 2-mfd. fixed condenser (T.M.C., type 25).
- One 1-megohm grid-leak (Dubilier).
- One type K.G.R. coil (Colvern).
- One screened H.F. choke (Graham Farish, type H.M.S.).
- One Q.P.-P. input transformer (Varley, type D.P.36).
- One 25,000-ohm fixed resistance (Dubilier 1-watt).
- One tone-control unit (W.B.).
- One on-off switch (Graham Farish).
- Three panel-mounting sockets (Belling Lee).
- Connecting wire, screws, flex, terminals, etc.
- One "Stentorian" loud-speaker (W.B.)
- One H.F.-pentode valve (Hivac).
- One Q.P.240 valve (Hivac).

For example, the H.F.-pentode valve may be replaced by a three-electrode valve of normal detector pattern, or the tone control might in some cases be replaced by a .01-mfd. fixed condenser when it is only desired to "mellow" the tone and not to control it. If it is proposed to employ a different coil a certain amount of care should be exercised in its choice, because if some coils were used reaction would have to be varied for nearly every station, whereas the tuner specified provides fairly uniform reaction over the whole of both wavebands with a fixed setting of the reaction condenser.

Chassis Lay-out

The arrangement of the parts is not very critical, and a fairly standard lay-out can be adopted, using a metallised chassis measuring approximately 10in. long by 8in. deep, and fitted with 2in. deep side runners. If the coil is mounted on the left with the wave-change-switch spindle projecting through the panel, the on-off switch can be placed at the opposite end of the panel, where it will match up with the wave-change knob. The sockets for station selection can then be placed in a line in the centre of the panel, the flexible lead with wander-plug attached coming through the panel near the bottom and half-way along. The valve-holders can most conveniently be placed in line at the rear of the chassis, the Q.P.P. transformer "balancing" with the coil. There will then be space for the three pre-set condensers in the centre of the chassis and near to the corresponding sockets. Space will also be found on the upper surface of the chassis for the reaction condenser and the tone control, whilst practically all the remaining components can be mounted conveniently underneath the chassis baseboard. Battery connections can best be made by means of a battery-cord assembly, of which the leads are joined directly to the respective components. The leads for aerial, earth, and speaker can be taken to a couple of terminal-socket strips mounted

(*Continued on page 873*)



This is the circuit of the simple self-tuned three-valve receiver described.

THE EASY ROAD TO RADIO.

THE BEGINNER'S SUPPLEMENT

SITE AND SET DESIGN

By H. BEAT HEAVYCHURCH

HAS it ever occurred to you to inquire why such a large variety of set designs are in use at the present time? Why, for example, while tens of thousands of listeners employ superhets of the latest type there are almost as many who prefer the "straight" receivers with two high-frequency valves; still more who can boast only one high-frequency stage, and a very considerable remainder who are still faithful to sets of the old detector and low-frequency variety.

There are, of course, a number of reasons. For example, the question of expense looms large as a factor in the problem, and many listeners who would willingly pension off their old receivers and adopt something more up to date cannot afford to do so.

Performance

Then there is the matter of performance. Everyone knows that, under given reception conditions, a set with one high-frequency stage will receive more stations than one having only a detector, and that two high-frequency stages give a still wider range of choice of programmes. But many people are quite contented with a restricted range, and have no desire nor need to employ a highly-sensitive receiver. I have met many listeners who, when taken to task on account of their ancient and inefficient receivers, have said, "Well, it gives me all that I want, so why change?" This matter of the desired performance is, I think, probably a bigger factor in the perpetuation of so many different types of receiver than is the matter of cost.

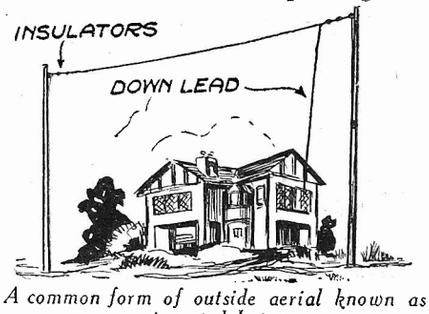
When all these causes of the infinite variety of receivers have been discussed, there remains one which should certainly be the deciding factor in the choice and design of every home-built receiver—namely the locality in which the set is to be operated. By this is meant that, once the listener has decided approximately on the performance he requires to obtain from his radio, he should, before buying or commencing to build a set, ascertain what type of receiver will best give the desired performance in the particular district in which he lives. It must be realized that any particular type of set will not necessarily give the same entertainment value in one place as it will in another. It all depends upon "local conditions."

Analysing the Conditions

In the first place, and almost the most important, is the matter of what kind of aerial it is possible to use. A set which, other things being equal, would give a very satisfying performance when used with a good aerial, may be hopeless when used with a poor aerial and earth system.

The next factor is the distance between the listener's home and the local broadcasting station. A set that at Hampstead will give wonderful strength from the National and Regional programmes may yield uncomfortably feeble volume at Slough.

Thirdly, there is a distinct connection between the distance separating the



A common form of outside aerial known as an inverted L type.

listener's home and the nearest broadcasting station having a wavelength close to that of the local British transmitter, and the angles at which these two and other powerful stations lie from the house. And, finally, the geographical position of the listener's home has a profound effect upon reception conditions and, therefore, on the type of receiver which must be installed if satisfactory listening is to be experienced.

