A NEW SUPERHET
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Cossor

OUTSTANDING selectivity is a feature of this new Cossor Superhet Receiver. Due to a special compensated Anti-Fading circuit stations on nearby wavelengths can be separated and held at even volume. Another important feature is the new 'THERMOMETER' TUNING

This is an exclusive Cossor development. Station names and wavelengths are instantly visible on an illuminated scale. As the tuning knob is turned a dark column rises or falls giving immediate and accurate tuning. Only the waveband actually in use is illuminated. Every worth-while development in Superhet practice has been incorporated. Now, for 11 guineas you can own a quality Superhet backed by Cossor—the pioneers of moderately-priced high-efficiency radio.


Please send me free of charge literature describing the new Cossor All-Electric Superhet Model 364.

L.143

Prices do not apply in I.F.S.
Rounding the World of Wireless

THE SILVER SOUVENIR!

Mr. F. J. Camm’s Latest Design

No reader needs to be reminded that this is Jubilee Year, in which His Majesty’s Silver Jubilee is celebrated. It is fitting that a journal such as PRACTICAL AND AMATEUR WIRELESS, which circulates among so many thousands of His Majesty’s subjects in all parts of the world, should signalise the event. This we shall do by publication of our new Souvenir series of receivers which have been specially designed by Mr. F. J. Camm to cater for the needs of every listener, no matter where he resides. Our readers will agree that Mr. F. J. Camm has produced many astonishingly successful receivers in the past, but none, in our opinion, equal to his latest—the SILVER SOUVENIR. Order next week’s copy now, for this issue will contain a fuller statement concerning his latest design.

Croydon Enthusiasts

There was an enthusiastic gathering of members of the Croydon Radio Society and the Thornton Heath Television and Short-Wave Society at St. Peter’s Hall, South Croydon, on Tuesday, March 12th, to hear Mr. F. J. Camm, Editor of PRACTICAL AND AMATEUR WIRELESS, lecture on the subject of “The Constructor and the Press.” The interest taken in the audience of the members of these two clubs. Well-organised and efficiently run clubs such as these are to be congratulated on the vast amount of work and good they do in the interests of amateur radio reception.

Television in Berlin

The German Reichsradiokanzlei proposes to open its regular television service at the end of March. The transmissions will be made from the Funkturm (Broadcasting Tower) at Witzleben, which was used as an aerial for the old Berlin station. They will be given three times weekly in the evening hours for a period of ninety minutes on 6.70 metres (vision) and 6.98 metres (speech).

State Interval Signals

The French P.T.T. in order to choose a series of interval signals for the capital and provincial stations, is recording the various suggestions put forward, and

all electrical appliances used in the household of New Jersey, the mains-fed wireless receiver only secured second place with 95.6 per cent. votes. Actually, it was beaten by the electric iron! In sequence, the electrical appliance came as under: iron, radio, sweeper, toaster, bells, and finally, the electric flapjack or waffle iron.

The Call of the Jungle

From British India comes the report that if an interval signal is required for the Calcutta or other broadcasting stations, it would be possible to use the trumpeting of a bull elephant or the growl of a tiger. Suitable records could be made for the various districts in which stations are to be installed.

Copying the B.B.C.

At the International Exhibition to be held this summer at Brussels (Belgium), the I.N.R. proposes to install a large broadcasting studio with a glass enclosed gallery to which the general public will be admitted. The programmes, in this way, will be heard both by loud-speaker and direct in the hall in order that comparisons may be made.

Canned Music Preferred

During the run of the recent radio exhibition at Belgrade (Yugoslavia), the authorities ascertained from visitors that of the items in the programmes, gramophone records were the most popular. Of the votes collected only 20 per cent. were in favour of “live” artists performing before the microphone.

Quality Group

Although the majority of U.S.A. broadcasting stations are comprised in the Columbia and N.B.C. networks, WOR, Newark (New Jersey), WLW and WGN, Chicago (Ill.) are the key transmitters of the new system calling itself the Quality Group. They now carry out an independent interchange of programmes.

Money for Jam!

A certain Continental station, the local station officials were recently accused of deducting the studio accounts with copyright fees or salaries paid to Beethoven, Mozart, and Chopin! Accountants from Moscow discovered the swindle with the result that the stuff was put under arrest.
ROUND the WORLD of WIRELESS (Continued)

"How Very Regional!"

In the Midland programme on April 1st is a mystery feature entitled "How Very Regional!" which is to be produced by Martyn Webster, but no information has been given in advance as to its character.

Variety from Peterborough

On April 1st a variety bill will be relayed from the Empire Theatre, Peterborough. The artists will include Ernest Shannon, in mirth, melody, and mimicry; Mr. Shannon has frequently broadcast, and his stage successes include the bandit hero in "The Maid of the Mountains" and Captain Posey in "The Little Dutch Girl."

Pre-war Musical Comedy

The Columbo Male Voice Choir—consisting of nine natives of Colne, all concerned with some aspect of the cotton industry, are to broadcast to Northern listeners a programme of pre-war musical comedy numbers on April 4th. They will be supported by the B.B.C. Northern Orchestra—conducted by T. H. Morrison, and the soloists will be Dorothy Paul (mezzo-soprano) and Wallace Irving (baritone).

Old-time Dance Music

Conducted by Stanford Robinson, the B.B.C. Theatre Orchestra will give a popular programme of old-time dance music to Regional listeners on April 9th. Many B.B.C. programmes bring in a large mail order business, the descriptions of which are always emphasised that advantage is taken of the opportunity given to the writers of being able to dance to the old tunes.

Crazy Week for Western Listeners

A Crazy Week has been planned for Western listeners beginning on April 1st, and all types of programmes will be affected. One high point will probably be a Mad Tea Party on April 3rd, when many of the people who broadcast regularly in the Western programme will come to the microphone. Reginald Redman and Francis Worsley have combined in a musical programme which is described as Musical Analia, a parody on the feature For Western Promotion. It will be given on April 6th, and all types of programmes will be supported by the B.B.C. Northern Orchestra, conducted by Francis Worsley. The soloists will be Dorothy Paul (mezzo-soprano) and Wallace Irving (baritone).

