A special compensated circuit is used to eliminate fading from all worthwhile stations, and is combined with a Cossor Visual Neon Tuning Tube to facilitate accurate tuning and avoid distortion.

**ANTI-FADING**

The many other advanced features of this remarkable Superhet are fully described in Folder L120 — send the coupon for your copy.

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**ABRIDGED SPECIFICATION**

All-Electric Superhet Model 535 is equipped with Five Cossor Valves (inc. Rect.) Illuminated Full Vision Scale—Single Knob Tuning—Volume Control with special scale. Tone Control. 8" Energised Moving Coil Loudspeaker. Magnificently finished cabinet, 20" high, 16" wide, 10" deep. For A.C. Mains only, 200/250 volts (adjustable), 40/100 cycles.
Midland Chamber Concerts

The leading journal for all English-speaking countries!

THE first of a new series of Midland Chamber Concerts is to be given on January 11th by the Alfred Clemons Quartet. It will be devoted to works by Dr. Vaughan Williams, who was born in Gloucestershire.

"The Babes in the Wood"

ON January 12th, scenes from the Clements pantomime "The Babes in the Wood" will be relayed from the Theatre Royal, Nottingham. Fred Clemons has been producing pantomime for twenty-eight years, and also running the Arcadia Follies at Skegness, which broadcast in the summer. In the cast of his Nottingham pantomime are Eva Bolton and Mitzi Gerald, Marcel Ovenden, Charles Harrison and Arnold Rooke.

Concert from Torquay

MARGARET TANN WILLIAMS (contralto) will be the vocalist in a concert by the Torquay Municipal Orchestra, conducted by Gwylim T. Jones, on January 10th.

"Sea Log"

THE story of a long and arduous voyage around Cape Horn will be told by Thomas J. McTear in the first talk in the series "Sea Log" from Belfast on January 5th. These talks are to be given fortnightly, and in them speakers who have followed the sea for pleasure or profit will tell of their experiences and adventures.

"The Cab"

THIS is the title of a one-act dialect play by John Taylor, which will be broadcast from Manchester to North Regional listeners on January 7th. The plot centres round the predicament in which a Northern working-class family finds itself when a rich relative decides to pay them a surprise visit, and the money cannot be found to pay his cab fare. The play is being presented by the Chorlmores, a small dramatic society, whose members are all they can be foreseen. They include the first of the two original members lived in Chorlton-cum-Hardy, Manchester, and the other in Morecambe. The Chorlmores won third prize with "The Cab" at this year's Blackpool Drama Festival. Those taking part in the broadcast version all live in Morecambe.

"Problems of Amateur Drama"

THE North Regional talk which L. du Gard Peach is to contribute to the series "Problems of Amateur Drama" on January 8th should be of special interest, for he is to speak on "Writing a Play," and it is as a dramatist rather than a producer that Peach is known throughout the country.

Some of the contents of the January issue of Practical Mechanics


Military Band Concert

THE Military Band of the Queen's Own Yorkshire Dragoons (Territorial Army) will broadcast a concert from Leeds on January 11th. The conductor is Lieutenant H. F. Fulford.

A Novel Musical Show

A musical show of novel character is being devised and got together for January 15th by Mr. Austin Cooper-Johnson, who is also arranging the music. The show will be something like a news reel of the shows playing in town—a rapid-moving musical half-hour composed of musical medleys of the film and stage hits of the moment.

Literary Criticism Talk

THE third talk in the series Literary Criticism for Welsh listeners will be given by Jerswell C. Peate on January 9th. Mr. Peate is well-known to listeners for his Welsh talks. He is Assistant Keeper in Charge of the Sub-Department of Folk Culture and Industries at the National Museum of Wales.

The Robert Burnett Choir

THIS popular choir, which will be heard on January 10th, needs no introduction to listeners. This choir, though only formed in 1931, has already made a place for itself in British musical circles, and many of the finest Scottish airs are included in its repertoire, some of these arranged by Mr. Burnett himself.

"St. Simeon Stylites"

ON January 6th, for the first time on Midland Regional, a short play is being given. The innovation is likely to be popular with many listeners, but the plays will, of course, have to be chosen carefully. For this broadcast, the play is to be "St. Simeon Stylites," by F. Sladen-Smith of the Unnamed Society, Manchester, who is the author of a number of successful plays. The scene is St. Simeon's tower, and there the saint, in interviews with various mortals and the devil himself, expresses his views on the state of the world. The players are from the Malvern Repertory Company, and the relay is from The Festival Theatre, Malvern.
ROUND the WORLD of WIRELESS (Continued)

Cornish Conversations

On January 6th the West Regional will broadcast an old Christmas Eve programme in which we shall hear Cornish conversations. The proceedings are interrupted by the usual songs and by the Madron Gwine Dancers. Madron is a little village near Penzance, where Gwine Dancing still survives. In the old days the Gwine Dancers put out their rounds for the twelve days of Christmas, bursting into the homes of all and sundry, performing their version of the old St. George Play, and demanding refreshments and money.

Talk for Western Farmers

In the feature "For Western Farmers in Particular" on January 3rd, for West Regional listeners, A. W. Ling, Agricultural Officer and Chief Advisory Chemist for the University of Bristol, who has taken part in many of the discussions, will give a talk on some topical subject of interest to farmers.

County School Choir

The Hawarden County School Choir, conducted by Fred Roberts, will be heard in a concert relayed from the County School, Hawarden, Chester, for West Regional listeners on January 4th. This choir gave its first broadcast shortly after winning the first place in the National Eisteddfod at Wrexham.

"Gypsy Call"

For the Children's Hour, on January 5th, which goes to all Regions, Midland is putting on a Romany serenade, "Gypsy Call." The author, Norman Timms, has had over one hundred plays and sketches broadcast.

"The Empire at Work"

An interesting series of talks commenced on the New Year entitled "The Empire at Work." These broadcasts are scheduled for Sundays at 6.45 p.m., once a month. It has been found that listeners take great interest in hearing of the everyday work of these listeners in various parts of the Empire, whether near or far away, a tendency that leads to a greater understanding of the daily trials of life. This neighbourly interest in other people's work is being extended to a wider sphere. It is proposed to obtain broadcasts by people working in various parts of the Empire, eventually all countries and districts of the Empire being covered. It has been found that listeners take great interest in hearing of the everyday work of these listeners in various parts of the Empire, whether near or far away, a tendency that leads to a greater understanding of the daily trials of life. This neighbourly interest in other people's work is being extended to a wider sphere.

"Soft Lights and Sweet Music"

This is the title of a programme of orchestral music, by Lord Dunsany, which will be broadcast on the Regional wavelength on January 9th. The proceeds will be awarded to the Imperial Institute, and the programme will be broadcast from the Scottish Regional.

A Ghost Story

This is the title of a programme of memories of the previous broadcasts under this title, which will be given on January 3rd. Austen Croom-Johnson, who is presenting the entertainment, says that he is trying to use each composer who has contributed to the series and include his most representative writings. The twenty minutes' programme will be filled with melody and rhythm, and as its title proclaims, will be easy to listen to. The cast will be: Austen Croom-Johnson, John Burnaby, Eric Seday, Reginald Leopold, Bill Shakespeare, Albert Harris and Elizabeth Welch.

"Goody Two-Shoes"

On January 9 an excerpt from the pantomine "Goody Two-Shoes" will be broadcast from the Scottish Regional.

INTERESTING and TOPICAL PARAGRAPHS

Variety Programme

On January 10th, listeners will hear a programme given by six versatile variety artists: The Radio Three girls and Jack Lorrimer, Ronald Hill and Clive Errand (three men). The Radio Three appeared in "Wonder Bar" and "The Show Goes Over," and the men have appeared in various variety productions. The peculiarity of this Sextet is that they each do all kinds of parlour tricks; not only singing and giving monologues, but three are solo pianists, others play various instruments and sing in all kinds of ways which modern radio demands. They will give a programme of sextet arrangements, solo comedy songs and various rhythm piano arrangements for one, two and three pianos. The show will be composed and sung together, and a bright radio entertainment is aimed at.

SOLVE THIS!

PROBLEM No. 120.

Greenbank built an A.C. receiver to a published design using a power pentode in the output stage. When new the set functioned satisfactorily, although it was observed, on taking measurements, that the anode current taken by the pentode was higher than the average figure given by the makers. After the set had been in use for about a week, however, there was a sudden failing-off in the set. The set was observed to be well-maintained, and the chassis was metalised on both sides, the two surfaces were not electrically connected together.

Solution to Problem No. 119.

Robinson had overlooked the fact that, although the chassis was metalised on both sides, the two surfaces were not electrically connected together. No correct solutions of Problem No. 119 have been received; consequently no books have been awarded.

A NOVEL XYLOPHONE.

Over 500 people, including Mr. and Mrs. Percy Edgars (Midland Regional Director of the B.B.C.), attended the Exide Dance held on December 5th at Tony's Major Ballroom, Birmingham. One of the attractions in the Cabaret was an 11-year-old Stanley Rawlins, who played, among other instruments, a xylophone made from Exide wireless battery boxes.
HALF-HOUR EXPERIMENTS

It is always a good plan for the experimenter to cultivate the habit of taking as many readings as possible of voltages, currents, resistances, capacities, and so on. Having made a note of some of these readings, any faults which may develop can nearly always be traced and corrected in a minimum of time. In addition to this advantage, however, the taking of readings to be taken gives an insight into the functioning of components that might otherwise never correctly be understood.

