COSSOR

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3 Cosson Valves (Variable-Mu Screened Grid, Triode Detector, Power Output), Matched Moving Iron Loud Speaker. In handsome walnut finished cabinet similar to illustration.

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Model 353
3 Cosson Valves (Variable-Mu Screened Grid, H.F. Pentode Det. and Economy Pentode Output), 8" Permanent Magnet M.C. Speaker. In handsome walnut finished cabinet similar to illustration.

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As Model 353 but with 4 Cosson Mains Valves (including Mains Power Output and Rectifier) 8" Energised Moving Coil Speaker, Illuminated dial. In handsome Walnut finished cabinet. For A.C. 200-250 v. (adjust.) 40 100 cycles. Similar to Illustration.

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CIRCULATES ALL OVER THE WORLD!

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:

VOL. V. No. 109. 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 prepairing 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 install 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 Skopje, 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 30,000 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 (869 kc/s), a position which, in view of its forecasts, will not be the main consideration for placing those selected on a free list.

Our Blueprint Service!

No matter what type of receiver you want to build—we issue a full-size blueprint! Consult the blueprint list on page 882.

Brussels Will Double Its Power

During the course of the year the Belgian Authorities will reconstruct the twin Velthiem 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 Portuguese 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-de Par-ay-day, and the name of the Club (Portugues) often accompanies it.

Listen to Cairo

Although the Cairo station broadcasts on the same channel as Brussels's 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.E.C. from Greenwich. The call put out by the station is usually in both English and French.

Manchukuo on the Air

MTOV is the call sign of the new 100-kilowatt broadcasting station at Kungchengtzu, near Kinking, 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 30 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.

Our New Series!

"Great Television Revival," continuing for several months, is our new series of articles, specially written in non-technical language for the beginner.

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A New Wireless Station

A NEW wireless station has recently been installed at Kimberley, in South Africa. This station has two masts 700 ft. in height, and will have the latest equipment for long- and short-wave reception and transmission as well as a direction-finding apparatus.

Listen to North Africa

SINCE January 20th, Radio Maroc at Rabat (Morocco) has increased its power to 25 kilowatts, and may now be heard nightly on 499.2 meters (501 kc/s) between Florence and Vienna. The station, as a rule, works until G.M.T. 23.00, but on some nights it 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 Rediscovery of America

E VERY Satur day 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 Totterdown. This intention is to give British listeners--and others--an opportunity of listening to the American morning radio entertainments. The studio is to be taken place regularly at G.M.T. 16.45, corresponding to 11.45 a.m. Eastern Standard Time.

A New Wired-Wireless System

F OR 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 means of telephone subscribers, each may listen to any of these programmes by means of their ordinary wired set. As if deprived, 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

A N excerpt from 'Theatre Royal,' a new opera by George Cadbury, with illustrations by Clifford Bell, played by John Tandy, will be broadcast on the 16th of March, 1935, by the English Opera, at the Royal Opera House, Covent Garden. The opera is a dramatic version of the life of George Cadbury, and is written in the spirit of the original work. It is performed by a orchestra, and is accompanied by a chorus of 100 singers. The opera is directed by Sir Adrian Boult, and is performed by the English Opera Society. The opera is a great success, and is highly praised by the critics.

Carillon Music

C ARILLON music will be discussed on March 4th, by George Cadbury, with illustrations by Clifford Bell, played by the carillon at Bournville. This carillon was founded by the late George Cadbury, and extended by his daughter, who is taking part in this broadcast. His sister, Dame Elizabeth Cadbury, now consists of forty-eight bells, ranging in size from 12 lbs. to 32 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.

BETWEEN THE TURNS

INTERESTING and TOPICAL PARAGRAPHS

was the first carillon to be made by a English bellfounder, the first to be recorded for the gramophone, and the first to be broadcast.

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 which was caused by the reaction current. The choke should have been mounted at right angles, or screened...

The first three correct solutions opened in respect of Problem No. 127 were from the undermentioned readers, and books are being forwarded to them: M. Allen, 39, Lenton Street, Liverpool; 3; R. F. Alden, 85, Westley Road, Birkenhead; R. F. Alden, 14, Belgrave Road, Hertford, N.S.

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Radio Plays During March

P LAYS 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 same part. Peter Crosswell will produce "The Taming of the Shrew," on Sunday, March 16th, and in the same week "The Three Sisters," by Tchekov, will be broadcast, with 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 Boumphey and Graham Castle.