Simplest Type

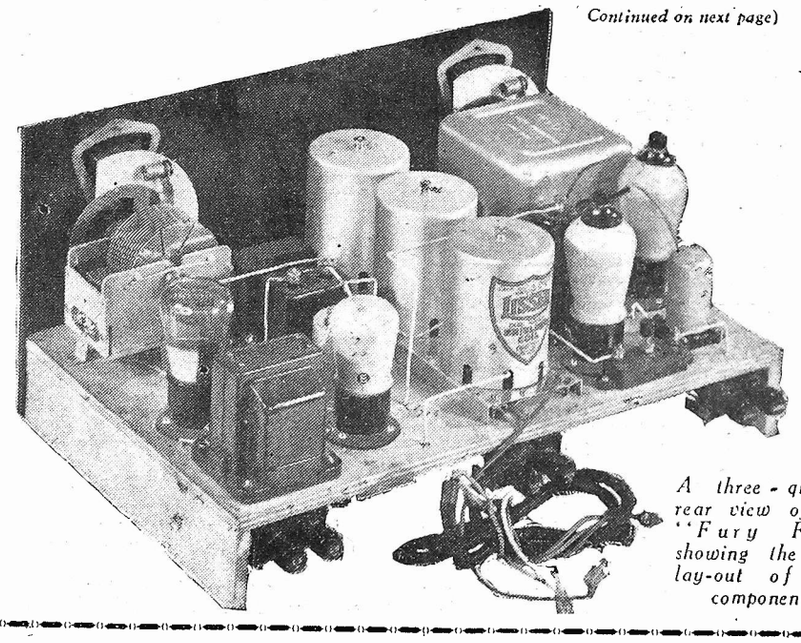
We may take it that the simplest type of set which is used to-day in any considerable quantities is the detector-L.F. combination, comprising either detector and pentode or detector, first L.F. amplifier, and triode output valve. Under what circumstances will a set of this type give a satisfactory performance? Well, in the first place, it could not be recommended for use at a distance of more than about seventy-five miles from the nearest B.B.C. station as a general rule. This is a very rough estimate, and I know of several such sets which are doing good service at over twice that distance. However, within the seventy-five miles radius one ought to be able to obtain ample volume from the local programmes.

But this is not the whole story, and the statement must be qualified by adding that if you are living within, say, ten miles of the local station, a set of this type will have great difficulty in separating the local programmes from more distant transmissions, and you will be almost limited to listening to the local programmes. Moreover, even if you are well outside the ten-mile limit—say forty or even seventy-five miles from the B.B.C. station—you may have difficulty in separating stations, especially in cutting out a station whose field strength is approximately equal to that of the local. For example, a set of the detector—L.F. type is utterly impossible to use at most places on the East Coast, owing to the strength of the German transmissions.

Another Case

The second class of receiver to be considered is the straight three-valver having one H.F. stage, either screened-grid or screened-pentode. Now here is a set which has a considerably greater degree of selectivity than the simple sets just referred to, and is also very much more sensitive. Its reasonable range can be placed at 150 miles from a main B.B.C. station—a conservative estimate, perhaps, but one which gives a nice little reserve in hand for foreign listening. The straight three with one H.F. stage has always two, and sometimes three, tuned circuits, and may be relied upon to separate the local stations from each other in almost every part of the country. It will probably not be able to receive free from interference those stations using the three or four channels on each side of the nearest B.B.C. stations, but unless you are living under the shadow of a main broadcasting

(Continued on next page)



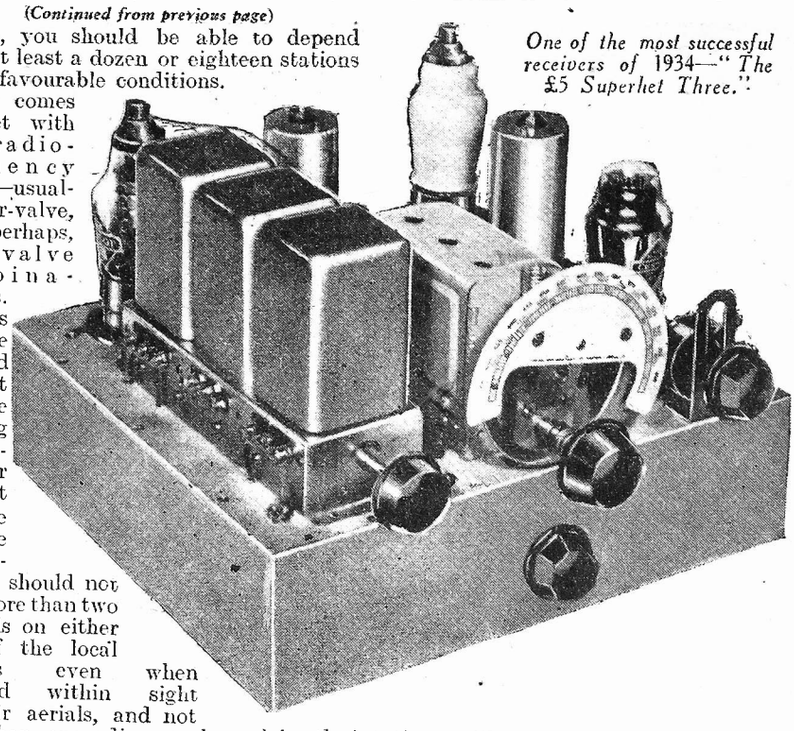
A three-quarter rear view of the "Fury Four," showing the neat lay-out of the components.

(Continued from previous page)

station, you should be able to depend upon at least a dozen or eighteen stations under favourable conditions.

Now comes the set with two radio-frequency stages—usually four-valve, or, perhaps, five-valve combinations. This may be summed up at once as being suitable for almost any site in the country. It should not miss more than two channels on either side of the local stations even when installed within sight of their aerials, and not more than one adjacent channel in the case of the more powerful Continental stations. Moreover, a set of this class will give a reasonably good account of itself with quite a small indoor aerial, or, in the case of a mains set, with a mains aerial. Naturally, in such cases, the power and number of stations will be cut down considerably, but at a conservative estimate a dozen stations should be receivable with ease almost anywhere.

One of the most successful receivers of 1934—"The £5 Superhet Three."