The value of voltage and current measurements will be more fully appreciated when it is pointed out that many of the largest firms of receiver manufacturers issue to their service engineers charts showing the readings that should be obtained between various points in the receiver. Having this data before him, the engineer can rapidly narrow down his search for faults, should they occur, and he is able to effect a remedy in a very short time.

**Necessary Instruments**

It might be considered that an array of expensive instruments would be required to take the necessary measurements, but this is not the case, although it is certainly worth while to buy a good combination instrument, such as the Pyro "Rotameter," the "Dixonometer," or the "Avo-minor," when funds permit. Nevertheless, a considerable amount of interesting work can be carried out with nothing more complicated or expensive than a moving-coil milliammeter which gives a full-scale deflection on 5 milliamps. A reliable meter of this type will cost about 30s., but it is better to spend this amount on one good instrument than on two or three moving-iron instruments of only moderate accuracy.

The first readings which should be taken are those of the anode current to each of the valves, the milliammeter being included between H.T. positive and the anode-circuit coupling components; the positions of the meter in a typical three-valve variable-mu detector circuit are indicated on the circuit diagram in Fig. 1. If these readings are taken when the set is new, or when it is known to be operating efficiently, they may be taken as "standards" so that comparisons can be made later when the receiver is not operating as it should. Quite apart from this, however, the readings are useful because they can be compared with the anode-current figures given by the valve-makers, or shown on the characteristic curves.

**Current Indications**

Let us briefly consider the readings which should be obtained in the case of a set of the type represented by Fig. 1. When the milliammeter is included in series with the anode circuit of the variable-mu valve in the position marked A, the current should vary from about 1 milliamp. up to 5 or 6 milliamps. as the volume-control potentiometer is adjusted. If the current remains the same regardless of the position of the potentiometer slider, it will be evident that either the G.B. circuit is broken or it is short-circuited—perhaps due to a fault in the by-pass condenser connected between the "bottom" of the grid coil and earth.

In the case of a mains set the same result would be observed if the by-pass condenser across the bias resistance in the cathode circuit were short-circuiting.

Next insert the meter in the screening grid lead, as shown at B, and again note the readings as the grid-bias voltage is varied. It is important to ensure that the meter should be on the "H.T." side of the by-pass condenser, because if it is between the condenser and the screening grid a false reading would probably be obtained, and the set might become unstable. The current will not generally exceed 1 to 2 milliamps., and it will fall to almost zero as the bias is increased. If it were found that there was no indication of current, this would point to the fact that the by-pass condenser or lower half of the fixed screening-grid potentialmeter was short-circuiting.

In the case of a receiver having A.V.C., the readings in both cases mentioned should vary according to the strength of the signals being received; the current falling off as the set is brought into tune with a signal. If the A.V.C. system happened to be at fault, the current would remain steady.

**The Detector Circuit**

With the meter in the position marked C, the anode current of the detector valve can be measured. The value of this current (Continued overleaf)
been trained. At the Midland Institute the players have acted by the Shakespeare and Dramatic Society of the Midland Institute, Birmingham, and professional. “The Oak Settle,” is to be acted by the players from the speaker varies. The soloists are Hurst Burton (violinist), who won the Federation of Musical and Dramatic Programme

ON January 7th, there is a musical and dramatic programme given by young Midland artists for Midland Regional listeners. The soloists are Hurst Burton (baritone), who sang Lapero in the Midland Institute performance of “Don Giovanni” in January last; Eric Hope (pianoforte), who won the Federation of British Music Industries Challenge Cup two years ago when he was seventeen; and Arnold Brennock, a local violinist of distinction. The Harold Brighouse comedy “The Oak Settle,” is to be acted by the Shakespeare and Dramatic Society of the Midland Institute, Birmingham, and produced by Stuart Vinden, at whose classes at the Midland Institute the players have been trained. This Dramatic Society is one of the oldest in the Midlands. In its present form it dates from 1989. Two of its original members were in the Pilgrim Players, who were the forerunners of the Birmingham Repertory Company.

“Sights and Seers”

A NEW series of four talks by Edmund Vale will be given under the general title of “Sights and Seers.” This series for West Regional listeners will deal with man’s reactions, adequate or inadequate, to his natural beauty and the first talk will be given on January 11th. Before going to the University Mr. Vale studied engineering and did two years’ practical work in the shops.

Programme Notes

The maximum current in this case will probably be so high as 35 milliamps., and for this reason the meter must be modified to deal with such high currents. The modification consists of connecting a fixed resistor in parallel with the meter terminals (see Fig. 2). The value of the resistor required depends upon the internal resistance of the meter, and the full-scale reading may be doubled by connecting in parallel a resistor having the same value as the meter—this value is usually marked on a good instrument. In the same manner, the readings can be trebled by using a resistance equal to half the value of the meter, quadrupled by using a resistance of one-third the value, and so on. The required resistance can easily be calculated from the calculations. WIRELESS dated December 29th, 1934.

After measuring the H.T. current taken by the individual valves, the total anode current should be measured, by using the meter in series with the H.T. negative lead, as shown at E in Fig. 1. The reading should now be equal to the sum of all the currents before, plus the current passed by the fixed screening-grid potentiometer. Should the current now appear to be greater than before, it will be evident that there is a short-circuit at some point in the H.T. supply.

Measuring Voltages

Voltage readings can next be taken, starting by measuring the voltage applied to the filament terminals of the valve-holders. The milliammeter can again be used, this time by joining resistors in series with it (see Fig. 3). The value of the resistor is found by applying Ohm’s Law, which gives the value as being equal to the voltage divided by the current in milliamperes, and multiplied by 1,000. Thus, if the meter reads up to 10 milliamps., it can be made to give a maximum reading of 100 volts by using a resistor of 4,000/10, or 400 ohms. This calculation does not take into consideration the resistance of the filament holder, but this can be ignored in many instances. Should the resistance be more than about 40 ohms, however, this figure should be subtracted from the calculated value before winding the series resistor.

It is always a rather difficult matter to secure an accurate measurement of anode voltages in a working circuit, because the meter must be connected in parallel with the various voltages. When this is done the current consumption is increased and the apparent voltage is less than the true figure. The readings in hand will be sufficiently accurate for most purposes, however, if a meter of the type considered above is used in conjunction with a series resistance. For voltages, etc., which are too high for a direct connection to be made, the meter must be connected across a series resistor of one-third the value of the meter, quadrupled to half the value of the meter, and so on. The required resistance can be easily calculated from the calculations. WIRELESS dated December 29th, 1934.

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A Popular Three-valve Arrangement is Dealt with this Week, the Receiver Being Designed for Use with Plug-in Coils of Standard Type.

By BERNARD DUNN.

The receivers dealt with in the first two articles of this series have been of types which require for their construction certain components of fairly critical values. By way of a change, and in response to numerous requests, it is therefore proposed this week to take rather a different line in describing a simple three-valve receiver, the detector is connected to function as a second stage. Contrary to general practice, the detector is connected to function on the anode-bend principle in order to overcome any possible difficulties of this sort.

A Popular Valve Combination

The arrangement of valves comprises the ever-popular detector and two low-frequency combination, the first L.F. valve being coupled to the detector on the resistance-capacity system, and an L.F. transformer being coupled to the detector on the resist-frequency combination, the majority of broadcasting stations for coil-changing, excepting when a wave-length range outside of that employed by the majority of broadcasting stations is required. Both of the tuned-aerial coils are of the centre-tapped type and, therefore, give reasonably good selectivity. In the interest of simplicity a single reaction coil is used, this being a size 75, although a slightly different coil might in some instances be desirable, especially if the detector valve is of the type specified.

Capacity Reaction

Tuning is carried out by the .0005-mf. variable condenser marked C3, and reaction is controlled by C4, which has a capacity of .0003 mf. Since anode-bend detection is used the usual grid condenser and leak are not required; instead, a lead is taken from the earth line of the H.F. tuning coils to a tapping on the G.B. battery, a .1-mf. by-pass condenser completing the high-frequency circuit. Resistance-capacity coupling being used between the detector and first L.F. valves, it will be found necessary to include an H.F. choke in the detector-anode circuit, but to avoid the possibility of H.F. currents getting through into the L.F. amplifier a .0002-mf. fixed condenser is joined between the detector anode and earth.

A comparatively modern refinement is to be found in the provision of decoupling in the detector circuit; a 10,000-ohm resistance and 1-mf. fixed condenser being included for this purpose. The L.F. valve is not of the power type, because the input to it is not great, so that fairly high amplification is of greater importance than signal-handling capacity. In order to ensure really good reproduction it is essential that the transformer (L.F.T.) between the second and third valves should be of a good pattern, having a primary winding of high inductance and reasonable current-carrying capacity; it is for these reasons that a rather expensive—but extremely reliable—component is specified for this position. Do not attempt to save a shilling or two by using a second-hand transformer which has entirely different characteristics, and which is probably intended to be resistance-fed.

The loud-speaker terminals are included directly in the anode circuit of the third valve, since the set is intended to operate a sensitive moving-iron speaker; an older, moving-iron speaker could be used, but this would not prove nearly so satisfactory for good reproduction of the weaker transmitters. As a safety measure a 100-m.a. fuse is inserted in the H.T. negative lead, but this is, of course, quite optional.

(Continued overleaf)
Arranging the Components

It is scarcely necessary to give a lengthy description regarding the most suitable disposition of the parts, since those who are in possession of plug-in coils are probably by no means new to home construction. A metallized chassis is, however, recommended, and the three coils may be mounted in fixed coil holders near the left-hand end of this. The holders should be so placed that the coils are about 1 in. apart when inserted, and the two-pole wavechange switch should be placed on the panel as near as possible to the coils. The valve-holders might well be placed in a line near the back of the chassis, the transformer and coupling components being placed on the underside near to the valve holders to which they are connected. A symmetrical panel layout will be obtained by placing the tuning condenser in the centre and towards the top of the panel, with the reaction condenser immediately below it. The on-off switch can then be situated to the right of the panel to match up with the wavechange switch.