Weather Talk

"Wanted—the right weather" is the title of the third of the "Northend Cuckoo" series of talks features which is to be broadcast to Northern listeners on April 1st. Northerners drawn from every walk of life—fishermen, a farmer, a schoolboy, a shop-girl, an unemployed man, a woman organiser of charity fêtes, a street cleaner, a landscape painter—will review this all-important question of the weather in connection with this concert.

Working Town Prize Band

Under the direction of Reginald Hutchinson, the Working Town (Cumbria) Prize Band will broadcast from the Newcastle studios on April 6th. The band has won many contests locally, and last year it made its first appearance at the Crystal Palace in 1928. It has worked its way up from the Junior Cup to the Championship section.

Chamber Music from Manchester

Three members of the B.B.C. Northern Orchestra—Frank Park (viola), Pat Ryan (clarinet), and Charles Kelly (pianoforte)—will give a chamber music concert from the Manchester studios on April 5th.

Broadcast of the Launching of the Strathmore

The Duchess of York is to christen the Strathmore in her father's name, when this 24,000-ton liner is launched at Barrow-in-Furness on April 4th. The ceremony will be covered in an outside broadcast included in the main Regional programme. Microphones installed along the slipway will "pick up" the sounds as the vessel takes the water; and there will be a running commentary on the proceedings by Commander D. A. Stride. The Strathmore was in course of construction when the Orient liner Orion was launched from the same dockyard (Vickers-Armstrong Naval Construction Works) in December last. Like the Orion the Strathmore is equipped with the most recent type of anti-fire apparatus.

"The Mystery of the Seven Cafés"

Eric Maschwitz, variety director, and A. W. Hanson, producer, who directs the "In Town To-night" feature, are preparing a new series of programmes provisionally entitled "The Mystery of the Seven Cafés. Continental music and melodrama will be blended in an unusual way. The main story concerns the adventures of a Secret Service man in pursuit of clues to an international mystery. The clues lie in cafes in seven capitals. In each of the seven instalments music by the cafe band is interwoven with thrilling drama. Sydney Horler will be responsible for the script and Walford Hyden and the Cafe Collette Orchestra will provide the music. The series is likely to start about the end of June.
MAKING A CALIBRATION CHART

An Article Explaining the Simple Method Adopted

By W. H. DELLER

When handling a new receiver, there is always an element of uncertainty regarding condensed settings for different stations, more particularly for "foreigners." The preparation and completion of a calibration chart will, however, provide a ready means of identifying unknown stations, and for that matter will also indicate the required condenser reading to obtain a wanted station. Beyond this, such a chart provides by far the simplest method of recording the various tuning positions.

Briefly, the operation consists of constructing a curve on a sheet of squared paper. This particular paper is faintly ruled in both horizontal and vertical directions to subdivide the surface into small squares. In the ruling most readily obtainable these squares measure one-tenth of an inch, which for the present purpose, on account of clarity, is eminently suitable. It does not matter if the ruling is in millimeters, but where such is employed it is better, unless a very small chart is needed, to allow more than one square for each degree or division on the condenser scale.

Marking Off the Squared Paper

The bottom edge of the paper is marked off to represent the condenser scale, commencing with zero at the left-hand corner, and progressing in numerical value towards the right. The line immediately above represents the lowest wavelength, or frequency, in kilocycles to which the condenser is responsible. The size of the paper mentioned is a standard one, but where it is unnecessary, the marginal strips may be dispensed with.

It will be noticed that the paper is divided into lin. squares with heavy lines. Along the first of these lines near to the bottom edge, rule a line with a pencil. Below this, and opposite to the first similar vertical line at the left-hand side mark a figure 0, and at each succeeding heavy line continue marking by increments of 10 up to 180. Rule another line up the left-hand side from the zero mark, and to the left of this proceed to mark off the wave-lengths, commencing with the medium waves from 200 to 600 metres. On account of the space required, the medium and long wavelengths are dealt with separately.

If it is intended to log the stations at the side of the chart more space must be left at the lower end of the scale between 200 and 400 metres. Therefore, it is suggested that an inch be devoted to each ten metres up to 300 metres, marking accordingly at the base line of each of the first ten large squares from the bottom. Allow 3in. for the next 50 metres, and 2in. each for each 50 up to 450 metres, while 1in. of space will be enough to record the stations up to 500, and again up to 600.

(Continued on page 38)

Fig. 1.—Marking the condenser settings on the chart by means of dots.

Fig. 2.—Showing how the squared paper is marked out for condenser and wavelength readings.

Using the Chart

Apart from providing a most interesting occupation for several evenings, the completed chart may reveal the reason for the failure to receive certain stations clearly, if at all. For instance, it may be found that the curve is "humpy," due to the condenser being faulty either on account of design or something wrong mechanically. Perhaps it should be explained what is meant by "humpy." This is where the curve suddenly flattens out in one part so that it rises perhaps only two squares over a distance of, say, eight squares, and rises again just in the same manner, travelling upwards five or six squares while moving towards the right-hand two squares. Therefore, it may be that while on the flat part of the curve only two stations are represented by eight degrees on the condenser dial, the steep portion may cover five or six stations with a relative condenser movement of two degrees, and are consequently impossible of entire separation. It is, however, pointed out that where the design of the condenser is responsible, the probability is that it is not one of modern manufacture. In such a case, considerable improvement could be effected by the substitution of another condenser.

Method of Calibration

Reverting to the actual chart and calibration, obtain a sheet of squared paper 18in. by 23in., and paste it on a sheet of stiff card 4in. wider than the narrow way of the paper. Should the card be other than white, paste a strip of drawing paper on each side to cover the face of the card so that it comes flush with the edge of the squared paper. The size of the paper mentioned is a standard one, but where it is undesirable to use a card, a larger sheet can be utilised. The purpose of the added blank margins is for marking the names of the stations on, but where considered unnecessary, the marginal strips may be dispensed with.

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(Continued on page 38)
### The ABC of Valve Pin Connections

**Battery Pentodes**

It will be seen that, in the case of battery-operated output pentodes, connections are only given for valves having five-pin bases. This is because the four-pin base and side terminal connections are becoming obsolete. Where old valves are in use, however, the side terminal corresponds with the centre pin, so that a second H.T. positive lead should be provided for joining to this terminal. All of the other diagrams are self-explanatory and do not call for any explanation. A few of the valves represented in the diagrams below are not now used very widely, but they have been included to make the reference more comprehensive. For example, the bi-grid valve which was formerly employed as first detector in certain types of super-heterodyne (chiefly in conjunction with a frame aerial) is practically obsolete, although still found in some of the older receivers.