Finally, we come to the superhet class. Apart from details of design, these can be roughly divided into the four- or five-valvers, having no high-frequency valve and only one intermediate-frequency stage, and five- or six-valve combinations having one H.F. valve before the frequency-changer stage. Performance of the former ranges from that of a straight set with one radio-frequency stage to a straight set with two radio-frequency stages so far as sensitivity is concerned, but selectivity is considerably better than that of a straight three, although a four-valve superhet has usually very little advantage on this score with a straight set having two radio-frequency stages and band-pass tuning.

The superhet with a pre-amplifying H.F. valve, however, probably represents the high-water mark of both sensitivity and selectivity, at any rate as far as conventional sets are concerned, and may be used anywhere with the certain knowledge that practically every station of real programme value will be received with a good aerial, and many dozens of the chief stations when using a mains or frame aerial. The latter arrangement, of course, will further increase selectivity and is useful in the case of stations on adjacent channels being located at different angles from the house in which the set is installed.

BLUEPRINT SERVICE

MISCELLANEOUS.

Blueprints, 1s. each.

Short-wave Superhet Converter	23.1.32	AW329
Simple Trickle Charger	16.7.32	AW352
Battery-operated Amplifier	22.10.32	AW362
D.C. High-tension Unit	26.11.32	AW369
A.C. High-tension Adaptor	26.11.32	AW369A
Short-wave Plug-in Adaptor	23.1.33	AW326
"A.W." Push-pull Amplifier	11.2.33	AW376
Short-wave Adaptor	18.3.33	AW382
Superhet Short-wave Adaptor	8.4.33	AW385
Class-B Gramophone Amplifier	10.6.33	AW391
Three Class-B Units	2.9.33	AW400
Universal A.C. Amplifier (3-valve)	18.11.33	AW411
Valve and Set Tester	6.1.34	AW415
Experimenters' D.C. Mains Unit	7.4.34	AW430
Experimenters' A.C. Mains Unit	21.4.34	AW432
Valve Voltmeter	28.7.34	AW442
Add-on Two-valve Amplifier (battery)	28.7.34	AW443
Economy Gramophone Amplifier (battery)	*Apr.* '32	WM277
Dual-speaker Amplifier (A.C.)	*Nov.* '32	WM304
A.C. Mains H.T. Unit	*Jan.* '33	WM310
Five Q.P.P. Output Units	*Mar.* '33	WM315
Class-B Mains Unit	*June* '33	WM324
A.C. Short-wave Converter	*Mar.* '34	WM353
10-watt A.C. Amplifier	*June* '34	WM360
"W.M." Electric Gramophone	*Sept.* '34	WM369

WRIGHT AND WEAIRE "LUCERNE" COILS

A SERIES of sets published in *Amateur Wireless* during the past few months were known as the "Lucerne Ranger," "Lucerne Straight 3," "Lucerne Major," etc., and Messrs. Wright and Weaire were one of the listed firms to supply the coils. These coils were of a special nature, and we would remind late "A.W." readers that these coils are still easily obtainable from the firm mentioned, the prices being 5s. for the aerial coil and 5s. 6d. for the anode coil.

PRACTICAL LETTERS FROM READERS

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

Is A.V.C. Worth While?

SIR,—I have noticed with interest that most modern receivers of commercial type are provided with A.V.C., yet it seems significant that receivers described in PRACTICAL AND AMATEUR WIRELESS have not been so fitted. After trying A.V.C. I think it is over-rated and feel sure that you are right in not fitting it to your sets.—B. J. (Watford).

No Intermediate L.F.

SIR,—Please allow me to congratulate you on your set—the "A.C. Hall-Mark." I shall build it as soon as possible. One point slightly surprises me, namely, that the push-pull output follows the leaky-grid detector without any intermediate L.-F. stage. I am sure you must have good reason for this. An article on "following the signal through the receiver" would interest many. I also hope you will give details of the actual working voltages and the current taken by the various valves.—D. B. F. MCANDREW (Glasgow).

[*In the receiver in question there is a high-ratio transformer between the detector and the push-pull stage, obviating the necessity for any intermediate L.-F. stage.*—ED.]

Short-wave Reception

SIR,—The following remarks on short-wave reception in the North of Scotland may be of interest to other readers. Results on the 13 to 14-metre band are practically nil. Only a few commercial morse stations and occasionally W8XK can be heard. The average strength is about R3-4. The 19-metre band shows a great improvement. W8XK (19.72 m.) comes through R 5-6/N/X. Zeesen DJB is also a very good signal. The Philips Experimental Station on 19 metres comes through R9x/FFSS/X and provides good entertainment. The 25-metre band is very reliable and amongst the many stations heard are RNE, GSE, FYA, and 2RO, all coming in at about R7-9.

On the 31-metre band Sydney VK2ME and Lindhurst VK3LR are frequently heard about noon (G.M.T.). The laugh of the kookaburra gives one a great thrill. On this band GSB, GSC, W2XAF, LCL, CT1AA and HBL are very good signals. The most reliable band is on 48 to 50 metres, and on this band RW59, DJC, and GSA come in at R99. The Americans, W8XAL, W3XAL and W8XK can be plainly heard after 10 p.m. (G.M.T.).

I might also add that good entertainment can be had from the amateur bands on 20, 40, and 80 metres. The 40-metre band is by far the most reliable and the 20-metre amateurs are seldom heard. The 80-metre band is only of use after 11 p.m. G.M.T., when quite good signals are obtained.

I might add that my set is the PRACTICAL WIRELESS Empire Short-Wave Three with which I am delighted.

May I close by thanking you for the excellent books which I received under your gift scheme and by congratulating you on the successful union of two excellent technical papers?—A. H. MILLER (Strathpeffer).

Prices of Components

SIR,—I should like to support your recent remarks regarding wireless dealers. The more I see of them the more incompetent they appear to become. One point about which they are especially slack is the price of components. Prices are being continually reduced, but they make absolutely no effort to keep abreast of the times. One retailer even denied to me that he had a trade catalogue!—O. C. UHTHOFF (Cambridge).