Altering the G.B. Voltage

The holders for the two tuning coils (L1 and L2) should be placed so that both pins and sockets are to the back and front respectively of the chassis; if this is not done it will be found that reaction is inoperative on one waveband.

After wiring up, the battery leads should be connected to tappings on the batteries which give the voltages shown in the diagram and the set switched on. Should it be found that the detector valve refuses to oscillate the connections to the reaction-coil holder should be reversed. Once this has been attended to it should be possible to receive a number of transmissions at good strength, but it will be well to try the effect of reversing the connections to the accumulator. The object of this is slightly to vary the G.B. voltage applied to the detector, since it is impossible to vary this in smaller steps than half volts in any other means.

The degree of selectivity can be varied over a wide range by altering the capacity of the pre-set aerial condenser, and an adjustment should be found that permits of good reception and the required selectivity on both wavebands.

It will be seen from the circuit that provision is made for connecting a pick-up in the grid circuit of the first L.F. valve, these connections providing an ample amount of amplification to ensure that the last valve is fully loaded.

Wireless in Africa

Details of the Wireless Equipment Recently Fitted to Junkers Aircraft

The Marconi Company have installed special radio equipment in the Junkers aircraft recently delivered to South African Airways. Three of the larger aircraft are fitted with transmitting and receiving equipment Type A.D.37/38, suitable for telephony and telegraphy on both medium and short wavelengths, and will link up with the present London-Cape Town air route, while a number of smaller aircraft, operating internal routes, are fitted with the new Marconi medium wave sets Type A.D.41/42. All are to carry Marconi directional receivers as an aid to navigation. The Marconi Company provided an experienced engineer and two expert operators to accompany the aircraft on their delivery flight from Europe to South Africa, during which excellent wireless working was attained on all machines.

On the medium waves, they gave a practically uniform performance of two-way communication over 600 miles on continuous wave telegraphy, while on short waves (with the A.D.37/38 equipment), good telegraph working was carried out with Victoria West over 1,200 miles and two-way telephony over 1,000 miles.

The signals from the air-liner, which were routine messages on a short wavelength transmitted while the machine was making a night flight, were received so well by the amateur at Victoria West that they came through at loud-speaker strength. Such long-distance reception is all the more remarkable when the fact is taken into consideration that the air-liner’s power output is only 60 watts. Not long ago, when one of the aircraft on the Shanghai-Malaya line was flying near Kupioka, its operator got into wireless touch with another aircraft on the same route which, at the time, was flying at about 2,000 feet, and communication being maintained for several minutes without fading or interference.

On another occasion, an Imperial Airways machine was making an aerodrome survey along the route from England to Australia, its operator established communication with the Sydney wireless station at a time when the aircraft was in flight at a point over 5,000 miles from that city.

Over the Nile

On another flight, during tests with an improved type of short-range wireless apparatus, a machine while flying above the White Nile, between Juba and Kampala, managed to establish communication over a distance of 3,000 miles with a station in England. During the same trials one of the operators, while over Central Africa, picked up and could hear quite plainly a news broadcast from a station at Miami, Florida. Long-range wireless was also established with stations in Germany and Italy; while Cairo received short-wave messages, without any fading, from a machine more than 1,000 miles away, flying southward towards Cape Town.

January 5th, 1935
SECRETS OF THE VALVE GRID!

And the Important Part it Takes in a Modern Valve

SOME irreverent journalist once described an electric lamp as a "hair-pin in a bottle." If he had seen one of the original radio valves used in the early days of broadcasting he would probably have called it a "hair-pin and a thimble in a bottle." He would not have been far wrong except that he would have omitted another and most important part of the valve, the grid. For between the hair-pin or "filament"—to give it its correct name—and the thimble which the technical man calls the "anode," is a third metallic object consisting of a spiral of thin wire and dignified with the name of "grid."

The above brief description is intended to convey the impression of a pear-shaped wire and dignified with the name of "grid."

The simple valve with a single grid just described is used in a large number of sets as a detector or as a final amplifier, but there are many other classes of valve having more than one grid.

Multi-grid Valves

The well-known "screen-grid" valve has two grids, and was introduced some time ago as a more efficient type of high-frequency amplifier for magnifying the signals as picked up by the aerial. Pentode valves have three grids and were first introduced by the Mullard Company in 1928 as final amplifiers or loud-speaker valves. They give a much greater degree of amplification and bigger volume than the ordinary three-electrode valve. More recently a modified form of pentode, known as the screened pentode, has been introduced for high-frequency amplification and gives a greater degree of magnification than any screened grid valve.

The very latest development is the Mullard Octode which has two, three, or four grids, one within the other. This is used in what is known as the "frequency-changing" stage of modern superhet. receivers. Its function being to change the signal frequency from a lower frequency at which it can be still more efficiently amplified, usually by a screened pentode. The accuracy with which valves of this type are assembled can be gauged from one of the accompanying illustrations, which shows the interior of a Mullard Octode in which the six concentric grids, each accurately spaced and isolated from the others, occupy a space considerably less than 1\(\text{in.}\) in diameter.

The Peto-Scott S.G. Three

Our description, however, gave the impression that this receiver was supplied in kit form. Actually, this instrument is sold only as a complete ready-assembled receiver, the price being 5s. 9d. It can be obtained on easy-payment terms for 5s. down and 18 monthly payments of 7s. 9d.

Lengths of grid for Mullard valves, as they come from the grid-making machine.
A DEVICE FOR "SEEING" SOUND!

This Simple Instrument Enables One to See, on a Translucent Screen, the Strange Effects of Sound Waves, and the Endless Variety of Patterns, Many of Them Curiously Beautiful, that are Produced by the Incoming Music and Speech in a Wireless Receiver.

With the interesting instrument described here a new field is opened for the amateur wireless experimenter. The Voxometer is made by placing a small loud-speaker unit in a tin container, as illustrated in the sketches. A half-pint paint tin, or round cocoa tin, will answer the purpose admirably. Two tin brackets are soldered to the tin can to secure it to the baseboard. Molten paraffin wax is poured into the space between the tin can and the loud-speaker unit, in order to produce a dead sound chamber ground between the loud-speaker unit and the rubber diaphragm.

The Diaphragm

To obtain the best results the diaphragm must consist of very thin rubber. In the original Voxometer, rubber from a toy rubber balloon was used, strong rubber bands being used to bind it over the top of the can.

The degree of tautness of the rubber diaphragm will depend somewhat upon the power of the loud-speaker, and the current fed into it, but a little perseverance will produce the desired results.

Owing to the fact that a small pool of mercury is placed on the rubber diaphragm, it will be necessary to make a slight depression in the centre. This can be done by fixing a small iron weight in the centre.

The Cabinet

This is constructed of plywood with a three-quarter inch soft-wood base. The window in the front is cut out with a fret-saw and provided with ground glass. The images of the sound waves are more powerful the source of light the better.

The Angle of the Mirrors

It will be necessary to do a little adjusting to make the device function correctly. When arranging the mirrors at the correct angle it should be borne in mind that the angle of incidence is always equal to the angle of reflection.

Matters will be helped a little if the inside of the cabinet is painted with dull black paint. The unit (which may, incidentally, consist of an old diaphragm type telephone earpiece, should be connected to the output terminals of the receiver in the normal manner, when the Voxometer can be used with either radio or gramophone music. More pleasing effects will be obtained if the Voxometer is situated in a dark corner of the room.
**MARVELS of the CINEMA ORGAN**

You may often have wondered how the modern cinema organ is able to reproduce such a wide variety of instrumental effects—the drums, saxophones, violin, pipes, flute, and so on. This important article explains by means of valuable and hitherto unpublished diagrams, as well as lucid text, the principles of this modern adjunct to the talkies.

Other interesting features include: Guiding Aircraft by Wireless, How Maps are Made, Pearl Diving, Building a Model Petrol Engine, How to Bind Periodicals at Home, the Machine-gun Camera, a Garden Railway, etc.

**PRACTICAL MECHANICS**

ON SALE AT ALL NEWSAGENTS AND BOOKSTALLS,
or by post 7d. from George Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.
The Choice of a Detector Valve is Explained in Simple Language in this Second Article of the Series

The three characteristics just mentioned are those which are most important in making a choice of a valve for any particular circuit arrangement, so that we can consider all five valves in the light of these essentials.