Also included are diagrams of connections for such components as the neon stabiliser, barretter and vacuum-type thermal-delay switch. These are not wireless valves in the strict sense of the term, but are contained in glass bulbs and fitted with pin bases which fit standard valve holders.

Connections for rectifying valves are also included, and these apply equally to both directly- and indirectly-heated types. The reason for this is that the cathode in the latter types is internally connected to one of the filament, or heater, terminal pins.

#### Under-chassis Connections

In order to provide an even simpler method of reference to the valve-base connections alone, however, we have had the illustration on this page specially prepared, and it will be seen that all the main types of British valves are represented. It should be made perfectly clear that the various drawings show the valve holders as seen from the top. When the connections to the terminals of a chassis-mounting valve holder are required it will not be a difficult matter to reverse the connections, whilst, if desired, a tracing of the particular connections required could be made and the connections obtained directly by holding the tracing up to the light and looking at it from the reverse side.

#### Frequency Changers

In examining the drawings it will be seen that the same connections are used for both push-pull and tetode valves; this is because the two screening grids in the latter are internally connected together. Another point which calls for an explanation is that H.F. pentodes are now available in two different types, having five-pin and seven-pin bases. Both types are in general use, but the seven-pin one is becoming increasingly popular because of the separate connection for the priming grid and metalling (where provided). Thus, these two connections can be joined to different parts of the circuit—the cathode of the valve and directly to earth, principally—and in this manner various forms of mains hum and instability may be suppressed. It is often advisable to try both of the connections mentioned when any form of instability is experienced, since definite rules cannot be laid down as to which is the better.
CIRCUITS AND SETS FOR ALL

The Circuit dealt with this Week is for a Sensitive Two-valve Transportable Receiver of Simple Design and Inexpensive Construction.

Generally speaking, a portable receiver calls for a fairly intricate design, and requires to have at least four valves. There are, however, many occasions on which a much simpler type of set will easily provide the results normally required, especially if reception of only two or three stations is insisted on and if the user is satisfied with a moderate volume level. The circuit reproduced on this page illustrates the essentials of a set of the latter type, and one that can satisfactorily be used as an ordinary portable, as a stationary receiver, or as a transportable. Only two valves are employed, but these are both of the high-amplification pentode type, so that they are able to deliver quite a good output. The set represented by this theoretical diagram is not supposed to be an extremely sensitive one having a marvellously long range or giving an output sufficient to fill a small hall; on the contrary, it is intended to be used for reception of comparatively near-by stations on a small loud-speaker when an aerial is not available, or for receiving four or five programmes when attached to an outside aerial. When greater range of reception is required and a good aerial cannot be provided, the little set will prove quite capable of bringing in at least a dozen transmissions on 'phones.

The Frame Aerial

It can be seen from the circuit that a frame aerial is provided, and that this has windings for medium, and long-wave tuning as well as for reaction on either waveband. In addition there is a separate winding, loosely coupled to the tuned windings, which is required only when an external aerial and earth leads are to be employed. By making use of this form of coupling there is no great loss of selectivity when the external leads are employed, and no need to employ a condenser in series with the aerial in order to reduce the "damping" effect on the tuned circuit.

Although the main windings are continuous, they actually consist of three parts: medium-wave tuning, long-wave tuning, and reaction. This arrangement makes for simplicity in winding the frame, and has proved eminently satisfactory in practice. Assuming that the end marked G is the commencement of the winding, the portion between G and M is the medium-wave tuning section; the portion between G and H.T.—200 ft., and between H.T.—and R, 20 ft. The length of wire required for the aerial-coupling winding (between points A and E) should be about 10ft., but this is best determined by experiment.

The windings can be made entirely with 24-gauge d.c.c. wire, the medium-wave and aerial-coupling sections being arranged with side-by-side turns (to prevent the greatest possible surface area) and the others pile wound. The long-wave portion should be divided into three or four sections to reduce self-capacity, and the reaction winding can be in a single section following the others. The coupling winding can be placed between the long- and medium-wave portions, the general disposition being as shown in Fig. 2.

Apart from the tuning circuits of the receiver, there are a few other points which differ to some extent from normal practice. For example, the detector valve, as well as the L.F. amplifier, is of the pentode type; this is to ensure the greatest possible degree of amplification in the detector stage. Actually, both valves are alike, and should be Cossor, type 220 H.F.T.

Prevention Against L.F. Instability

Coupling between the two valves is by means of a plain 1:5 L.F. transformer—which should be of good make, since it has to carry the anode current to the detector—while detector decoupling is provided in the conventional manner by means of a 20,000-ohm resistance and a 2-mfd. fixed condenser. To prevent interaction and to avoid L.F. instability a 100,000-ohm fixed resistance is included in series with the grid of the second valve. A loud-speaker is shown in the anode (Continued overleaf)

approximately 70ft., between M and H.T.—200 ft., and between H.T.—and R, 20 ft. The length of wire required for the aerial-coupling winding (between points A and E) should be about 10ft., but this is best determined by experiment.

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A Novel Projection Dial

A Simple Device for Illuminating Station Names as They are Tuned In

WHEN a good programme is tuned in on the radio it is a very common and aggravating thing to be asked "which station is that?". After you have settled down to listen in a comfortable chair; having paid little or no attention to the tuning dial, and not wishing to be discourteous, up you have to get and peer into the dial. In view of this the writer has contrived a dial arrangement (shown in Fig. 1), which projects the name of the station on to a ground glass screen, enabling a person with normal sight to see at a glance, and at a considerable distance from the receiver, the name of the station to which it is tuned.

Details of Construction

Before constructing this device the set must be accurately calibrated, and this was accomplished by fixing a strip of paper over the scale on the drum dial and writing the name of the station as it was tuned in behind the narrow slot in the three-ply panel immediately in front of the tuning condenser. I then took a piece of unexposed photographic film and fixed it in a solution of hypo-sulphite (taking care not to allow any light to reach the film before putting it in the fixing solution). Having dried this strip of film I placed the piece of paper, on which I had written the names of the stations, over it (the emulsion, or matt side up) and at each station I made a small perforation with a pin; then at each perforation on the film I printed the name of the corresponding station upside down with a mapping pen and Indian ink. I removed the celluloid scale from the drum, and fixed this printed strip of film in exactly the same position as occupied by the strip of paper.