Our £5 Superhet

SIR,—I have much pleasure in informing you that I have constructed your Battery Model £5 Superhet Three, and it is everything it is claimed to be. Thank you for the pleasure it gave me during construction, and the satisfaction it is now giving me and mine in performance.—C. R. MARTIN (Liverpool).

Our Short-wave Section

SIR,—I quite agree with your correspondent, A. Blakeley, that a large number of readers would be pleased to see an extension of your short-wave section in PRACTICAL AND AMATEUR WIRELESS. I have now no patience to read other wireless periodicals, but it has always occurred to me that the short-wave section was too small. I know that short-wave "fans" are still in the minority, but I feel that an extension of this section would be very much appreciated.

The theoretical diagrams given are excellent, but a suggested lay-out should also be given so that proper care and attention can be given to screening with a view to obtaining the last "ounce" of punch which is so essential in short-wave work.—J. S. RALPH (Barrow-in-Furness).

CUT THIS OUT EACH WEEK

Do you know

—THAT the addition of sodium silicate to accumulator acid renders it non-liquid.

—THAT a non-spillable accumulator for a portable may be obtained by adding the above chemical until the desired consistency is obtained.

—THAT the well-known light-sensitive material, selenium, is insoluble.

—THAT "metallised" valves are not coated with aluminium as popularly supposed, but with zinc.

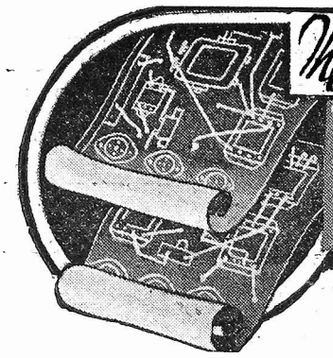
—THAT all A.C. mains units should be protected by means of a fuse on the input and on the output portions.

—THAT a .5 amp fuse to each input lead will provide ample protection on the input side, and a similar fuse should be joined in the lead to the centre-tap of the secondary of the mains transformer.

—THAT A.C. receivers designed for 50-cycle mains should not be used on mains of lower periodicity.

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

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



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

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

PRACTICAL WIRELESS.

Blueprints, 1s. each.

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Empire Short-Wave Three ..	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Autokoil Pentode Two ..	31.12.32	PW9A
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A.C. £5 Superhet Three ..	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
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AMATEUR WIRELESS AND WIRELESS MAGAZINE.

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Four-station Crystal Set	31.3.34	AW427
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STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.

B.B.C. One-valver	Out of print	AW344
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Three-valvers: Blueprints, 1s. each.

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1934 Ether Searcher: Chassis Model (SG, D, Pen)	3.2.34	AW419
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Lucerne Straight Three (D, RC, Trans)	9.6.34	AW437
All-Britain Three (HF Pen, D, Pen)	Out of print	AW448
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Transportable Three (SG, D, Pen)	*Feb.* '32	WM271
Multi-Mag Three (D. 2 Trans) ..	*June* '32	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen) ..	*June* '33	WM327
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Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF) ..	*Jan.* '34	WM343
"W.M." 1934 Standard Three (SG, D, Pen)	*Feb.* '34	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371

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

65/- Four (SG, D, RC, Trans)	Out of print	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	Out of print	AW421
Crusaders' A.V.C. 4 (2 H.F, D, QP21)	18.8.34	AW445
(Pentode and Class-B outputs for above; blueprints 6d. each) ..	25.8.34	AW445A
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Calibrator (SG, D, RC, Trans) ..	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans) ..	*Nov.* '32	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
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Five-valvers: Blueprints, 1s. 6d. each.

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New Class-B Five (SG, D, LF, Class B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344

Mains Operated.

Two-valvers: Blueprints, 1s. each.

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Economy A.C. Two (D, Trans) A.C.	*June* '32	WM286

Three-valvers: Blueprints, 1s. each.

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A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM333
Six-guinea AC/DC Three (HF, Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	*Nov.* '34	WM374

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

A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	Out of print	AW380
AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	*Apr.* '32	WM279
All Metal Four (2SG, D, Pen) A.C.	*July* '33	WM329

SUPER-HETS.

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

1934 Century Super	9.12.33	AW413
Super Senior	*Oct.* '31	WM256
1932 Super 60	*Jan.* '32	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

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

1934 A.C. Century Super, A.C. ..	10.3.34	AW425
1932 A.C. Super 60, A.C. ..	*Feb.* '32	WM272
Seventy-seven Super, A.C. ..	*Dec.* '32	WM305
"W.M." D.C. Super, D.C. ..	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C. ..	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370

PORTABLES.

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

General-purpose Portable (SG, D R.C, Trans)	Out of print	AW351
Midget Class-B Portable (SG, D, LF, Class-B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM287
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM362
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM363

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	Out of print	AW329
S.W. One-valver for America	Out of print	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen) ..	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, R.C, Trans)	Out of print	AW355
Experimenter's 5-metre Set (D, Trans. Super-regen)	30.6.34	AW438
Experimenter's Short-waver ..	*Jan.* 19,'35	AW463
Short-wave Adapter	*Dec.* 1,'34	AW456
Superhet. Converter	*Dec.* 1,'34	AW457

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

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans) ..	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Super-hets: Blueprints, 1s. 6d. each.

Quartz-crystal Super	*Oct.* '34	WM372

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368

Three-valvers: Blueprints, 1s. each.