### TECHNICAL DATA:

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Filament Voltage</th>
<th>Filament Current (amps)</th>
<th>Filament Power (watts)</th>
<th>Impedance (ohms)</th>
<th>Amplification Factor</th>
<th>Mutual Conductance</th>
<th>Maximum Anode Voltage</th>
<th>Grid Bias for 150 Anode Volts</th>
<th>Anode Current for 150</th>
<th>Anode Volts with 4.5 volts</th>
<th>Grid Bias (average)</th>
<th>Normal Anode Working Voltage (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSSOR 210 R.C.</td>
<td>2 volts</td>
<td>0.4</td>
<td>0.16</td>
<td>50,000</td>
<td>40</td>
<td>8 m.a.</td>
<td>150</td>
<td>1.5 v.</td>
<td>150</td>
<td>4.5 volts</td>
<td>85 m.a.</td>
<td>120</td>
</tr>
<tr>
<td>COSSOR 210 H.F.</td>
<td>2 volts</td>
<td>0.4</td>
<td>0.16</td>
<td>22,000</td>
<td>24</td>
<td>1.1 m.a./v.</td>
<td>150</td>
<td>3 v.</td>
<td>150</td>
<td>4.5 volts</td>
<td>1.6 m.a.</td>
<td>50-120</td>
</tr>
<tr>
<td>COSSOR 210 L.F.</td>
<td>3 volts</td>
<td>0.4</td>
<td>0.16</td>
<td>10,000</td>
<td>14</td>
<td>1.4 m.a./v.</td>
<td>150</td>
<td>3 v.</td>
<td>150</td>
<td>4.5 volts</td>
<td>1.6 m.a.</td>
<td>50-120</td>
</tr>
<tr>
<td>COSSOR 210 DET.</td>
<td>2 volts</td>
<td>0.4</td>
<td>0.16</td>
<td>13,000</td>
<td>15</td>
<td>1.15 m.a./v.</td>
<td>150</td>
<td>4.5 volts</td>
<td>150</td>
<td>4.5 volts</td>
<td>4.8 m.a.</td>
<td>100-120</td>
</tr>
<tr>
<td>Anode</td>
<td>50-90</td>
<td>100-150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This illustration shows the electrode assembly of a modern battery valve.

The maximum output from a valve, the load impedance, connected to its anode circuit should be of some fairly critical value. In the case of power valves the optimum load is usually stated, but for other three-electrode valves whose impedance is greater than about 7,000 ohms such a figure is not generally given and the value of the load is not quite so critical. Nevertheless, the anode-circuit impedance is important and should not be less than twice the impedance of the valve.

### Difficulties of High Impedance

To obtain an impedance of 100,000 ohms it is practically essential to employ a fixed resistance, since it is a very difficult and expensive matter to construct an L.F. transformer with a primary inductance sufficiently high to present so great an impedance. The use of such a high resistance presents another difficulty, though, because it causes a considerable drop in voltage; taking the average anode current with a voltage of 75 between the anode and filament as being 3 milliamperes, the resistance causes a voltage drop of 50 ohms. This means that, in order to get 75 volts on the anode, a battery voltage of at least 150 (allowing 25 volts drop across the decoupling resistance) must be employed. Even with such a voltage available, the actual amplification factor could not be expected to be more than about two-thirds of the maximum. Summing up, it can be stated that a valve such as the 210 R.C. is most suitable only in a receiver which has an ample supply of H.F. voltage, where the input voltage to the detector is low (not more than one preceding H.F. valve), and where resistance coupling is used between the detector and the following valve.

Turning again to the other end of the range, it will be seen that the 210 L.F. is best for use in a receiver having an appreciable amount of H.F. amplification and employing transformer coupling. This
Another Useful Switch

HERE is a type of aerial earthing switch which I have made and found very satisfactory. Most of the parts required can be found in the junk box. First, scribe a circle from the centre of the ebonite and mark off the three spaces at the top and bottom of the circle to take the six studs which are sunk flush in the ebonite. Four more studs are required, which are bolted to the small square piece of ebonite, a hole being drilled in the centre of this piece to take the spindle, which is secured each side with nuts, after which a knob can be screwed on. The hole in the centre of the base piece is drilled large enough to take the bush from an old variable condenser, which makes a good fit for the spindle; it is then pushed through, and a small spring put over the end and locked with double nuts. The switch is shown in the "on" position, the dotted lines indicating the "off" position, in which the set is completely disconnected at back of the baseboard. The switch is shown in the "on" position, the dotted lines indicating the "off" position, in which the set is completely isolated from the aerial and earth. The connections at back of the baseboard are made with strip copper or brass. Two stops are also fitted, as indicated in the drawing, so that the switch cannot go beyond the "on" and "off" position. Although there are six contact studs only five are used.—B. KNAPP (Newport, I.O.W.)

A Resistance Box

THE accompanying diagram explains fairly well how this useful gadget is made. It consists of three (or more) resistances fastened to sockets in a small piece of wood supported on battens. The connections on underside of base shown thus:

- Ebonite Base 3½" x 3½" x 3/4". Soldered on Aerial Switch Board A, Ebonite box 1½" x 1½" x 1½" Switch Arms.

Details of construction:

- To Set
- To Earth
- Slide Soldered to Switch Arm

A novel pocket station log.

If the reader already has a station log he can now fill in the stations in their respective places, or they can be filled up later on.—ALEX. J. MASSON (Aberdeen).

An Aerial-Pulley Substitute

A GREAT drawback to the usual wheel pulley for an aerial is that the aerial wire is apt to come off the wheel and get wedged. A more efficient arrangement is to obtain a bent piece of steel tubing (a piece of old cycle handle-bar will do, and fix this to the mast, as shown in the sketch. The halliard can then be threaded through the tube and the aerial can then be pulled up or down without any fear of getting wedged, as in the case of a wheel pulley.—WALLACE HODGES (Bearwood).
SHORT-WAVE broadcast transmitters nowadays operate on various wavelengths, using different call signs according to the time of day and night. Whilst searching for them the beginner will no doubt tune in transmissions of quite a different nature which are apt to leave him guessing.

Ships, expeditions, and experimental and commercial telephony transmissions are frequently heard working to schedule or otherwise, and a working knowledge of some of them will undoubtedly increase the beginner's interest and provide additional scope for his activities.

**Ship-to-shore Stations**

First I propose to comment upon ship-to-shore stations, and others which operate at intervals to no definite or published schedules.

The wavelengths assigned to ships and the shore stations with whom they work are as follows: 7.57 metres, 67.87 metres, 38.58 metres, 24.33 metres, 22.50 metres, 33.93 metres, and 16.80 metres. The chief interest in listening to ships is the tests which are carried out during which the position of the ship is sometimes given by the operator. Plot this position on your map, listen for her the following day and plot the new position, and then measure the distance between the two.

Scanning around the wavelengths mentioned above you may hear a number of ships under various call signs. The following list will assist you to identify them:

- **VQJ P** - Queen of Bermuda.
- **BDL** - Bremen.
- **GDL** - Homeric.
- **GFY** - Majestic.
- **GMJ** - Empress of Britain.
- **GBQ** - Bremen.
- **BZG** - Bremen.
- **GLS** - Olympic.

Amongst the Italian ships you may hear are:

- **VQJ** - Conte Di Savoia.
- **RCL** - Rex.
- **PAL** - Europa.
- **DOAH** - Bremen.
- **DOBX** - Columbus.
- **DHRL** - New York.

The following shore stations work with the ships, Italian and German ships:

- **CGA** - Drummondville, Canada, 61.15 metres.
- **GBC** - Rugby, England, 60.26 metres.
- **GAA** - Montreal, 22.58 metres.
- **DAP** - Germany, 24.20 metres and 35.42 metres.

One of the pioneer shore stations in the ship 'phone service is WOO, which works with various nationalities on the following wavelengths: 17.00 metres, 23.36 metres, 35.02 metres, 63.13 metres.

The official Italian shore station is located at Caltano, Tuscany, Italy, and may often be heard calling the "Rex" and "Conte Rosso," using the call sign IAC on 16.80 metres, 35.80 metres, 45.10 metres.

German ships work regularly with their shore station DAF. The latter using wavelengths of 17.37 metres, 24.20 metres, 35.42 metres.

When listening to ships, make a note of the call signs heard, also the station they are working. A quick search over the assigned wavelengths often results in picking up the other transmission.

Another ship is the four-masted schooner "Seth Parker," behind which lays an interesting story. Phillip H. Lord, the American radio star, is the owner and is realising his boyhood ambition by sailing around the world.

The schooner is fitted with radiophone apparatus and has a coverage of 17.54 metres to 51.55 metres. Listen for the call sign KNIV on 14 metres, 17 metres, 24.30 metres, 25.36 metres, 23 metres, 18.05 metres, and 31.29 metres.

KZG, one of the Byrd Expedition stations, may be heard direct on these wavelengths. The above is Real DX and is worth tuning for, as the "Seth Parker" will be more or less constantly on the move. One kw is the power used.

**Africa**

A commercial telephone is operating at Cape Town S.C., using the call sign Z8B. The writer heard this station operating on 33 metres some time ago.

**America**

The beginner usually wishes to hear one or more American stations. If you are able to listen during the afternoons, W3XAL, on 16.87 metres, between 3 p.m. and 4 p.m., is worth trying for and almost sure to be received. Another ship working is W3XAL, using the call sign KZG on 17.29 metres.

This station daily during November at 7-05 A.M., also in the evenings on the o-v-2 receiver. If you hear this station, make a note of the various items and address your reports to W3XAL, 30, Rockefeller Plaza, New York, N.Y., U.S.A. Use an International Postal Reply coupon with every report and send to stations abroad, and thus make sure of receiving verification. I do not propose to comment upon the better-known transmitting shore stations which schedules are available, such as W3XAL, W2XAD, etc.

W2XL is a most interesting American transmitter, and the most powerful, so far as reception over here is concerned, that the writer has ever heard with absolutely no fading.

W2XL does not appear to work to a definite schedule. If, however, you read in the daily press of a disaster to American aircraft, ship or the like, tune around 16.80 metres, or you will probably hear W2XL contacting with various portable transmitters right on the spot.

**Japan**

The Japanese language is rather difficult to recognise, and it is probable that amongst the stations you have logged as unidentified you may find a number of Japanese origin. The writer has received a number of Japanese transmissions during which announcements were made in English. One of them is JVH, 20.55 metres, which has been heard at 14.00 p.m. working with PH, Holland. JVH is located at Kominakowo Chichis Ken, and it is possible to receive these transmissions at good headphone strength on an average two-valve receiver between 9.30 p.m. and 1.30 a.m.