The medium wave stations are printed on one side of the strip, and the long-wave stations on the other, and by means of a shutter (Fig. 2), closing alternately one half of the slot in the three-ply panel, and operated by the wave-change switch, the name of one station at a time can be projected on the screen. The latter is set slightly back from the panel of the receiver and, being in comparative darkness, it will show clearly what is projected on the screen.

The general assembly of the various parts is clearly shown in Fig. 1, while Fig. 3 shows the method of mounting the lenses. The constructional details illustrated are those which applied in my particular case, but they may require slight modification in certain instances according to the tuning condenser employed, and its position in relation to the panel.—F. W. R. (Macduff)

Fig. 1.—Showing the general assembly of the finished parts.

Fig. 2.—Details of the shutter.

Fig. 3.—Showing the method of mounting the lenses.

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 provision of any public service of television it is essential that the type employed shall have features which make it receive on sets of differing design. This is the case with the high-definition television service promised to be ready for public use towards the end of this year. Here, the signal which is propagated from the ultra-short-wave radio transmitter is generated, as a result of the equipment producing voltage variations that are a direct function of the brightness (or dullness) of successive picture areas explored in an ordered and consecutive manner. These areas are scanned at a rate which is quite independent of the nature of the subject being televised. At the receiving end, therefore, it is essential for the light intensity of the picture-reproducing device to be modulated in an identical manner, this being known as "intensity modulation." Present Examples With the disc receiving machine, the size of the scanning spot is kept constant since it is a fixed sized aperture in a rotating disc passing over the glowing area of the cathode in the neon lamp. The incoming signals vary the intensity of this glow continuously, and so the picture is built up from light and shade intensity. Then, again, the same principle holds good with a mirror-disc machine using a Kerr cell. The size of the beam of light emerging from the Kerr cell nicol prism combination is governed by the rectangular-apertured mask fixed to the glass envelope of the cell. The beam of light collected by the condenser lens and passed through the cell plates is altered in intensity by applying the incoming television signals to these plates, but no attempt is made to vary the spot size, and this spot, through the medium of the rotating drum, builds up the result- ing picture by moving at a constant speed over the fluorescent screen.

**Fig. 1.—**Inserting an additional mesh electrode between cathode and anode for modulation purposes.

**Fig. 2.—**Another suggestion for intensity modulation which included a potentiometer control.

**Fig. 3.—**Including an amplifying valve in an anode modulation circuit.

**Fig. 4.—**An imperfect image resulting partly from misfocusing and over-modulation.

**A Variant**

When it comes to using the beam of cathode rays in a C.R. tube for the purpose of showing television pictures, the same principles must hold good. In other words, the intensity of the beam must be modulated, but in so doing the focussing or focusing of the spot on the fluorescent screen must not change, while the mean time base circuits in causing the spot of light to move across the screen at a constant velocity, and in this way trace a line of fluorescent light of constant intensity. If the spot is made to move exceptionally fast the degree of line fluorescence observed on the screen will be relatively small, but if, on the other hand, the speed is reduced, the intrinsic brilliance of the traced line will correspondingly increase.

This is termed velocity modulation, and the various light and shade details in the televised scenes are reproduced at the receiving end by adapting the velocity of the electron trace across the screen to high and low values, and thus give dark and bright sections of the picture. The scheme is a very ingenious one, but since intensity modulation is the method adopted by the Television Committee as a result of adopting the Baird and E.M.I. systems, attention will be devoted here to the different schemes of intensity modulation which have been proposed from time to time with varying degrees of success.

**The First Schemes**

It is actually necessary to alter the number of electrons which reach the screen in the constant sized beam and so adjust the light intensity. The first proposal for effecting this was by means of the interposition of an additional electrode at some point between the cathode and orifed anode, the electrode, of course, being actually in the path of the beam. This is shown in the diagram, where AB represents the tube screen, and the orifed anode is indicated with its positive potential applied for the purpose of effecting acceleration to the electrons omitted from the cathode. Placed between the anode and the cathode is the modulating electrode, the incoming signals being applied between this electrode and the cathode in order to produce the required variations. This electrode first of all took the form of a fine mesh grid, and was then modified to a circle or loop of wire. Other alternatives were the proposals to place the grid mesh relatively close to the fluorescent screen after the ray had been influenced by both the accelerating electrode, and also the deflector plates, and the inclusion of twisted instead of one.

As far back as 1924 an idea was patented which in some respects is rather similar
to present-day practice, inasmuch as
it introduced a form of potentiometer control.
The scheme is shown in Fig. 2, the control grid receiving signals after the orifced anode, while between this grid and the screen was fixed in the beam path a second anode. This was also orificed, but not connected to any potential or part of the circuit, being included with the object of assisting in the focusing of the beam. The incoming signals were applied between the grid mesh and the moving arm of a potentiometer, which effectively altered the mean potential of the grid.

**Drawbacks**

At first sight schemes of this character would seem to be quite satisfactory. Their object is to effect only the electron density of the cathode beam, and not to alter the

![Fig. 5](image)

**Fig. 5.**—Interposing an apertured mask to cut off the electron beam in accordance with incoming signal intensity.

electronic acceleration to a degree which will manifest itself in the picture built up on the screen. This did not materialise in practice, however, and it was found that the screen was altered quite materially by alterations in the potential of this modulation grid by the applied incoming signals. The same remarks applied when the control grid was placed remote from the cathode, for then the modulation potentials have to be amplified very considerably to be in any way effective.

Yet another idea proposed was to modulate the anode, and this is shown in Fig. 3. Actually, the television signals were applied between the grid and the filament (cathode) of a three-electrode thermionic valve, the cathode of which was connected to a hollow cylinder in the beam path. Not only was the scanning velocity altered quite materially, but "misfocusing" of the screen spot occurred, thereby giving rise to a very material blurring of the fine detail and structure in the reproduced picture. Effects of this character are shown quite clearly in Fig. 4, where the resultant television picture that is illustrated is not only harsh, due to a measure of over-modulation (often referred to as "soot and whitewash" in modern television parlance and being synonymous with the overloading effects in a loud-speaker), but as a general rule the nature of the electron assembly is modified somewhat to prevent any of the picture defects (such as defocusing) detailed earlier from being brought to the reader an impression of the results which have been obtained under conditions simulating those of an actual service, reference can be made to Fig. 7. This is a radio-

Modern Practice

With modern cathode-ray tubes used for television purposes, however, the Wieland cylinder actually surrounds the cathode (or filament), and this is supplied with a negative biasing potential to assist in the necessary magnification of the modulation or concentration in the beam path. This is illustrated in Fig. 8, where the incoming signal potentials vary the potential difference of this cylinder with respect to the cathode, this serving to alter the intensity of the beam reaching the screen in conformity with the incoming potentials originally generated.