Emigrator (S.G, D, Pen), A.C. ..	*Feb.* '34	WM352

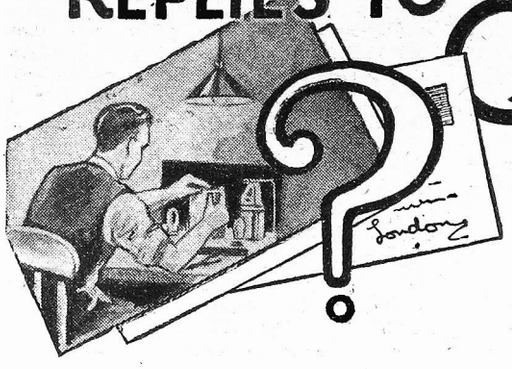
Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292

Trickle Charger: .. .. .. *Jan.* 5,'35 AW462

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff



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

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

SPECIAL NOTE

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

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

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

Coils for 7 Metres

"I want to experiment on the new television wavelengths, and should welcome your recommendations as to the most suitable type of coil, *i.e.*, size of former, type of wire, etc."—R. G. Y. (Barrow).

For a normal type of circuit you should make the coils from heavy gauge bare wire, say No. 16 or 18. To avoid losses due to oxidation tinned copper wire will be found most suitable. Obtain a former having a diameter of about ¾in. and wind the wire with adjacent turns touching. When the required number of turns have been wound the wire should be released, when it will spring out slightly larger than the former and adjacent turns will separate. The coil should be mounted direct into position without a mount and without the former. A single turn may be used as an aerial coupling coil, and three turns (tuned by a 50 mmfd. condenser) will probably be found most suitable for the grid coil. This may be modified according to the type of circuit you decide to use, and will serve as a basis for experiment.

Modifying a Disc

"I have built a disc television receiver which I have been using for some time, and this I understand will be obsolete in the near future. Is there any way in which I can alter the disc so as to see the high-definition pictures?"—O. T. (Richmond).

At the present moment we cannot offer you assistance in this direction. You must bear in mind, however, that the 30-line transmissions will continue for some time yet and they will not cease as soon as the high-definition transmissions begin. In that respect, therefore, your present apparatus will serve you for some time to come. On the other hand, it may be possible in the future to modify your apparatus to take advantage of the newer transmissions, and if so, details will be given in this paper.

Speaker versus Receiver

"I have just obtained a moving-coil speaker which is advertised in your pages every week. I spent a lot on this as it is boosted such a lot, but am very disappointed with the results. Not only does it give quieter volume than my old trumpet, but the quality is not so good. It's deep and "woofy," and there are no top notes at all. How can you boost a thing like that?"—F. G. (Aylesbury).

We are afraid you have fallen into an old pit. You may be a new reader of our journal and have thus not made yourself acquainted with the conditions necessary for good wireless signals. You should bear in mind that the loud-speaker only delivers what is fed into it, and therefore you must first of all obtain a circuit which will do justice to a good loud-speaker. As you were using a trumpet type of speaker we presume that your receiver is also of rather old design, and as the old speaker was deficient in bass response the circuit was probably full of bass resonance and also deficient in top note response. Thus, on your horn speaker you heard what was apparently bass, and the squeaky nature of the speaker gave you what you imagined were top notes. Now you are using a speaker which is a faithful reproducer without resonances, and consequently it shows up the defects in your set. To convince yourself that this is indeed so, take the speaker to a local dealer and get him to test it on a modern set; if it sounds all right, you must bring your set up to date, and then you will be able to obtain really high-quality signals.

Some Facts about Earths

"I have a buried earth plate, with a seven foot stranded cable joined to it. The soldered joint is quite sound and well painted, and the cable is unbroken. Yet when I disconnect the lead the weak stations remain unaltered, and reaction does not seem to be affected. As I understand it, this points to an inefficient earth. How can this be with my arrangement?"—G. T. (Woking).

It is, of course, quite possible to have an arrangement such as yours which is, nevertheless, inefficient. The requirements of an earth are not low resistance wire and good, large earth plate, but a low-resistance path throughout. To ensure this, it is obvious that there must be good connection between the plate and earth, and it is probably here that your trouble lies. If you are situated on sandy soil, and your plate is buried in dry sand, it would be inefficient. If possible, the plate should be in moist clay, although if that is not possible, you should make a large hole and pack the plate with coke and if possible some such material as soda, sal-ammoniac, etc. You will then find that your earth is O.K.

Not to Specification

"I have built up your Hall-Mark set, although I did not use the parts you gave. I had some by me and a local store has a lot of dismantled gear from well-known commercial sets, and I got some of these as they seem equal to those sold to home-constructors. I also made one or two slight modifications to the circuit to suit my needs. I find that it is not a patch on an old two-valve set which has been in use four years. I have tested the parts carefully, and have wired them to your published circuit, but with no better results. Could you examine this in your laboratory and tell me where I have gone wrong? I will pay any expenses incurred."—G. C. W. (Harringay).

No, we are sorry we cannot look at your set. Firstly, we must take the standpoint that if you know sufficient to be able to state that the parts which you have bought are equivalent to those we specified, and are able also to modify a circuit, then you should be fully capable of finding a fault or two.

Reactance of a Condenser

"I am carrying out some experiments, and wish to know the formula for the reactance of a condenser. The book in which I kept such details has unfortunately been destroyed in a fire which consumed not only all my wireless books, but also the entire contents of my workshop and three wireless sets. I hope you can give me this information as soon as possible."—T. R. (Birmingham).

The formula you require is: $\frac{10^6}{2\pi f c}$

where f is the frequency in cycles per second, and c is the capacity in microfarads.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet St., E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High St., Clapham.

OFFER the Following Manufacturers' Surplus New Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra, I.F.S. and abroad, carriage extra. Orders under 5/- cannot be sent c.o.d. Please send for Illustrated catalogue, post free.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves and Magnavox Super 66 energised speaker, £12/10/0.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, condensers, resistances, and diagram, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps with 4v. 2-4 amps. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps., with 4v. 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9; 250 milliamps, 30 hys., 20/-.