Other Japanese stations are JVM (27.93 metres), between 6.00 a.m. and 12 noon, sometimes later; JVT (10.03 metres), JVE (19.15 metres), JVO (40.16 metres), and JVE (40.70 metres). There are, of course, a number of others working experimentally on various wavelengths.

**Canada**

The Canadian Marconi Company appear to have a number of experimental transmitters working, so do not be surprised to hear Montreal calling one of the Rugby group on position R. Station CGA3, on 23 metres, working GMBJ, "Empress of Britain," and other ships, is one of them, and may be heard owing to the rugby schedules, so keep an ear open for such chance transmissions, which are often very interesting.

Much confusion is caused by jumping to conclusions concerning the reception of various Rocky Point transmitters. Most lists show about a fraction of the transmitters located at this place. There are, it is reported, between seventy and eighty transmitters, and experimental transmissions are nearly always on the air using various wavelengths. WTR (43.29 metres), WFT (31.08 metres), WQW (29.20 metres) are just a few heard to date. You may hear them working at intervals on position R. Point, and of course, scrambled or inverted speed.

It is common nowadays for American locating short-wave stations, also commercial, to contact ships and Japanese ships during the early mornings from about 2.00 a.m. to 11 a.m., arranging relay schedules, so keep an ear open for such chance transmissions, which are often very interesting.
THE EASY ROAD TO RADIO.

THE BEGINNER'S SUPPLEMENT

THE CORRECT USE OF ELIMINATORS

Many Users Fail to Obtain the Full Advantage of their Eliminators. This Article Stresses Many Points which Should be Watched.

Owners of battery-operated sets who live in houses wired for electric light can avoid all the troubles and much of the expense attaching to the use of high-tension batteries by employing a high-tension battery eliminator, or "mains unit." The price of a factory-made eliminator is, of course, greater than that of a high-tension battery—but the eliminator has years of life, whereas the battery must be renewed at fairly frequent intervals. If, however, first cost is an obstacle, it is a simple matter to make your own eliminator, and suitable designs are published in Practical Wireless from time to time.

Two Designs

For the benefit of newcomers to radio, it must be explained that there are two kinds of eliminator—one suitable for use on direct-current mains and the other for A.C. mains. The direct-current eliminator is the simpler and consists merely of "what is called a "smoothing circuit," which is an arrangement of choke and condensers, which removes the inequalities or "ripples" which exist in the mains voltage and thus renders the supply sufficiently steady for high-tension purposes.

If your district has alternating-current mains, however, the unit must be of the other type, which includes some form of "rectifier" for converting the alternating current to direct current before it is passed to the smoothing circuit. The rectifier may be either of the metal-oxide or valve type.

It is not intended to delve into the design of eliminators in this article, but to indicate the way in which the listener, having provided himself with a suitable unit, can utilise it to the best possible advantage. Before doing so, however, attention is drawn to the two diagrams given in Figs. 1 and 2, which show the internal connections of a D.C. and an A.C. mains unit respectively. It will be observed that these connections give a device which differs from a high-tension battery in this respect, that whereas the battery is usually "tapped" at various points so that different lower voltages can be obtained for different valves, the diagrams show output terminals giving one H.T. voltage only. However, most commercial units are provided with some form of voltage divider which enables intermediate values to be obtained, and it is a simple matter when constructing one's own unit to provide either fixed or variable "tappings" by means of voltage-dropping resistances or potentiometers.

Proper Rating

Now for the question of how best to operate an eliminator. Of course, it is quite possible to connect it up in place of the original high-tension battery and let it go at that. Reception will certainly be satisfactory, and probably better than when the battery was used. But a little thought and arrangement will ensure infinitely better results.

In the first place, examine the number plate attached to your eliminator, or the description of the unit if it is made to a published circuit. Somewhere it will be stated what output the unit is rated to give. This will be so many milliamperes at so many volts—for example, 25 milliamps at 150 volts, is a very common rating.

Despite this, if a greater current than 25 milliamps is drawn, the voltage will fall a little below 150 volts, and, conversely, if the full 25 milliamps are not drawn, the voltage will rise above 150 volts.

The next thing to do is to find out exactly what high-tension current your receiver takes when connected to a 150 volts H.T. This information can be computed from the valve-maker's data, but as the exact figures depend very much upon the actual working conditions in the set, it will be better to measure the total high-tension drain with a milliammeter, which should be connected in the common high-tension circuit, preferably between the H.T. — terminal of the set and the negative terminal of the high-tension supply. The method of taking this measurement is explained in the article in this issue entitled "Half-hour Experiments."
If, as is most likely, the total high-tension output of your set is well under the rated current of the eliminator, you can be sure of obtaining the full rated high-tension voltage and a little over. It is not likely that the voltage rise will be serious enough to harm the valves, for modern valves are always rated to operate on 150 volts at the anode, and the various components connected in the anode circuits of the valves always account for a certain voltage drop.

Using the Full Output

However, assuming that you have ample current to spare—say your set takes only 10 milliamps and your eliminator can go up to 25—it is worth considering whether you might not make use of the full rated output. One way of doing this, with excellent results in improved performance, is to substitute agood super-power output valve in place of the small power type fitted in so many sets.

The modern set with one or more high-frequency stages or their equivalent in intermediate-frequency amplification, is usually well able to load up a super-power valve, and a valve of this type is not generally fitted to sets merely because it requires approximately 10 to 15 milliamps of H.T. compared with the 5 or 6 taken by a smaller valve.

A Critical Voltage

The next stage in adjusting your set to work at maximum efficiency with a battery eliminator is to switch on the set and to take measurements of the high-tension voltage at the anode of each valve, and at the screens of each screen-grid or screened pentode valve. Provided the anode voltage in each case does not exceed 150 volts by more than a few volts, all will be well, except in the case of the detector valve. This has perhaps been running at 60 volts or even less, and the increased voltage obtained from the eliminator will have the result of rendering the reaction force of such a control is fitted. If an adjustable tapping is provided on your eliminator, this should be adjusted until reaction control is smooth. At the same time, it may be necessary to adjust screen voltages to the maker's recommended values, and lastly, high-bias voltages to all valves should be checked up against the corresponding anode voltages, and adjusted if necessary.

As already stated, if a variable tapping is fitted to the unit, this should be used for the detector, which is the only valve in the set requiring critical anode adjustment. But in view of the fact that an eliminator, particularly an A.C. mains unit, has a rather higher resistance than a good hightension battery, it is very important to provide suitable decoupling in the various anode and screen circuits. It is for this reason that it is preferable to make an eliminator with only one H.T. positive terminal, and to supply the various valves with high-tension through separate voltage-dropping resistances, which also serve as decoupling.

Suitable Decoupling

The next stage in adjusting your set is to take measurements of the high-tension voltage at the anode of each valve, and at the screens of each screen-grid or screened pentode valve. Provided the anode voltage in each case does not exceed 150 volts by more than a few volts, all will be well, except in the case of the detector valve. This has perhaps been running at 60 volts or even less, and the increased voltage obtained from the eliminator will have the result of rendering the reaction force of such a control is fitted. If an adjustable tapping is provided on your eliminator, this should be adjusted until reaction control is smooth. At the same time, it may be necessary to adjust screen voltages to the maker's recommended values, and lastly, high-bias voltages to all valves should be checked up against the corresponding anode voltages, and adjusted if necessary.

A Final Point

As already mentioned, you will probably have a few volts to spare, so why not utilise them for automatic bias? The method is quite simple. Fig. 4 gives the connections for automatic bias to the output valve only, and it will be seen that all that is required is a fixed resistance connected between the negative terminal of the H.T. supply and the negative L.T. terminal. A condenser, of say, 1 or 2 microfarads may be connected in parallel with the biasing resistance if required, but is not always necessary. The value of the bias resistance is calculated exactly as for a voltage-dropping resistance, except that in this case the current value to be used must be the total high-tension current for the receiver.

Subject to these adjustments, the set will really give of its best. Improvement will be due to several causes; the various valves being fed with their full high-tension voltage will give maximum amplification. The output valve will give its full rated output and distortion will be reduced. Moreover, performance will be consistently good, because there will not be the continuous deterioration of H.T. supply which always occurs with a battery.
SUPPLEMENT TO "PRACTICAL WIRELESS"

AMATEUR TELEVISION

A CONTINENTAL SCANNING SUGGESTION

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

A RMBED with the idea that ultimately the public will wish to receive television images possessing definition detail in excess of the present thirty-line B.B.C. service, many workers in the science have turned their attention to the development of methods which can give the increased number of scanning lines with reasonably straightforward adaptation of existing mechanical devices. Little success seems to have rewarded the efforts so far, but there is one idea emanating from the continent which appears to possess a germ of possibility.

The arrangement first came to light when an inventor wished to use sixty-line scanning with a drum receiver, and yet avoid the necessarily large bulk and high cost of a sixty-mirrored drum because of its extremely accurate mirror positioning. It was therefore decided to use a ten-mirrored drum in conjunction with a system of six fixed mirrors, and the proposed method is shown in simple schematic form in Fig. 1. The optical analyser, as it is called, is stated to be capable of giving images of even higher definition, but this seems questionable at the moment.

First of all, the modulated beam of light from a crater-type neon lamp, or a commercial form of Kerr cell, is focused by one or more lenses on to the revolving drum with its individual mirrors set round the periphery at the correct angles one to the other. The ray or beam of light reflected from, say, mirror a is not thrown directly to the transmissive viewing screen but meets the first mirror of a series of six fixed ones as indicated.