In Fig. 6 is shown the simplified scheme of connections for work of this nature. The initial negative bias is applied to the cathode. The modulating signal voltages are passed through a radio receiving set to the cathode and cylinder via the fixed condenser. In addition, however, a stopper resistance is included between the potentiometer arm and the cylinder for the purpose of preventing these modulation signals taking the relatively low impedance path provided by the potentiometer winding itself.

Results obtained by this method of intensity modulation are, in practice, very satisfactory, but as a general rule the nature of the electron assembly is modified somewhat to prevent any of the picture defects (such as defocusing) detailed earlier from being brought to the reader an impression of the results which have been obtained under conditions simulating those of an actual service, reference can be made to Fig. 7. This is a radio-

![Fig. 6](image)

**Fig. 6.**—Simplified circuit of intensity modulation on the C.-R. tube shield.

![Fig. 7](image)

**Fig. 7.**—Showing the result of over-correction, and slight over-modulation.

W H E N E V E R a discussion arises concerning television, one question crops up with unfailing regularity: "What advantages accrue from the use of the cathode-ray tube in the receiving apparatus to portray the radiated picture signals?"

While some of the advantages may not be immediately apparent it is generally conceded that the most important are the following:

1. The complete absence of mechanical moving parts.
2. The noiseless operation of the apparatus as a result of advantage (1).
3. The greater ease with which the picture can be truly reproduced, especially in the matter of eliminating the floating or hunting action which so often characterises an image produced by a disc or mirror drum.
4. The adequate brightness of the pictures on the tube's fluorescent screen, making visible the objects of the natural or artificial room illumination is present, provided this illumination is not directed at the screen.
5. The persistence of fluorescence of the screen supplements persistence of vision, and in this way removes the effect of the small amount of light available coupled with the short time exposure required in order not to take cognisance of the normal artist movement consequent upon performing her actions before the television scanner.
6. The case with which changes can be effected, such as horizontal or vertical scan, picture ratio, picture enlargement, alteration in number of scanning lines or picture frequency.
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by SYDNEY HORLER.

If you would like a copy of our Forecast Booklet, please put a X here.
Auto-Bias Problems

In this Article a Few Practical Circuits are Examined, with a View to Clearing Up any Difficulty

By the Technical Staff

The principle underlying the application of automatic grid bias is now thoroughly well known, for it is universally employed in all mains-operated receivers and occasionally in battery sets, especially when an eliminator is used for the high-tension supply. There are, however, right and wrong ways of arranging automatic grid-bias circuits, more particularly in connection with the output stage.

Concerning the basic principle, it will suffice to remind readers that by making the anode current pass through a resistance connected in the cathode circuit, a voltage drop is produced which can be utilized to provide the necessary steady difference of mean potential between the grid and the cathode.

A Case Illustrated

In Fig. 1 is shown the usual arrangement for an indirectly-heated valve; the circuit is the same (except for differences in the values of resistances and condensers) for screen-grid valves, screened pentodes, triode amplifiers, and also for indirectly-heated valves of the output type. For the sake of simplicity, however, the diagram is drawn for an indirectly-heated triode having a choke-capacity output circuit. Also, for the sake of argument, it will be supposed that 250 volts of high tension are available, and that the bias requires a negative grid bias of 30 volts, and takes an anode current of 30 milliamperes.

A simple Ohm's Law calculation will show readers that in order to obtain a voltage drop of 30 ohms and 30 milliamperes, the bias resistance, R, will have to be 1,000 ohms. If, then, we call the potential at H.T. positive +250 and at H.T. negative, zero, the potential at the cathode will be +30, and at the grid zero. This means that the cathode is 30 volts positive with respect to the grid, which is the same thing as saying that the grid is 30 volts negative with respect to the cathode.

The condenser connected across the bias resistance may be as small as 0.1 microfarad in the case of a high-frequency valve, and up to 25 or even 30 microfarads (low-voltage electrolytic type) for an output valve. It is often desirable to decouple the grid circuit, and this can be done by means of a decoupling resistance as shown in Figs. 2. The modified position of the by-pass condenser in this arrangement should be noted.

Power Loss

It must now be considered whether these arrangements are really the best in all circumstances. It can be stated straight away that no fault can be found with them for high-frequency stages, or for early low-frequency stages, but there are cases where they are not ideal for output valves. Take, for example, the case of an output triode, for which the optimum load impedance is a matter of a few thousand ohms only. The output power in the circuits shown in Figs. 1 and 2 is developed in the load (that is the speaker circuit) and in the biasing resistance, and since the resistance is of comparable value with the impedance of the load, a large proportion of the output power will be lost in the bias circuit. For example, the optimum load of the valve might be 4,000 ohms—quite a common figure, while the bias resistance is 1,000 ohms. The total impedance in the output circuit, therefore, is made up of the load and the bias resistance, and the available output power will be divided between the two in the inverse ratio of their impedances.

An Alteration

Now consider the circuit of Fig. 3 and compare it with that of Fig. 2. Here it will be observed that instead of arranging the bias resistance in series with the load, so that it robs the load of a substantial part of the output of the valve, the load is taken between the anode and the cathode of the valve so that the bias resistance is not included in the output circuit. In fact, the bias resistance now acts purely as a voltage-dropping resistance, in exactly the same way as the resistances sometimes connected in the anode load to reduce the anode voltage.

In connection with Fig. 3, it should be remembered that this bias resistance now carries the anode currents of all the valves in the receiver, and its value should be calculated on this basis. The formula is: Bias resistance for output valve equals bias voltage required multiplied by 1,000 and divided by the total high-tension current of the set in milliamperes. This arrangement is perfectly satisfactory for receivers employing straight high-frequency stages, but when variable-mu high-frequency valves are used, either with or without A.V.C., the current in the bias resistance of the output valve will vary with the adjustment of the variable-mu valve, and the bias to the output valve will vary in proportion.