ALL Premier Mains Transformers have engraved panels, terminal connections, all low-tension windings centre tapped, tapped and screened primaries 200/250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps, 4 volts 2-3 amps, 4 volts 3-4 amps., 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps, 4 volts 2-3 amps, 4 volts 3-4 amps, 12/6.

PREMIER combined HT8 and HT9 transformer rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, either type, 18/6.

PREMIER HT10 transformer rectified output 200 volts, 100 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, 19/6.

PREMIER HT11 transformer 500 volts 120 milliamps rectified output, 4 volts 2 amps, 4 volts 2 amps, 4 volts 3-5 amps, 22/6; with Westinghouse Rectifier, 42/6.

SPECIAL offer Western Electric mains transformers input 200/250 volts, output 350-0-350 volts, 120 milliamps screened primary 4 volts 1-2 amps, 4 volts 2-3 amps, 4 volts 3-5 amps, 9/6. Input 100/250 volts, 300-0-300 volts 60 milliamps 4 volts 1-2 amps, 4 volts 2-3 amps, 6/6. Input 200/250 volts screen primary output 500-0-500 volts 150 milliamps 4 volts 3-5 amps, 4 volts 2-3 amps, 4 volts 2-3 amps, 4 volts 1 amp, 4 volts, 1 amp, 19/6.

MAINS transformer with Westinghouse Rectifier output 150 volts, 30 milliamps and 4 volts, 2 amps LT., 15/- the pair.

USA 3-gang condenser with trimmers, 3/11; a really solid job.

PREMIER L.T. Charger Kits, consisting of Premier transformer and Westinghouse rectifier, input 200-250v. A.C., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v., 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Truspeed Induction Type (A.C. Only), Electric Gramophone Motors, 100-250v., 30/- complete. D.C. model Truspeed, 100/250v., 42/6.

COLLARO Gramo. Unit, consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-; without volume control, 46/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire-Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CENTRALAB Potentiometers, 400 ohms, 1/-; 50,000, 100,000, ½ meg., any value, 2/-; 200 ohms, wire-wound, 1/-.

RELIABLE Canned Coils with Circuit accurately matched, dual range, iron cored, 2/11.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 144, 2,500 ohms, 12/6; D.C. 152 magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 16/6; 9in. cone, 22/6.

SPECIAL offer .00015 brass short-wave tuning condensers with slow-motion and complete dial, 3/9. Short-wave chokes 10-200 metres, 9d.

DUBILIER electrolytic condensers, 12 microfarads, 20 volts 6d., 8 plus 4 microfarads 500 volts 4/-, 50 mf. 50 volts, 1/9.

AMERICAN G.E.C. auto-transformers 450 watts, one side 110 volts, other 90/240 volts in 5 volt steps, 30/-.

(Continued at top of column three)

(Continued from foot of column one)

BRITISH Radiophone fully screened 3-gang .0005 top trimmers with complete, slow-motion drive, 7/6.

MAINS transformer input, 200/250 volts, 6 volts 1 amp, 4/6. 10 volts .5 amp., 4/6.

SPECIAL OFFER. Kolster-Brandes (shop-soiled) Receivers, 2-valve Battery Pup, with self-contained Speaker, Valves and Batteries, 27/6.

POLAR Star Manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmers; unscreened, 5/-.

RELIABLE Intervalve Transformers, 2/-; multi-ratio output transformers, 2/6; Microphone transformers, 50-1 and 100-1, 2/6; 1-1 or 2-1 Output Transformers, 2/6.

UTILITY 3-gang Condensers. 0.0005, fully screened, with trimmers, ball bearing straight or superhet, 6/9, complete; with illuminated disc drive, 7/11; the best 3-gang available.

T.C.C. Condensers, 4mf. 450v. working, 4/-; 4mf 750v. working, 6/-.

VARLEY Constant Square Peak Coils, bandpass type B.P.7 brand new, in maker's cartons, with instructions and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instruction, in original cartons. 2/6.

PREMIER British-made Meters, moving iron, flush mounting, accurate, 0-10, 0-15, 0-50 m.a., 0-100, 0-250 ma., 0-1, 0-5 amps.; all at 6/-.

WESTERN Electric Condensers, 250v. working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 400v. working, 1 mf., 1/-; 2 mf., 1/6.

WIRE-WOUND Potentiometers, 1,000, 2,500, 50,000, 500,000, 2/- each; 1,000 ohm, semi-variable, carry 150 m.a., 2/-.

A LARGE Selection of Pedestal, Table and Radiogram cabinets, by best manufacturers at a fraction of original cost. Send for list.

THE following Lines 6d. each, or 5/- per dozen.—Chassis valve holders 5-, 6-, or 7-pin, screened screen-grid leads, any value 1-watt wire resistances, wire end condensers 0.0001 to .0.5, 3 amp. main switches, Cyldon double capacitors.

SUPER-MOVING Coil Speakers, handle 10 watts, energised directly from A.C. mains, manufactured by world-famous radio and gramophone company, 40/-.

T.C.C. Electrolytic condensers, 8 mfd. 440v. working, 3/-; 4 mf. 440v. working, 3/-; 15 mf. 50v. working 1/-; 50 mfd. 12v. working, 1/-; 15 mf. 100v. working, 1/3.

CONDENSER Blocks, H.M.V. 400v. working, 4+2+1+1+1+.5, 3/9; 2+2+1+1+1+.5, 3/-; Dubilier 300v. working, 4+4+2+.1, 3/-; Phillips 6+4+2+1+1, 4/6.

GRAMPIAN Permanent Magnet 9 inch Moving Coil Speakers, handles 4 watts. Universal Transformers, 18/6. Ditto Energised, handles 5 watts, 2,500 ohms, 21/-.

10,000 12,000, 15,000 ohm wire-wound potentiometers with mains switch, 1/6.

SCOTT Aerial and Anode Coils Dual Range with Circuit, 2/6 per pair.