Method of Operation

During the course of the travel of the drum mirror a the beam moves across this first fixed mirror and so describes a horizontal or vertical (depending upon whether the transmitter exploration analysis is carried out horizontally or vertically) line on an adjacent screen from the ray reflected from this mirror.

With the modulated beam still impinging on mirror a the ray next meets the second mirror, which is inclined slightly with reference to the first mirror, and hence brings about a slight realignment of the beam so as to describe a second scanning line adjacent to the first. This light beam traversal is so arranged that it impinges on each of the separately inclined six mirrors during the whole of the time that the modulated ray is in "contact" with mirror a on the drum. Thus for the partial revolution of a ten-mirrored drum (actually an angular rotation of 36 degrees) six separate and distinct scanning lines, side by side, have been described on the screen.

When mirror b now takes charge of the light beam from the modulated source, it performs an identical operation to mirror a and a further six lines are scanned on the screen. At the end of one revolution of the ten-mirrored drum, sixty lines have been traced, and the process then repeats itself again, continuing this at a rate depending entirely on the speed with which the drum is revolved by its coupled motor.

Objections

One very prime difficulty which seems to suggest itself is that the ultimate picture ratio of the received image traced out in this way is very prone to be quite different from that which is intended. Then, again, the optical focusing is more complicated, due to the additional mirrors required, while the fact that additional light reflections are introduced in the receiving apparatus entails a loss of light which is sure to affect seriously the brilliance of the received image.

Although the work and cost of making the mirrored drum is simplified, there is the extra complication of the set of six fixed mirrors, the individual setting of which is not an easy matter. Finally, if the optical path of any one of the double-reflected rays is traced out it will be found that if it is in focus at the centre of its path across the screen, it will be very much out of focus at the extremities. The result of this is the production of a scanning field which is misshapen, often trapezoidal and rectangular, as should be the case if undistorted images are to be secured.

The idea, however, is not one which can be wholly discarded, and it is conceivable that mirrors with reflecting surfaces of definite curvature may in some measure assist in overcoming some of the objections which have been cited.

ANOTHER MOTOR SPEED CORRECTING DEVICE

A N absence or a reduction of "hunting" or "floating" in the received image is the aim of all television enthusiasts, and in the columns of this journal many ideas have been put forward to render assistance in this connection. These number which have been tried from time to time, however, is in no way exhausted, and the arrangement shown in Fig. 2 is yet another suggestion which might appeal to those who care to experiment with their apparatus. Many automatic devices which depend on the utilisation of the synchronising signal, which is included in the radiated television image signal, function in rather an erratic manner when beyond the normal service range of the London National transmitter. This is because of the signal fading, and even when some form of automatic volume control is included in the radio set, at least in so far as the modulation fed to the synchronising device is concerned, continual re-framing and re-phasing becomes necessary.

With the present B.B.C. transmissions, new mains installation arrangements have been made to ensure good locking with the scanning mirror drum, and it is therefore necessary to devise some means whereby fluctuations which occur in the mains feeding the receiver motor are compensated.

The Device Explained

Reverting to Fig. 2, an ordinary scanning disc is shown being driven by a universal type motor, which can be supplied from the A.C. mains, and be speed controlled with the aid of a variable resistance R1. If preferred, this resistance can be made up from a coarse and fine resistance control but that is a detail which the constructor can settle for himself. On the motor shaft there is a shaft that is integral with
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AMATEUR TELEVISION

ANOTHER MOTOR SPEED CORRECTING DEVICE
(Continued from previous page)

the drive is mounted on a toothed wheel
or rotor which can really have any over-
slip number of teeth, without affect-
ing the right balance of the motor.
the trial, eight has been found quite a satisfac-
tory number.

This wheel rotates between a pair of
magnets thus providing the means of
controlling the speed of the machine.

The winds of these
electro mags are fed from an eliminator,
which derives its A.C. feed from the same
means to which the rectifier is con-
nectioned.
The eliminator is a quite standard in charac-
ter, the rectifying valve being of the
D.W. type, rated at 60 milliamperes at
500 volts.

Across the smoothed rectifier
is joined the pair of magnets, the coil
windings of these magnets being connected in
series to give a good south pole.

Since the 'air gap between the pole
and pole piece faces is the minimum
possible, while the wheel itself can be
quite light, say 2lb., and small, say 4in.
If the field chisels are home made, then
a satisfactory number of turns for each will be
5,000, using No. 37 S.W.G. enamelled wire.

A Simple Action

To operate this device, the motor speed
should be adjusted by means of the resis-
tance $R_1$, so that it is slightly above
the correct value of 750 revolutions per minute.

Then alter the potentiometer $R_2$ when
the wave is directly across the output of
the receiver so that this is just sufficient
current passing through the electro magnets
to produce a magnetic braking action on the
toothed rotor and bring the motor speed to the correct value.

If, now, a fluctuation in the mains volt-
gage brings about a slight reduction in voltage,
the motor speed will tend to drop.

The extent of the magnetic braking action
reduces at the same time, however, owing to
the reducing factor of the south pole, and the
two effects will counter-balance when the
adjustments have been made correctly.

Similarly, if the voltage of the mains rises,
then the tendency for motor speect to
drop will be nullified by the increased
magnetic braking action.

A few trials will
do not have to be made to ascertain just
the right balancing between $R_1$ and
$R_2$, but once this has been settled the de-
vice will function satisfactorily provided the
transmitter motor maintains a correct speed.

The eliminator is a very standard in charac-
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the wave is directly across the output of
the receiver so that this is just sufficient
current passing through the electro magnets
to produce a magnetic braking action on the
toothed rotor and bring the motor speed to the correct value.

If, now, a fluctuation in the mains volt-
gage brings about a slight reduction in voltage,
the motor speed will tend to drop.

The extent of the magnetic braking action
reduces at the same time, however, owing to
the reducing factor of the south pole, and the
two effects will counter-balance when the
adjustments have been made correctly.

Similarly, if the voltage of the mains rises,
then the tendency for motor speect to
drop will be nullified by the increased
magnetic braking action.

A few trials will
do not have to be made to ascertain just
the right balancing between $R_1$ and
$R_2$, but once this has been settled the de-
vice will function satisfactorily provided the
transmitter motor maintains a correct speed.

The eliminator is a very standard in charac-
ter, the rectifying valve being of the
D.W. type, rated at 60 milliamperes at
500 volts.

Across the smoothed rectifier
is joined the pair of magnets, the coil
windings of these magnets being connected in
series to give a good south pole.

Since the 'air gap between the pole
and pole piece faces is the minimum
possible, while the wheel itself can be
quite light, say 2lb., and small, say 4in.
If the field chisels are home made, then
a satisfactory number of turns for each will be
5,000, using No. 37 S.W.G. enamelled wire.

A Simple Action

To operate this device, the motor speed
should be adjusted by means of the resis-
tance $R_1$, so that it is slightly above
the correct value of 750 revolutions per minute.

Then alter the potentiometer $R_2$ when
the wave is directly across the output of
the receiver so that this is just sufficient
current passing through the electro magnets
to produce a magnetic braking action on the
toothed rotor and bring the motor speed to the correct value.

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transmitter motor maintains a correct speed.
A three-quarter front view of the Amplion receiver, showing the simple knob layout and the attractive appearance of the cabinet.

The Amplion Radiolux Superhet
A Five-Valve All-Electric Superhet Table Model

ONE of many interesting features of the Amplion A.C. Radiolux Superhet Receiver is the neon tuning device fitted above the tuning scale. This indicates faithfully when a station is correctly tuned in, by the fact that the length of the glow in the neon lamp is then fully extended. The set incorporates every modern device, the latest valves, knife-edge selectivity, and a minimum number of controls. A comprehensive specification is included in the panel printed on this page. Definitely an ideal set for even the most exacting wireless enthusiast, it is nevertheless very moderately priced.

The Set Tested
On test, a considerable number of stations was heard on both long and medium waves at good loud-speaker strength. Selectivity was exceedingly high, and second-channel whistles were entirely absent. On rotating the tuning knob it was found that background noises were very loud between stations, thus showing the high amplification of which the set is capable, but immediately a signal was tuned in the background disappeared, leaving the signal clear and interference-free.

Constructional Details
The set is enclosed in a well-made walnut cabinet of the conventional table type which has been designed to prevent "boom" and box-resonance. The Amplion speaker is fitted above the receiver. The internal speaker may be suitable for use in districts surrounding high-power stations, such as Droitwich. The latest type of octode frequency-changer has been employed in the second stage, being coupled to the second detector by a high-efficiency L.F. transformer. The second detector circuit which has been usually found difficult to balance has been specially designed, and the unique method employed ensures a pure signal being delivered to the output stage. A recent development in pentodevalve design is incorporated in the output stage and allows for an undistorted output of three watts. Volume control is effected by controlling the first stage gain by use of a potentiometer which incorporates the mains on-off switch.

SPECIFICATION IN BRIEF
RECEIVER: Amplion Radiolux 5-valve superhet. A.C. table model.
MAKERS: Amplion (1932) Ltd.
PRICE: 12 guineas. A.C. mains 110 or 190/265 volts, 40/100 cycles.

The circuit diagram which incorporates a number of novel features as described above.
**IMPRESSIONS ON THE WAX**

**REVIEWS OF THE LATEST RECORDS**

By T. ONEARM

**TWO** brilliant little novelties from the Orchestre Raymonde appear in the Columbia list this month. "Glow Worm" is familiar to most, and here it is the light-hearted treatment and innumerable instrumental touches that stamp it as a refreshingly different interpretation. "Indian Mail" is an impression of an Indian mail train, and here again the orchestra excels in instrumental effects, the bumble of Oriental life mingleing with the sounds associated with the great roaming locomotive being cleverly done. This record is Columbia DB1467, and you should certainly hear this disc.