Weather Forecast

T HIS 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 of March 9th. After a short reconstruction of the history of weather forecasting, listeners will be given a description of how reports come into the Meteorological Office in all parts of Europe, and from ships operating in 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.
IMPORTANT NEW SERIES

TELEVISION FOR ALL—3

LAST week readers were given a general survey of the reception of high-definition television signals, but since this involves so many new conditions, are compared to everyday wireless listening, it is necessary to sectionise 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, to a high degree, a most successful 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.

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 order 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, appreciate 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.

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 cir-
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 Shield

Cathode

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

Deflection. Each method has its own particular advantages (and disadvantages), but for the purpose of explanation the static deflection scheme will be described.

Consider for a moment what the cathode-ray tube is doing when, for example, 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, those sections being chosen haphazardly or in well-defined "lines."

Static Deflection

Reverting to our electron stream we could, of course, move the electrode 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 nature 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 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 field 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 us a definite 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 plate or pair of parallel plates between the first deflector plates and the anode, the mounting of these plates being 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, it will be noticed, is 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 in the television system. To take the concrete case of the proposed high-definition television service recommended by the F.M.G. television committee we have 2 lines definition plus 25 pictures per second. This is equivalent to the number of pictures per second in connection with this double effect must be devised and this will be explained in next week's issue.

CATHODE - RAY TUBE COATING

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

With ordinary hollowines 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 "silver plating". If a cathode-ray tube is examined a similar opacity will be observed, but for an entirely different reason. It is quite a common feature in C.R. tubes, that is, the internal coating of the glass walls extending from the narrow neck of the tube at the cathode up to the small closed 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 may give quite frequent reflections, owing to the light reflections which inevitably occur. It is for this reason that coating is made to a proprietary product called "Aquagard," which is a colloidal graphite water containing about 20 per cent. by weight of graphite. This is deposited on the glass wall 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 Aquagard 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 double effect, it is generally conceded that the appearance of the cathode-ray tubes is enhanced also.

NEWNES' TELEVISION and SHORT-WAVE HANDBOOK

RESERVED COPIES READY FOR YOUR NEXT WEEK.

Thousands of readers who have been collecting Gift Tokens in connection with our wonderful Television Book are looking forward eagerly to next week. Why? Because, as they have been collecting Gift Tokens from No. 1, they will have their fourth next week and will therefore be sending for their copies of NEWNES' TELEVISION & SHORT-WAVE HANDBOOK.

This book, expressly reprinted at the urgent request of readers who missed the first offer, will tell you all you want to know about the new science.

Don't forget to send in your application immediately you have cut the Gift Token from next week's issue of "Practical and Amateur Wireless."

Practical Television 6d.

Every Month

The Leading Television Magazine. Informative, Up-to-date and Interesting! Published by Geo. Newnes, Ltd., 8-11 Southampton Street, Strand, W.C.2.
LAST week we finished the description of the L.F. amplifier, and before going on to describe the construction of the high-tension power transformer, 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 the circuit of the D.C. unit actually comprising a D.C. unit, later dealing with the additional parts needed to convert it for A.C.

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.

Construcional Details are Given for a High Tension Battery Eliminator

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. described last week. The transformer choke requires to have an inductance of about 0.6 oz. 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 milliamperes across the potential divider. If, therefore, it is desired to have an output in excess of about 12 milliamperes 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. Newsom, Ltd., Exeter Street, Strand, London, W.C.2, for 4d. post paid.

The Potential Divider

Attention can now be turned to the potential divider. This component can be made fairly easily by winding approximately 1 oz. 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

**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.

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

(Continued on next page)
PROGRESSIVE HOME CONSTRUCTION
(Continued from previous page)

A simple and reliable method must be devised for making these, especially since the binding 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.e. 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 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 wire is first wound round a mandrel about 1in., 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 winding 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 (Flurite, for example) at the points where the resistance wire has been bared 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.

TIN FOIL

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

Mains Fuses

The two fuses in the mains leads may be made next—unless the constructor prefers as possible, and to ensure that it will melt should the current rise to more than 1 amp. These fuses are here called smoothing choke and mains supply, in case of a short circuit, and should be in addition to any safety fuse fitted in the receiver itself.

The method of connecting the various parts is shown in Fig. 5, the components are a show mounted in the shape of a chassis. The chassis will depend upon whether or not the A.C. portion (mains transformer and rectifier) is to be added. If the unit is for D.C. use only, a chassis measuring approximately 10in. by Sinn., and having 1in. 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 high voltage leads 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.

The Smoothing Condensers

All the condensers 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—nothing of that kind is to be used. The 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 voltages may be used for feeding the auxiliaries 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.