SPECIAL OFFER. Guaranteed U.S.A. Electrolytics, 4 mf. 1/9, 8 mf. 1/9, 12 mf. 1/9, all 550v. Peak Working.

DARIO directly-heated 1 watt, 200v. Mains Power Valves, 2/6.

BLUE SPOT 45 P.M. Speaker, multi-ratio transformer, handles 4 watts, listed 45/-, at 25/-, or in handsome walnut cabinet, 35/-. Blue Spot 99 P.M. Speaker, multi-ratio transformer, handles 5 watts, listed 59/6, at 31/-.

BLUE SPOT Energised Speakers 2,500 ohms type 29D.C., Power and Pentode Transformer, 9/11.

SUPER Moving-Coil Speaker by world-famous radio and gramophone company, 300v. 30 m.a. field (10,000 ohms), 25/-.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a world famous Continental valve manufacturer; 2 volt Battery Valves, H.F.: Det.: L.F.; 2-3: Power: Low Consumption Power, Super Power, 2/9; Screen Grid; 4 and 5 pin Pentodes, 5/-: all the following standard mains types, fully guaranteed, 4/6 each; H.F. Pentodes, Variable-Mu H.F. Pentodes, H.L., L. Power, medium, high, low mag. and variable-mu Screen-grids, one, three, and four watt A.C. output directly-heated Pentodes: 250v. 60 m.a. full-wave rectifiers: D.C. types, 20v. 18 amp., filaments, Screen-grid V.M.: H.: H.L.: Power: Pentodes; H.F. Pentodes: Variable-Mu H.F. Pentodes.

The Following Types, 5/6 each: 350v. 120 m.a., full-wave rectifier, 500v. 120 m.a., full-wave rectifier, 2½ watt indirectly-heated Pentode.

The Following American Types, 4/6: 250, 112, 171, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 83, 27, 2A5, 77, 78.

The Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 267, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59. Send for Complete Valve List.

PREMIER SUPPLY STORES

(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest station: Clapham North, Underground.

UNIVERSAL RADIO BARGAINS.—Sets, Kits, Speakers, Valves, Pick-ups, Coils, Transformers and all other components at Keen Prices. Stamp for Lists and Prints.—"Universal," 20, Victoria Road, Peckham, S.E.15.

WANTED, good modern wireless parts, sets, eliminators, meters, valves, speakers, etc. Spot cash waiting. Exchanges. Send or bring. We pay more than any other dealer. Open 9-8.—University Radio, 142, Drummond St., Euston, N.W.1.

RADIO CLEARANCE, 280, High Holborn, W.C.1, offer the following stupendous bargains, limited quantities only, all orders over 5/- post free.—'Phone: Holborn 4631.

RADIO CLEARANCE First Bargain List is now Available, send 1½d. stamp to cover cost and postage.

RADIO CLEARANCE Makes Special Offer of a Limited quantity S.T.600 Dorchester Kits to Designers' Specification, including Colvern coils, Polar condensers, T.C.C. fixed condensers, R.1 Hypermite transformer, ready drilled panel and terminal strip, list price £5/17; our price, £3/10.

RADIO CLEARANCE.—Dorchester 3-valve service grid, detector, power or pentode battery, chassis including all first-class components, brand new, completely wired; at 30/- each, less valves.

RADIO CLEARANCE.—Earl permanent magnet moving-coil speakers, 7½in. cone, brand new, boxed; list price 29/6; our price 10/11.

RADIO CLEARANCE.—Plessey mains transformers, primary input 200-250 volts, secondaries 350-0-350 at 120 m.a., 4 volts 2½ amps., 4 volts 6½ amps., screened primary, exceptional value; 7/6 each.

RADIO CLEARANCE.—Standard Telephones and Cables mains transformers, shrouded type, for H.T.8 rectifier with 4v. 4 amp. C.T., L.T. winding; exceptional value at 6/- each.

RADIO CLEARANCE.—British Radiophone 3-gang Midget type superhet. condensers, fully screened with trimmers 2 0.0005 sections and 110 kc. oscillator section; 7/6 each.

RADIO CLEARANCE.—British Radiophone 3-gang Midget type straight condensers, fully screened with trimmers, 3 0.0005 sections, 7/6 each.

RADIO CLEARANCE.—British Radiophone 3-gang superhet, condensers, unscreened, 2 0.0005 sections and 110 kc. section, 4/11.

RADIO CLEARANCE.—British Radiophone 110 kcs. intermediate frequency transformers; 3/- each.

RADIO CLEARANCE.—British Radiophone set of band-pass coils, manufacturer's type, with circuit diagram, suitable for tuned grid or tuned anode; set of 3 coils, 4/-.

RADIO CLEARANCE.—British Radiophone set of superhet. coils, manufacturers' type, with circuit diagram, suitable for use with above advertised condenser; 5/6 per set of 3.

RADIO CLEARANCE.—5-pin chassis mounting valve holders; 3d. each.

RADIO CLEARANCE.—British Radiophone volume controls, 10,000 ohm, 25,000 ohm, 50,000 ohm, 200,000 ohm, 500,000 ohm, 1 meg., at 1/6; volume controls, with switch, 1 meg., 1/9.

RADIO CLEARANCE.—8 mfd. dry electrolytics 500v. working, well-known make; 2/6 each.

RADIO CLEARANCE.—8,000 ohms volume controls log type, with Q.M.B. switch, by G.E.C., 2/- each.

RADIO CLEARANCE.—1 watt resistances, well-known make, all sizes; 6d. each.

RADIO CLEARANCE.—1½mm. white sleeving; 9d. per doz. lengths.

RADIO CLEARANCE.—Telsen 0.0001 and 0.00015 reaction condensers; 5d. each.

RADIO CLEARANCE.—Steel chassis, cadmium plated, drilled ready for use; 4 valve, 1/6 each.