A Short Circuit

In such circumstances, therefore, it will be necessary to revert to the bias arrangement shown in Fig. 2, but the losses involved in this circuit can be avoided by the modification shown in Fig. 4. Here, the output is taken between anode and cathode and not between the anode and H.T. negative terminal. Even this arrangement

(Continued on page 54)
Methods of Measuring Wavelengths and of Making Different Types of Wavemeters are Explained in this Fifteenth Article of the Series.

By FRANK PRESTON

Wavelength, Inductance and Capacity

There are, nevertheless, many occasions when simple means of measuring wavelengths is extremely valuable, more especially when dealing with short waves, wavelengths, it is better to use a standard type of four-pin plug-in coil of the type shown. Any number of these coils can be made or bought to suit the wavelengths to be covered. Formers or complete coils are made by Eddystone, and both have been reviewed in the "Facts and Figures" section of this journal. The condenser shown has a maximum capacity of .00016 mfd., which becomes a sub-standard for short-wave work. It should be added, however, that since there are no stray capacities in circuit, a condenser of this value will cover a really wide band of wavelengths on any range. As the condenser will require to be calibrated, a large circular dial marked off in degrees or other equal divisions is desirable, and a good slow-motion component is to be preferred for the sake of accuracy.

Using an Absorption Wavemeter

The method of using the absorption wavemeter is perfectly simple, and consists of placing the coil (which may be mounted on a small box containing the tuning condenser) fairly near to the aerial lead-in of the receiver. A station should then be tuned in on the set, after which the wavemeter condenser is adjusted until signal strength is reduced to a minimum. When this condition obtains the wavemeter and receiver are tuned to the same wavelength, since the former is "absorbing" the greatest amount of energy from the tuning circuit of the receiver. The wavelength of the station received being known, a note can be made of the setting of the wavemeter condenser for that wavelength. Other stations can then be tuned in and the meter calibrated on as many of these as possible. It is an advantage to prepare a graph, such as that shown in Fig. 3, so that the wavelength of the meter for any particular range may be obtained by reading off in degrees or other equal divisions.

Fig. 1.—A simple tuning circuit of which the resonant wavelength can be found by employing the formula: \[ \text{wavelength} = \frac{1.884}{\sqrt{L \cdot C}} \]
which are not so well "charted." Before proceeding to deal with the question of making wavemeters of different types it might be well to quote a very simple formula which is often valuable when considering this subject. The formula is: \[ \lambda = \frac{1.884}{\sqrt{L \cdot C}} \]
where \( L \) is the inductance of the coil and \( C \) is its capacity. In other words, the formula reads: wavelength equals 1,884 times the square root of the inductance of the coil multiplied by the capacity of the parallel condenser. Thus, if we consider a simple-timing circuit, such as that shown in Fig. 1, which is a tuned-grid circuit between an H.F. and detector valve, the highest wavelength to which the circuit will tune is the (medium-wave) coil.

Fig. 2.—Theoretical and pictorial circuits for the simplest type of wavemeter—the absorption type

Table of Capacities

<table>
<thead>
<tr>
<th>Condenser Reading</th>
<th>Capacity (mfd.)</th>
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</thead>
<tbody>
<tr>
<td>20</td>
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</tr>
<tr>
<td>40</td>
<td>0.004</td>
</tr>
<tr>
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<tr>
<td>80</td>
<td>0.008</td>
</tr>
<tr>
<td>100</td>
<td>0.010</td>
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</tbody>
</table>

Table of Inductances

<table>
<thead>
<tr>
<th>Inductance</th>
<th>Value (microh)</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>314</td>
<td>0.000328</td>
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<tr>
<td>470</td>
<td>0.000442</td>
</tr>
<tr>
<td>625</td>
<td>0.000556</td>
</tr>
<tr>
<td>781</td>
<td>0.000670</td>
</tr>
</tbody>
</table>
WHEN it is necessary to rebuild a moving-coil loud-speaker, and there is difficulty in obtaining a suitable former of a proper size and type, a suitable job can be made from gummed paper strip. A former of brass or ebonite should first be tumed some thousand of an inch smaller in diameter than the internal diameter of the former required. This is to allow for the thickness of a layer of wire which is placed on the former first, and also a layer of thick wax paper, to allow of the easy removal of the finished speech coil. One end of the former can be shaped to a cone to simplify the fitting to the large cone, and if this is required the former should be turned to allow for this. The sketch shows the position of the completed coil, and the following notes describe how this condition is reached.

A layer of enameled wire is first wound on the former, secured at the smaller end in a hole drilled in the former and jammed there with a match stick. The wire is carefully wound on turn by turn, the cone being used for a short piece along the larger diameter, and the end secured in another hole. A layer or two of the wax paper is then wound over the wire so that the diameter is the same as that required for the finished former. The wax paper is secured by placing a warm iron on the paper, thus melting the wax. A strip of gummed paper is then properly fit

Paracticl and amateur wireless

Making a Buzzer Wavemeter

The buzzer wavemeter is used in a similar manner to the detector type, but with the exception that the note (high-pitched) whistle heard in the speaker or 'phones indicates the tuning point slightly off from resonance. Using a heterodyne wavemeter the buzzer wavemeter is, simply placed some distance away from the receiver, and tuned until the note can only just be heard when the two circuits are exactly in tune. For this reason, when calibrating the buzzer wavemeter, it is necessary to keep the instrument as far away from the receiver as possible.

A Third Type of Meter

The heterodyne wavemeter is identical in principle with a miniature transmitter, and also with an oscillating detector. It consists of a tuned circuit coupled to a valve having a reaction coil in its anode circuit. For this reason it would be possible to employ an ordinary single-valve receiver as a wavemeter provided that a sufficiently accurate dial and slow-motion drive were fitted to the tuning condenser. In practice, however, it is generally better to use a rather different arrangement in which the degree of reaction coupling is fixed, and a suitable circuit is shown in Fig. 5. A four-pin plug-in coil is again used, and tuning is carried out by means of a .00016-mfd. condenser as before. The grid coil is tuned and the coupling coil, which serves for reaction, is untuned.