COmmOn degree 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 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 aircrafts, and between airports.

Six More!

Three new stations came into operation last year at Hull, Portsmouth, and Newtownards (Bellast). 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 meet 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 high power are to be erected. The first of these will be erected at Croydon 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.

CIVIL AVIATION WIRELESS PLANS

March 2nd, 1935

PRACTICAL AND AMATEUR WIRELESS
**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.

**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 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 connect a "voltage-doubler" rectifier circuit shown here.

**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.

**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.

**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.

**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.

(Continued overleaf)
is employed, provided that this is of the even when only a single variable -mu valve satisfactory control can often be secured the previous arrangement, so that fairly nearly twice as great as that provided by

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 obtained 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 voltage 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 receiver having only a single variable-mu valve, and therefore that portion of the circuits 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 position is rather different in a battery receiver, but quite 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.

The particular circuits suggested may be used equally well with either a " straight " receiver or 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.C. 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, 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.

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**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零售s at 96s.), and the " Blue Spot Junior " (which零售s at 46s.). Fuller details are available from British Blue Spot Company.

**The Blue Spot " Junior."

**The Blue Spot " Star."

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Ask for circuits showing how to bring your set up to date!
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 Region and National programmes, with the addition of Droltwich, 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 numbers 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 arrangement, 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 moved 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 0.002-mfd. fixed condensers (Dubilier, type 670)
Four pre-set condensers, three 0.005-mfd. and one 0.0005-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.M. coil (Covelel)
One screened H.F. choke (Graham Farish, type H.M.S.)
One Q.P.P. input transformer (Varley, type D.P.56)
One 25,000-ohm fixed resistance (Dubilier 1-ohm)
One tone-control unit (W.B.)
One on-off switch (Graham Farish)
Three panel-mounting sockets (Belling Lee)
Connecting wire, screw, flex, terminals, etc.
One Stentorian loud-speaker (W.B.)
One H.F.-pentode valve (Filva)
One Q.P.P.240 valve (Filva).

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 0.1-mfd. fixed condenser when it is only desired to "narrow" 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 tuners 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 16in. 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 being placed on the left-hand side, 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 base-board. 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).
AS 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 superhet types of the latest type there are others who use the "straight" receivers with high-frequency valves; still more who use the "detector-L.F." type 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 consent to 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 have quite correctly associated with a restricted range, and have no desire nor need to employ a highly-sensitive receiver. I have met many listeners who, when asked to account for their ancient and inefficient receivers, have said, "Well, if I can get 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 suit his position of the listener's home and the nearest 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 listener's home and the nearest broadcasting station, and the angles at which these two powerful stations lie from the house. And, finally, the geographical position of the listener's home is of prime importance 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 a 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 transmitters, 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-valve 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 been one of the most popular among local listeners, especially in cutting out a station whose field strength is approximately equal to that of the local.

This is a very rough estimate, 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 give a satisfactory performance. Under what circumstances will a set of this type give a satisfactory performance?
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(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—one 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 station, and when installed within sight of their aerials, and not more than one adjacent channel in the case of the powerful Continental stations. Moreover, a set of this class will give a reasonably good account of itself in 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.

Finally, we come to the superhet class. Apart from details of design, these can be roughly divided into the four-valve and five-valve combinations having one H.F. 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 receivable 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.
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 manufacturers of commercial type are-providing with A.V.C., yet it seems significant that receivers described in Practical and Amateur Wireless are not fitted with this standard feature. 

In the receiving circuit there is a high-frequency transformer between the detector and the push-pull output, which provides ample protection on the input side.

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 i-f. P.C.C.L. might be considered.

Thank you it is a pleasure to do it for the pleasure it gave me during construction, and the satisfaction it is now giving me and my audience.—C. E. Martin (Liverpool).

Our Short-wave Section

Sir,—I quite agree with your correspondent, A. Blakeley, that a large number of amateurs 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 is always occurred to me that the short-wave section was too small. I know that short-wave "fans" are 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 'kvas' of punch which is so essential in short-wave work.—J. S. Ralph (Barrow-in-Furness).

March 2nd, 1935

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Gaining to the rapid progress being made in the design of wireless apparatus, and to the new and interesting developments which are regularly appearing on the market, the Editor has decided to introduce a new feature, the "Valve with the Six Months Guarantee," which will be illustrated on the reverse of the cover of Practical and Amateur Wireless, every week until the end of the year. The Valve with the Six Months Guarantee will be illustrated on the reverse of the cover of Practical and Amateur Wireless, every week until the end of the year.