Turner Layton (of Layton and Johnstone) is one of the most accomplished artists in variety. As pianist and baritone in the famous duo he is, of course, well known, but he will soon have his singing in several languages, notably French. He sings in this language on Columbia DB1470.

"There's No More You Can Say" (Parlophone, 18s. 6d., DB1465). A Parlophone record.

"Smoky Gets In Your Eyes." Malcom McEachern, who is known more widely as "Mr. Jetsam," of Flotsam and Jetsam fame, sings two fine songs this month on Columbia DB1465. They are the "Cobblers' Song from 'Chu Chin Chow," and Mendelssohn's "I'm a Roamer."

In the first we have the well-known philosophic song of the cobbler who estimates the world by its tread, while the other is a very difficult song to render. These titles constitute a fresh triumph for the redoubtable "Mr. Jetsam." I can specially recommend this record to readers.

**Regal Zonophone Records**

An exceptionally fine record appears in the above Company's list for this month, on which readers will have the pleasure of hearing twenty-four selections from this Company's star records of 1934. The artists appearing on this record, which is Regal M1142, include: The Commodore Orchestra; Singing Mountaineers; Joe Loss and his Band; Billie Holiday; Arvon O'Connor; Scott Wood and his Orchestra; Shaw's Hawaiians; Humber and his Orchestra; Anona Winn; and the Broadway Bandits.


Hear this record without fail.

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**LET US SEND YOU THIS 28-PAGE BOOKLET—FREE**

It gives all particulars of various Courses that cover every phase of Radio work.

The Radio industry is progressing with amazing rapidity. Only by knowing thoroughly the basic principles can pace be kept with it. I.C.S. Instruction includes American broadcasting as well as British wireless practice. It is a modern education, covering every department of the industry.

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We will be pleased to send you details and free advice on any or all of these subjects. Just fill in, and post the coupon, or write in any other way.

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**SHORT WAVE MANUAL**

1935 EDDYSTONE SHORT WAVE MANUAL

**HITS ANY BATTERY SOCKET**


**PRICE** 1/6 Net.

**PRACTICAL TELEVISION**

6d. EVERY MONTH

Published by GEO. NEWNES, Ltd., 8-11, Southampton Street, Strand, W.C.2.
SUPPRESSING INTERFERENCE

The Research Department of Bellini and Co Ltd., have obviously devoted much care and preparation in the production of their newest illustrated booklet entitled "Cutting the Crackle out of Radio." Now in its fourth edition. Briefly, it is a description of the methods evolved by the Post Office and by engineers throughout the world for the tracing and suppression of electrical interference with broadcast reception, and includes the results of research work by the firm in question. The subject is developed from first principles, as the title of the first section indicates. This reads: "What is Electrical Interference?" and a clear and concise description follows. Step by step the reader is guided towards a clear understanding of everything that it is necessary for him to know—so being perhaps no great mathematician about interference. No one who takes more than a passing interest in wireless can fail to be immensely interested in the straightforward explanations set out, and, indeed, there can be few experts who will fail to be interested in the new points of view brought to his attention.

WILL'S Capstan Cigarettes

Flat Fifty Cardboard Box

2/5

Plain or Cork Tipped

Issued by The Imperial Tobacco Company (of Great Britain and Ireland), Limited.
A Synchronous Turntable.

The Simpson's synchronous electric turntable has already been most favourably commented upon in our columns. Our readers should make a note that British Radiogram are now the sole concessionaires for this product. It is fitted by means of a one-hole fixing device, and if a clockwork machine is already possessed this may be removed and the new motor easily fitted in its place, using the existing clearance hole for the spindle. It may, of course, only be used on A.C. mains. The synchronous motor is very compact, therefore taking up remarkably little space beneath the motor-board. The price has been fixed at two guineas in either 10in., or 12in. sizes, being suitable in both cases for either 200 to 250-volt mains or 100 to 150-volt mains of 60 cycles. The appropriate voltage should be specified when ordering. In operation, the turntable maintains the correct and constant speed of 78 r.p.m., current consumption being 5 watts. Sturdy and workmanlike in every detail of construction, it is perfectly noiseless when running. Beyond very occasional oiling of the centre bush no maintenance is required. A means of adjustment for wear is provided. This thoroughly-to-be-recommended turntable may be obtained on hire-purchase terms, if desired, from the well-known firm of Peto-Scott.

Sixty-shilling Television Kit

Construction has been reduced to simplest terms in the Mervyn sixty-shilling kit, the makers having gone so far as to drill the fixing holes in the wooden base, which is furthermore of skeleton construction, thus avoiding the necessity for cutting the long slot through which the disc projects. A Mervyn series-wound motor, a 151in., scanning disc, a motor control and series resistance, a pair of motor supports, a “Nu-glo” lamp and holder, and two pairs of terminals, mounts, screws, connecting wire, etc., are all provided. The motor is of sound construction, with capped bearings, and runs smoothly without shake or tremble. The commutator is nicely finished and should give no trouble. Adjustable carbon brushes are provided. The disc is of sheet-aluminium, giving no trouble from whip or wobble, and the slight increase of weight, due to the fact that no part has been cut away is unnoticeable. The whole of the surface of the disc facing the operator is finished in “camera black.” The holes are cleanly cut, and a brass bush of the single-screw locking type is firmly attached to the centre. To support the motor, two sheet-steel supports are employed, and as these are finished in blue, there is no amateurish rough-assembly appearance, and it is not essential to employ a cabinet. Full instructions are enclosed to enable the amateur to put the parts together, including hints on adjusting the apparatus to obtain best results.

The neon lamp is of unusual construction, having a flat metal plate with fine wire mesh backing it, a metal frame intervening. Thus it is possible to use either type according to individual requirements. The current required for each single electrode is 30 milliamperes, but when both are connected the current consumption is 55 milliamperes. The makers are Mervyn Sound and Vision Co., Ltd., 4, Holborn Place, London, W.C.1.

Valve-test Adapters

ILLUSTRATED on this page is the latest Pifco product, distribution of which has already commenced in large quantities, so that by the time this brief description appears in print supplies will no doubt be already available to the public through any good-class radio dealer. Taking the form of a set of five-to-five, to-seven, and to-nine socket adapters for use in testing all five, seven, and nine-pin valves in conjunction with the well-known Pifco range of patented radio-testing instruments, this new product will be found a most useful addition to the experimenter’s existing testing equipment. The illustration shows one of these sets made in black bakelite, suitably mounted with nickel-plated fittings, and supplied in a velvet-lined box. The purpose of these adapters is to test quickly the grid and anode circuits of various types of valve in conjunction with either the Pifco Rotameter-de-Luxe, the Pifco Standard Rotameter, or the Pifco Radiometer. Serious experimenters and also service men will find them particularly useful. The price has been fixed, we understand, at 10s. for the complete set as described above.
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).

The £5 Superhet with Class B

Sir,—I write to let you know that I am still just as delighted as ever with the £5 Superhet, which I constructed according to your suggestion on page 391. Desiring to use the set for gramophone records, however, and having a class B stage available, I am now using class B as the output stage of both radio and gramophone, getting an output of some 3 watts with the Mazda PD220A. You may be very interested, if not surprised, to hear that no decoupling of any kind beyond that shown in your wiring diagram—almost nothing—has been found necessary with class B—even at full volume on the set.

The set was, and is, exactly what I required in every way, and, as I have previously stated, I have never yet heard in any periodical anywhere a such a neat and efficient and up-to-date-in-every-way little set, and I congratulate you on the evolution of its design.

In conclusion I would say I am now a regular reader, and find your paper absorbing interest, and would take this opportunity of thanking you.—A. E. Holdaway (Clapham, S.W.4).

[These coils, of course should be as stated in the specification in the issue referred to. —ED.]

A High-class Receiver Wanted

Sir,—In Practical Wireless dated December 8th you asked if any other reader was interested in a receiver having a two H.P. stage, A.V.C., push-pull output, band-pass tuning, tuning indicator, and an output of from 4 to 6 watts. It is the type of circuit I should very much like to see described in Practical Wireless.—G. Boxall (Petworth).

Modifying the “Fury Four”

Sir,—We notice in your issue of December 15th, on page 502, regarding the “Fury Four” receiver that a printer’s error has crept in. You actually recommended Colvern G1, 2 and 3 coils for this circuit, whereas G10, 14 and 13 should have been mentioned, vide your specification on page 905 of your issue of January 27th last.—E. S. Lancaster, for Colvern, Ltd.

[These coils, of course, should be as stated in the specification in the issue referred to. —ED.]

Wet H.T. Batteries

Sir,—On page 489 of issue of December 15th, and under the heading “Facts and Figures,” you write (in connection with wet H.T. batteries): their messiness and the constant attention which is required in order to keep them ‘topped up.’

Well, my practical experience of these cells does not agree with that verdict.

My last battery was installed on July 18th, 1932, and remained absolutely untouched until December 19th, 1933; it had given over 1,500 hours’ service to that date, and the effective voltage per cell was still over one volt (1.05 v.), the outside of each cell was dry and clean with no signs of “creeping salts,” and there had been any evaporation at all it was not noticeable.

The battery was re-made on December 19th, and from that day to this has not been interfered with in any way. The cells, as before, are perfectly dry and clean, and the level of the liquid is practically unaltered. A T.T. battery installed on October 27th this year is giving every satisfaction.—C. W. Bernard (Ballycastle, Co. Antrim).