Using a Heterodyne Wavemeter

The heterodyne wavemeter is used in a similar manner to the buzzer type, with the exception that the note (high-pitched) whistle heard in the speaker or 'phones indicates the tuning point slightly off from resonance. The reason is that only at two points of the wavemeter tuning scale, one of which is slightly above, and the other slightly below, the resonance point. It is the silent point between the two whistles which should be observed. Just as with the buzzer wavemeter, it is necessary to keep the instrument as far away from the receiver as possible. The note which is slightly above the silent point is the detector note (which should be suppressed as much as possible), but its electro-magnetic equivalent can only be heard through a receiver after rectification. Thus, the buzzer wavemeter is simply placed some distance away from the aerial lead to the receiver, and adjusted until the transmitted note is heard at greatest strength in the speaker or 'phones. Most accurate readings are always to be obtained when the meter is so far away from the receiver that the note can only just be heard when the two circuits are exactly in tune. For this reason, when calibrating the buzzer wavemeter it may be found necessary to take the instrument out of the room from that in which the receiver is housed, particularly if the set is of a very sensitive type.
In Your Wavelength

by Thermion

The Modern Tower of Babel

I had the temerity to state in a previous issue that we Southerners speak the best King’s English. I am willing to admit this is a debatable problem—but it is my confirmed opinion, on the principle that where there is a will there is a way, some day I will write a book on the same opinion still! But ye gods and little fishes! I have been snowed under, and over, from readers in Lancashire, Yorkshire, Wales (look you, whatsoever!) and Ireland (be-gorrah!). Each reader claims that his particular spot of country is that in which purest English is spoken. Well, well! I don’t intend to settle the problem, except to say this: there are many excellent dictionaries in which will be found pronunciations. One dictionary may give one pronunciation whilst it is another will give a different pronunciation. Hence, no one can lay down a hard-and-fast rule where authorities differ; but there are certain words on which all dictionaries are agreed, and I am yet to find a dictionary which supports, say, the Scottish pronunciation of night as nath, the Irish as Oirish, the Yorkshire Book as Boook, butter as booteer, or man as mun. If you go to the South West you will find Somerset pronunciation booter, and go on. Notwithstanding the B.B.C. pure English campaign, many vocalists seem unable to speak perfect English. Here are a few vocal examples recently heard:

“Now raus in all the world, Under tiler you come.”

I will leave you to guess the tune. Here’s another:

“Giver me yer guineas, The lever lighter inner you rise.”

And another:

“... the dyar seetor that shanes inner your yer...”

I could give you many other examples, but will leave you to spend a pleasant half an hour listening for similar examples. You can make quite a hobby of it. And don’t forget the boo boo boo folks, and the ye gods and little fishes.

Use the Index

Many readers may be unaware that indexes for all issues of PRACTICAL AND AMATEUR WIRELESS (not Amateur Wireless) are available from us for 4d. Each reader contains an index that is sent with the Press given by Mr. E. J. Camm, the Editor of PRACTICAL AND AMATEUR WIRELESS, on March 12th last at St. Peter’s Hall, South Croydon. This proved to be a most illuminating evening, for notwithstanding my lengthy association with the Press I learned a good many things which I did not know before, both from the lecturer’s answers to questions, and the lecturer’s answers to questions which followed.

Crooners Again

A PROPOS my remarks about that lowest form of life—crooning—I have just received the following letter:

“Dear Thermion,

Although I did not read your article on crooners, I can easily guess the general idea of it. But I did read the article about Signature Tunes. You showed, as most writers of anti-jazz propaganda do, a narrowed-mindedness throughout which is typical of British people. And I find some

for over-civilised highbrows to which class I belong.

“Maybe the Editor will think you are good if you get lots of letters like this.”

Mr. Camm

P.S. I have just received the following letter:

“I duly consign of your statements rather strange, such as, you have never seen anyone listening to dance music, as they always turn off the switch at the first sound of the signature tune, and yet how could they know whether they would like what was to follow if they never listen to dance music? You yourself must listen to know that the bands can quite easily miss the name of the band; that is where the signature tune comes in. I agree on the lyric question, ninety per cent incorrect, apart from the people who attempt to imitate our American cousins. But I do not agree that jazz is so low (not dance music, mark you!); a proper rendering of jazz can be a wonderful self expression in music which is far more natural than the stereotyped symphonic tripe which wastes the best hours of the evening on the radio, and which is only fit

(Continued overleaf)

March 30th, 1935

PRACTICAL AND AMATEUR WIRELESS

Trade Apathy

Mr. Jack Harvey, a radio engineer of Cambridge, sends me the following interesting letter:

“The letter in your issue of March 2nd from a local correspondent airing his grievances against retailers is particularly interesting.

“For some time it has been very clear to me that the apathy of the trade has been the chief cause of the decline in amateur constructing, to the detriment of everyone concerned, the constructor himself, the manufacturers, the few dealers who would be willing to take an active interest in this side of radio.”

“What seems to be required is that means be found for bringing together the constructor and the trader who is willing to help him, surely not an insurmountable difficulty.

“T have always made it a part of my policy to offer the fullest possible service to constructors, but it is difficult to get the fact known. Ordinary local advertising would be of no use; it would only result in one of two things: the constructor would expect everything he wanted in stock or to see his selected circuit working as a complete receiver, both of which are, of course, impracticable.

“The suggestion I have to offer is that a permanent list of traders be compiled and their published from time to time or be made available on application, after the fullest possible investigations have been made, and at the same time make it perfectly clear to readers not to expect the impossible, such as the two points mentioned as objections to local advertising.

“I feel sure that if this scheme were explored to the full it would do more than anything else to revive home construction, and I shall be only too pleased to go further into details.”

I should like to have other readers’ views regarding the scheme suggested in Mr. Harvey’s letter.

Pictorials or Theoreticals?