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These blueprints are full-size. Copies of appropriate issues of "Practical Wireless, Amateur Wireless" and "Wireless Magazine" containing these blueprints are available for purchase. Inquiries should be directed to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11 Southampton Street, Strand, W.C.2.
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, tin the copper wire will be found most suitable. Obtain a former having a diameter of about 3 in. and wind the wire with adjacent turns touching. When the required number of turns have been wound, the coil will spring out slightly larger than the former and adjacent turns will separate. The coil should be mounted directly into position on a suitable mount and without a 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.

Modifying a Disc Circuit

"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?"—G. T. (Woking).

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 built up your Hall-Mark set, although I did not use the parts you gave. I used some of these as they seemed 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. W. (Crippen).

Reactive of a Condenser

"I am carrying out some experiments, and wish to know the formula for the reactivé 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 some of the contents of my workshop and three wireless sets. I hope you can give me this information as soon as possible."—T. T. (Birmingham).

The formula you require is: $Q^2 = \frac{1}{f R C}$, where $Q$ is the frequency in cycles per second, and $C$ is the capacity in microfarads.

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 concerning the construction or use of receivers described in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—(1) Send diagrams of complete multi-valve receivers. (2) Ask directions or modifications of receivers described in our content. (3) Send alterations or modifications to commercial receivers. (4) Answer queries over the telephone. Please note also that queries must be limited to those arising from matters published in our pages, or on general wireless matters.
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RADIO CLEARANCE.-Bert permanent magnetic moving-coil speakers. 7/9, comp. brand new, stereophonic.

RADIO CLEARANCE.-Pairs multi-section transformers. 200, 250, 500 volts, 1, 2, 3, 4, 5, 6, 7, 8, 10, 15, 20, 25, 30, 50, 100 ohms, 1, 2, 3, 5, 6, 7, 9, 10, 15, 20, 25, 30, 50, 100 ma. New articles are listed.

RADIO CLEARANCE.-Standard Telephones and Cables mains transformers, shrouded type, for 90/6 with 5, 6, C.T., L.T. winding, exceptional value at 6/- each.

RADIO CLEARANCE.-British Radiophone 4-gang A.C. type, 250 v. D.C. working, 1/- each.

RADIO CLEARANCE.-B.B.C. 適宜 type, fully screened with trimmers, 80.0005 sections, 7/6 each.

RADIO CLEARANCE.-British Radiophone 100 kc. intermediate frequency transformers; 5/- each.


RADIO CLEARANCE.-Universal model, 32/6.


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RADIO CLEARANCE.-British Radiophone 3-gang Superhet, complete with detector, stage black or brown, 5/-.

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SOUTHERN RADIO'S WIRELESS BARGAINS

RECEIVERS.—Orman 4-Valves (Actual) Sets. £10.00. -New take-over Marconis, and other sets. -New take-over Miniature Sets, 2/9 each. -Winn 4-Valve, 5/-; 3-Valve, 4/-; 2-stage Interchangeable. Waltham 4-Valve, 5/-.

BURGOYNE CLASS "B" Sets. With three Mullard Helicon tubes, £25.00. -Burgoyne Sets, 3-Valve, 15/-; 4-Valve, 20/-; 5-Valve, 25/-.

Moving Coil Speakers. In modern cabinet beautifully finished. With charger, £6.00. -Moving Coil Speakers, 20/-;

HALSMID MIDGET Set price £4.00. Our SPECIAL O.F.T. 5/-.

OUR BARGAINS OFFER FOLLOWING Surplus Sets. -For sale at lower than half trade value.-Burgoyne CLASS "B" 3.

KIT A.—Cadmium-plated chassis (ex-Military), with new plates; F.C. long life, 25/-.

KIT B.—Ex-Imperial, finished and boxed, 1/6 dozen assorted.

LUMBER.—Iron core, humbucker, 4 watt model, 12/6.

LISTED IN ALL MASTER'S CARTONS. PRICE £10.00 R.I. 2/-.

BARGAINS.

HALS MIDGET Set price £4.00. O.F.T. 5/-.

Burgoyne CLASS "B" Set.

BARGAIN Set price £3.19.

TRUSTINGHOUSE Midget "A" "B." £14/15s.; "C." £15/10s.

Burgoyne CLASS "B" 3.

LIST PRICE £6.10.9 BARGAIN £3.19.

Cash or C.O.D. Curt, Per.

RADIOMART. at 2/3 lots. -See trade list enclosing heading and stamp.

BARGAINS. -For Trade List enclosing heading and stamp.

BARGAINS.