RADIO CLEARANCE.—4 mfd. Post Office Condensers, 250 v. D.C. working; 1/6 each.

RADIO CLEARANCE, 280, High Holborn, W.C.1. 'Phone: Holborn 4631.

THE following unused set manufacturers' Surplus; all goods guaranteed perfect; immediate delivery. MAGNAVOX speakers, complete with hum-bucking coil, output transformers, etc. DC152 (9in. cone), 22/6. DC154 (7in. cone), 16/-. All with 2,500 or 6,500 ohms fields.

WESTINGHOUSE rectifiers, HT8, 9/6. HT9, 10/-. HT10, LT5, LT4, 10/9. Regentone transformers for HT8 or HT9, with 4v. 4amp. LT winding, 7/-. Eliminators, first-class make. Outputs 150v. 25ma, SG and detector. AC type with Westinghouse rectifier, 25/-. AC type with .5 amp. trickle-charger, 30/-. DC type, 12/6.

DUBILIER or TCC dry electrolytic condensers 8mfds or 4mfds, 500v working, 50mfds, 50v, 200 mfds, 10v, 3/3. 50mfds, 15v, and 15mfds, 100v, 2/3. 50mfds, 12v, 2/-. TCC type "M" condensers, any value up to .001 mfds, 6d. Erie resistances, 1 watt type, 7d., 2 watt, 1/2, 3 watt, 1/9. Send for comprehensive list.

WARD, 45, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

HALL-MARK THREE Superhet Three, ST600 Guaranteed First Specified Kits—Lowest Prices—Easiest Terms—Lists Free—Melfo-rad, Queen's Place, Hove. (Trade supplied.)

REPAIRS to Moving Coil Speakers, Cones and Coils fitted, or rewound. Fields Altered. Prices Quoted Including Eliminators. Loud-Speakers Repaired, 4/-. L.F. and Speech Transformers, 4/- Post Free. Trade Invited. Guaranteed Satisfaction. Prompt Service. Estimates Free. L.S. Repair Service.—5, Balham Grove, London, S.W.12. Battersea 1321.

MAINS Transformers, chokes, etc., to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

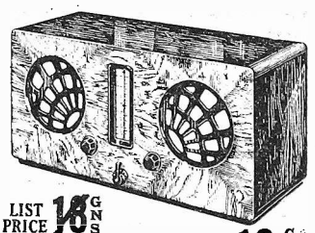
EXPERIMENTER'S OPPORTUNITY. Parcels containing Wireless Components, 40/-, value for 5/6, Carriage 1/-.—Taylor's, Radio House, Macaulay Street, Huddersfield.

BARGAIN

McMICHAEL RADIO SUPERVOX

4-VALVE A.C. MAINS

ONE THIRD OFF MAKERS' PRICE



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VAUXHALL.—Practical Wireless Universal superhet chassis, completely built as specified with valves and Magnavox or Rola speaker, carriage paid, £8/15/0.

VAUXHALL.—Radiophone radio-paks R.F. superhets complete with volume control, escutcheon, new Lucerne station named dial, 34/-.

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RECEIVERS.—Osram 4-Valves (Actual) Sets. Complete with Four Osram Valves, Moving-Coil Speakers. Pedestal Cabinet. Ready for use on all Voltages A.C. In sealed cartons, £6/0/0 (List £15/15/-).

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SPEAKERS.—Blue Spot Permanent Magnet Moving Coil Speakers. Universal Transformers for Power, Super-Power, Pentode and Class "B." All Brand New 1935 Series in sealed cartons. Type 99 P.M., 30/- (List 59/6); 45P.M., 24/- (List 45/-); 62P.M. (in Cabinet), 38/- (List 67/6); 32 P.M. in magnificent cabinet, 45/- (List 87/6).

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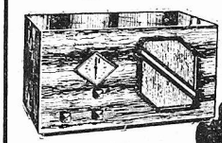

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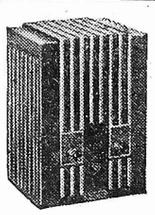

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RADIOMART. Utility 3-gang, as above, straight or superhet, 7/11, with dial, 8/11.

RADIOMART. Famous 8 mfd. dry electrolytics 500v., 2/11; NSF., ditto, 8 x 8 mfd., 500 v., 3/6.

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Briefly outlined, this includes the acquisition of additional premises for our new despatch dept. at 23, Bartholomew Close, of approximately three times the size, and a staff on the mail order side of nineteen hands. The control of this department is in the hands of Mr. R. Glenville, who has left the mail-order department of London's greatest general store to join us. He has brought many invaluable ideas with him, and has been instrumental in evolving this new organization. The additional space available at 24, Aldersgate Street., has been utilised in the development and enlargement of our technical and demonstration rooms. On this side Mr. L. Eastwood has taken charge. Until joining us Mr. Eastwood was in charge of the technical side of a famous record and radio manufacturing firm. He is well known for his development work in high fidelity receivers and wide range amplifiers. *Our technical department is at your service, and will answer authoritatively all technical queries without cost or obligation.*

THE above programme has been carried out at great expense and on a large scale. In some quarters it was suggested that we were courting financial loss. We have truly lost an enormous amount of business by an almost complete cessation of advertising during the process; but we prefer to look upon it as a big investment which will pay us altogether priceless dividends of goodwill. We have faith in the wireless public and in our own twenty thousand customers to prove this and to justify this big reliance.

I ASK you all, secure in the knowledge that your requirements will be dealt with more efficiently, more quickly, more accurately, and with greater service than at any time previously, *to give the new G. M. Mail-Order System and Service your early trial*, and then, afterwards, to me your personal verdict. Thank you.

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23, Bartholomew Close, *February 20th*, 1935.

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G. M. SERVICE.—Radiophone 110 K.C. I.F. transformers. 3/-.

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