“An Excellent Work”

Sir,—I received my copy of the “Television and Short-wave Handbook” about a week ago, and have found time to examine it. I have much pleasure in voting it a very excellent work indeed. Like its predecessors, it is just what every amateur has been wanting for a very long time. Again, thank you!—James D. Menzies (S.W.19).

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Sir,—As a pioneer reader of Practical Wireless, I also would like to express my pleasure with the design for a short-wave superhet—H.F. “straight” set. My occupation is that of a radio engineer, and has been for the last two years. I have been waiting for the first popular short-wave boom the inventions I have received have outnumbered the attempts to give the public a good and efficient short-wave receiver.—Geo. Blany (Manchester).

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[These coils, of course, should be as stated in the specification in the issue referred to. —Ed.]

Cut this out each week

Do you know

- THAT an aperiodic H.F. stage forms the simplest method of increasing the range of a short wave receiver;
- THAT a good H.F. choke or a resistance (non-inductive) may be used in the aerial circuit of the above scheme;
- THAT when two L.F. stages are employed, the poorest one should be in the last stage;
- THAT the above arrangement avoids the amplification of signals which are not of good quality;
- THAT a good earth connection is essential in the case of mains receivers, especially those employing H.F. amplification;
- THAT a local-station "quality" receiver, with fixed tuning and remote control, is a good arrangement to adopt for household purposes, and leaves facilities for experiment on separate apparatus;
- THAT an aerial should always be isolated when used with a mains receiver.

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**Replies to Queries and Enquiries**

**A Long-range Receiver Wanted**

I have a fairly large cabinet of which I enucleate a three-dimensional sketch, and which was previously used to house a rather old-fashioned eight-valve receiver. As you will see, the depth of the cabinet from front to back is 7 inches; now, how do you suggest that I can build a modern receiver, capable of good long-distance reception, and would be pleased if you could refer me to any of your designs, for a suitable instrument. Also, would you please let me have a circuit and a list of parts required, advising me regarding the price of the above-naming blue print?—H. V. (London, N.W.2).

We regret to advise you that we have not described any receiver of the type you require that could be built into your cabinet. In consequence of this, it will be necessary either to design and make a set of your own, or to modify the cabinet, increasing the depth. As you will see from the Special Note printed on this page, we cannot undertake to supply constructional details for receivers which have not been described in *Practical Wireless*, and we are, therefore, unable to accede to your request. We would add, however, that if you are prepared to alter the cabinet the "£5 Superhet" described in the number of recent issues would be well suited to your requirements. This receiver was described in four forms, for battery, A.C., D.C., and universal-mains operation.

**A Three-valve Receiver**

Will you please advise me of the most suitable three-valve receiver for operating a moving-coil loud-speaker, and suitable for use with either dry H.T. batteries or an eliminator?—C. H. G. (Hillingdon).

Unfortunately, your request is very vague, since we could recommend numerous three-valve sets all of which would fit the requirements you specify. However, you desire to have a really high-class instrument, the "£5 Superhet" described in the issues of *Practical Wireless* dated October 27th, November 3rd and 17th would be most suitable. On the other hand, if price be a most important consideration, the "Hall-Mark Three" can strongly be recommended. This receiver was dealt with in the issues of *Practical Wireless* dated December 8th and 16th.

**A Good A.C. Set**

Would you please advise me if the "A.C. Leader Three" is capable of giving good reception of a fair number of stations and of operating a Blue Spot moving-coil loud-speaker?—D. V. (Oxford).

The receiver you mention will certainly do all that you require of it, presuming that the speaker is provided with a transformer for matching a mains power valve. As you do not state the exact type of speaker, we are unable to be more definite on this point.

**Radiogram Superhet**

"Would you please advise me as to a good six-valve battery radiogram, of up-to-date design and including such features as A.V.C.?"—M. C. (Chester). We have not described a receiver of the type you mention and therefore regret that we are unable to give the particulars you desire. At the same time we would point out that the "£5 Superhet Three" described in the issues of *Practical Wireless* dated October 27th, November 3rd and 17th with the addition of the class B unit described in the issue dated December 29th would be quite ideal for your purpose. This combination instrument will give extremely powerful reception of a large number of stations, besides giving ample volume on record reproduction. Automatic volume control can be added to the set by following the instructions given in the issue dated November 17th.

**Coil Connections**

"I recently bought a pair of dual-range coils and understood that a diagram of connections was given in the box. On opening the latter, however, I found that the diagram had been omitted. There is a name, presumably of the makers, on the box and the address: 'Deemark, London, S.E.8. Can you please advise me of the full address of the makers, so that I may write to them?'—B. K. (Newport, I.O.W.)."

We regret to advise you that we are unable to trace the makers of the coils from the details you give, and would, therefore, suggest that you inquire of the supplier.

**A G.B. Difficulty**

"Enclosed is the circuit of an H.F. unit which I have recently made for use in conjunction with my three-valve receiver. You will see that this grid bias is applied to the screen-grid valve from a small G.B. cell. The trouble is that after the set has been in use for a short time the G.B. cell is very warm and shows no voltage reading. Can you please tell me what is wrong?"—A. G. (Sheffield).

Your trouble is due to the G.B. cell being wrongly connected, and it is being short-circuited through the tuning coil. The load you show going from terminal 6 to earth should be broken" and a 0.1 mfd fixed condenser inserted.
PRACTICAL WIRELESS

RELAYABLE Intervale Transformers, 25; multi- 
ratio output transformers, 25; all with 2,000 volt 
working, 20/-.
OAK TOOLS: 0.0005, 2 Gangs, 3,000 ms., 500 m.d.
RHODES CONDENSERS, 0.0005, 2,000 m.d., 10/-.
MAVAGNA D.C. 125. 125 mms., 90/-.
H.T. 150 m.m.; 25, 50, 100, 200, 300 ohms, 1/-.
MAGNIAC, 25,-, 50, 100, 200, 300, 500, 1,000 ohms, 
2/-.
RELIABLE Canned Oils with Circuit accuracy 
values, 2/-.
POLAR star manufacturers’ model, 3-gang con- 
der transformers, 30/-.
DIAL TYPEody Condensers, 0.0005, fully 
screened, with trimmer, ball bearing 
insulation, 5/-.
VARLEY H.V. Intervale C0ns, 0.0005, choice of 
H.F. or mains working, 2/-.
SCREENED H.F. Condensers, one of the largest 
manufacturers’ output, listed 2/-.
PREMIER British-made Meters, iron, flush 
(Westinghouse, C.T., L.T., 25/6; L.T., D.C. 
model Truspeed, 106/250v., 47/6.
200-250v. Al... put Sy.
SPECIAL Offer of Wire-wound Resistances, 4 watts;
120/-; 2,000 ohm, 2/-.
ELLIOTT Moving-Coil Milliameters; projecting type, 
1,000, 1,500, 2,000 m.d., 20/-.
WESTINGHOUSE metal rectifier, condensers, 
amplifiers, transformers, 18/6.
REEL-MOUNTED D.C. rectifiers D.C. types, 20v. 18-amp., 
4/6.
FUSED Magnavox condensers, 0.0005, 2-gang 
1/-; 4 mfd., 3/-.
WESTINGHOUSE, 0.0005, 2-gang 6/6.
BRITISH RADIOPHONE two-gang condenser 
with trimmers, 60/-.
200-250v. 5 gang, 3/6.
ARMSTRONG Wireless, 2 gang, 3/-.
H.P. Transformers, 40v. 10, 150/-, 600/-.
ECONOMY 1,000, 1,500, 2,000 ohms, 1/6.
ECONOMY 2,000 ohm field, 15/-.
As above, but with 10in. cone.
FUSED Magnavox condensers, 0.0005, 2-gang, 
100/-; 2 mfd., 8/-.
U.K. G.P.O. Relays: A.C. with trickle charger, 2v., 4v. or 
3v. 4/6.
DUBLER or TOC dry electrolytic condensers 
values, listed 4/-.
SOUTHAY and Radio cabinets, by best 
makers.
WOBURN RADIO offer following 
sets... £5.
W.O.BURN RADIO offer following 
emarkets, complete with hum-bucking 
coils, output transformers, and 10/6. 
All with 2,500 or 5,000 ohms fields.
RECEIVERS: Mains Power transformers, 
A.C. type with Westinghouse 
A.C. model, 30/6.
RIEPER: Celebrated, dial light and drive, 4/-.
W.R.C. Eliminators: MM. 200 v. 25 ma., 3/-.
G.P.O. Relay, electro-magnet, 4d.
R.F. Cassette Receivers £2. 50/-.
W.R.C. Eliminators, 150 v. 25 ma. A.C. Model, 
20/6.
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WESTINGHOUSE Rectifiers, Manufacturers’ type; 
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British makers.
70/-.
MAGNAVox, complete with hum-bucking 
coils, output transformers, and 10/6.
All with 2,500 or 5,000 ohms fields.
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Condensers, 3.5 mfd. 300 volt D.C. working, 1/- each;

T.C.C. Condensers, 1 mfd. 450 volt D.C. working,

T:C.C. Condensers, 1 mfd. 600 volt D.C. working,

T.C.C. Condensers, 5 mfd. 900 volt D.C. working,

T.C.C. Condensers, 1 mfd. 450 volt D.C. working, 2/- each;

T.C.C. Condensers, 5 mfd. 900 volt D.C. working, 2/- each;

All Condensers, 4 mfd. 300 volt D.C. working, 2/- each;

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All Condensers, 8 mfd. 1500 volt D.C. working, 2/- each;

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