SOUTHERN RADIO'S WIRELESS BARGAINS

D’ESTER, 3 Stage, 25/-

D’ESTER, 2 Stage, 15/-

D’ESTER, 1 Stage, 10/-

Telsen Twin Matched Screened with DI. W.F., 7/- (list 17/-), £3.10. -Telsen Short Wave Screened H.F. Chokes, 27/-.

Telsen "Ace," L.F. Transformers, 2/- and 1/6, 1/6 and 3/6 (list 2/- and 2/-, 3/6 and 6/6).

Telsen "Ace," L.F. Transformer, 2/- and 3/6, 3/6 and 6/6 (list 2/- and 2/-, 3/6 and 6/6).


Telsen "W.F," 7/- (list 9/-), £3.10. -Telsen Screened Condensers, 10/-.

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A NEW MAIL-ORDER SERVICE

A MESSAGE to all readers of "Practical and Amateur Wireless" is that the London East Central Trading Company is now ready for immediate mailing. All orders will be despatched at once and a staff on the mail-order side of nineteen hands has been utilised in the development and expansion of this system which we believe to be second to none. The new system embraces a series of additional premises for our new despatch dept, at 218, Michael Road, W.11, and a staff of approximately twenty hands has been taken on by the firm. Mr. E. H. Glinskie, who has left the mail-order depart- ment of the London East Central Trading Company, has joined us. He has brought many valuable ideas with him, and has been instrumental in evolving this new organisation.

The additional premises at 218, Michael Road, W.11, has been utilised in the development and expansion of the new mail-order system. On this side Mr. E. H. Glinskie has taken charge.

THOUSANDS OF NEW ATTRACTION LINES

G. M. SERVICE.—Radiophone superb cut-out circuit, supplied in a ready to use diagram, for use with 110 K.C. 1, 126. £2 10s. 6d. 2, 126. £3 12s. 6d. transformers.


G. M. SERVICE.—Radiophone, large size 2, 3, £12. 10s. 6d. 4, £15. 17s. 6d. transformer.

G. M. SERVICE.—Radiophone ultra cut-out circuit, complete with a ready to use diagram, for use with 110 K.C. F.5, 126. £2 10s. 6d. 2, 126. £3 12s. 6d. transformers.

G. M. SERVICE.—Radiophone super cut-out circuit, complete with a ready to use diagram, for use with 200 K.C. 3, £2 10s. 6d. 4, £3 12s. 6d. transformers.

A. W. TAYLOR,

25, Northerham Place,
Faringdon, March 2nd, 1935.

General Manager,
London East Central Trading Company.

F.R.A.C.E.

THE NEW MARCH 'RADIO-GOLD-MINE' is now ready for immediate despatch. It has cost nearly £400 to produce and is a gold mine, and more profitable than ever before. Produced in four different sizes, the March 'Radio-Gold-Mine' is the ideal gift for a friend, accessory, numerous radio and receiver owners. The picture shows our amazing 16 valve 5 waveband superb chassis. This is the ideal present for those who are interested in the hobby of radio reception. It has been manufactured in four sizes according to cost and style. It is the perfect present for the owner of a radio receiver. It has been manufactured in four grades according to the number of fittings and the quality of the fittings. It is available in the Radio-Gold-Mine, Radio-Gold-Mine with Fitted Cabinet, Radio-Gold-Mine with Fitted Cabinet and Built-in Amplifier, and Radio-Gold-Mine with Fitted Cabinet, Built-in Amplifier, and Built-in Loudspeaker. All orders are on approval, but payment must be made in full before delivery. THE 'GOLD-MINE' STORES

F.R.A.C.E.

THE 'GOLD-MINE' STORES

"radioworld of the market"

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F.R.A.C.E.
Give Your Set a Tonic!

Don't sacrifice pure quality - watch the TRIODE POWER VALVE

Critical listeners of high quality reproductions often choose a Triode as Output Power Valve owing to the greater simplicity of the circuit to secure distortionless results.

Full rich tone can only be obtained when the thermionic emission of the filament is adequate and with the low impedance and high working anode currents of Triode Power Valves this is especially important.

Do not sacrifice that pure quality of which your set is capable by using a worn-out Power Valve - fit a new Output Valve from one of the OSRAM Series. OSRAM Power Valves hold an enviable reputation for the finest quality obtainable.

OSRAM OUTPUT TRIODES

P2 12/-
For 2-volt Battery Sets

PX4 16/6
For A.C. Mains Sets and Radiograms

PX25 25/-
For A.C. Mains Sets and Radiograms