I was interested in the discussion at the Croydon Society lecture aforesaid, at the objection some members made regarding pictorial diagrams. Most of them (except one or two of the younger members) thought diagrams should suffice. Personally, I disagree. Those pictorial diagrams of which we give a generous portion, and which are fairly costly to produce, are intended for the unconverted and for those who join the ranks of home construction
All-wave Reception

UNDER the heading I wrote, in the issue dated March 9th: "I wonder how many... experimenters have given their attention to the design of an all-wave set"; and also: "I point out is whether we shall find it better... to have two entirely different sets for... broadcast and short-wave bands, or whether a single receiver will adequately meet our needs." A reader, A. W. Galloway, of Woodstock, wrote in reply to my query by sending a circuit diagram of a four-valve all-wave receiver which he has built and which he claims to have proved entirely satisfactory. The writer of the receiver writes: "Making use of a pair of all-wave coils, and using a wooden bakelite rat trap, it can be truthfully claimed that I have had two years of successful listening. Every Sunday this year between 2 and 4 p.m. I have obtained (mostly with perfect clarity) VK2ME, Sydney, and, of course, the usual bag of Americans from, say, 7.30 p.m.—moon or no moon. Now this is not the result of an attempt on my part to ally to you the side of the all-wave set."

He continues to write: "When you consider that I have practically no real technical knowledge and that the outfit was only a few shillings more than it would have cost to assemble an ordinary broadcast receiver, I think you will agree that all-wave listening should not frighten the newcomer." In view of these remarks I am inclined to agree.

My correspondent concludes by writing: "Why not persuade your technical staff to produce a battery model (all-wave receiver) for use with a reasonably sized pair of all-wave coils, and using a wooden bakelite rat trap. I think you will agree that this might be possible, and desirable, to modify the conventional symbols for short-wave coils by indicating the coil by means of the same employed in circuits for heterodyne receivers. At least, I should not like to drive my 250 loops in a circuit diagram, would you? Nevertheless, the suggestion might prove useful. What do you think of this?"

PRACTICAL AND AMATEUR WIRELESS

CONVERTING AMMETERS TO VOLTMETERS.

Most receiver defects can be located by means of a good-quality A.C. Voltmeter, and it is therefore rather surprising that so little use is made of this instrument by experimenters. Perhaps this is a question of expense, however, as most readers will probably be of the opinion that such an instrument does not give an accurate reading of the output voltages of magnetrons or of the filament voltages of a valve. If the value involved is a maximum, however, the meter must be calibrated to give the correct result. A simple and inexpensive voltmeter might be made in the following manner: a filament voltmeter having a maximum scale deflection of 5,000 volts can be obtained for approximately 26s., however, and this scale can easily be extended to suit various voltages. As a voltmeter this is merely a calibrated current measuring instrument. However, if the output voltage is known, it will only be necessary to multiply the reading registered on the scale by 5,000. For example, if a reading of 2 m.A. is obtained the actual voltage will be 10,000 volts.

COST OF RUNNING MAINS SETS.

We often receive inquiries concerning the cost of running a radio receiving set. The figures here involved are quite simple, however, and it only being necessary to follow the calculations of the transformer primary. To obtain a rough estimate of this consumption, the usual maximum of the transformer secondary windings should be added together, and 20 per cent. being allowed for losses in the transformer core. For example, if a three valve mains receiver using four volt one amp. valves, the t.C. winding is approximately 2000 ohms, and if the usual type of power rectifier valve is employed in the output stage, the voltage will be approximately 40 watts—assuming that an H.T. rectifier requiring an input of 200 volts at 200 m.A. is used. The total secondary consumption will then be 52 watts and this plus 25 per cent, will give a primary consumption of 66 watts. This is equivalent to the consumption of an average electric lamp, and one unit of electricity will supply the receiver for approximately sixteen hours.

HEATER WINDINGS.

It is often found that commercial mains transformers have not the correct i.e. the exact current required by the valve heaters. For example, many of the transformers designed for 2500 lines and 16 pictures per second, are rated to supply four volts at 1 amp., (for rectifier filaments), and four volts at 3 amp., (for the receiver heater valves). If the 4 volt 5 amp. winding is used for supplying less than five 1 amp, valves, however, the voltage will rise in excess of four volts, the actual increase being governed by the current requirements of the valves, and the regulation factor of the transformer. It is, therefore, advisable to fit a dissipating resistance across the winding in order to keep the voltage at 4 volts. The required resistance value can easily be calculated by Ohm's Law. Taking, for example, a receiver consuming 4.5 volts at 5 amp., will require a dissipating resistance of 34 ohms having a wattage rating of 12 watts, or higher. The ends of the resistance should be connected to the end terminals of the transformer grid winding.

IMPROVING SELECTIVITY.

The present-day receiver, owing to the congested state of the wireless band, is probably many readers, however, who cannot afford to buy an expensive 150 watt superhet, and would like to improve their existing straight receiver at the least possible outlay. Of course, some of the older types of straight receivers incorporate an intercooler in conjunction, with the heterodyne circuit, having the H.F. coupling condenser connected to the grid end of the collector, and the L.F. coupling condenser connected to the plate. Selectivity can be improved by converting the tuned grid coil into an H.F. transformer, and then inserting approximately forty turns of 8.S.G.W. wire on a former of smaller diameter. After winding the coil, insering this extra winding inside the existing coil. The G.C. coupling condenser should be moved to the end of the extra 8-turn winding, the other end of this being connected to the H.T. lead previously connected to the H.F. choke.

Dr. F. M. Lees, in his letter, is quoted as concluding his letter by writing: "I think it is fine the way that the Short-wave Section of PRACTICAL AND AMATEUR WIRELESS has been enlarged—this is now the most interesting section in the whole mag."

Television in Germany

I READ that high-definition television broadcasts are shortly to be made in Germany. It is proposed to broadcast the programmes three times a week between 8.30 and 10 p.m. Central European Time, in Polizei, and will be sent out on ultra-short wave lengths, being employed using 180 lines and 25 pictures per second. It will be recalled that similar transmissions were made in France a few years ago, the only exception being that the programmes were only of an experimental nature, whilst those now proposed will be more in the nature of a public broadcasting service.

I shall be interested to see whether Germany or Britain is the first to establish a reliable high-definition service, but it rather appears that Germany will win, for the new transmissions are tentatively timed to start in a few days from the time I pen these notes, and they may be in operation by the time you read this page.

The Status of the Radio Engineer

A SHORT time ago I commented in these columns on the many inefficient so-called wireless engineers and dealers, and at the time it was my opinion that something was done to remedy the position. I must now admit that people in the interests of the wireless public, I am reminded of this by an advertisement which recently appeared in a certain trade journal for a fully competent man capable of taking complete responsibility for one of the technical side of a large firm of retailers. I do not like to put my views on what is needed in the world. I am interested in the various people who want service, and occasional advice.

A Matter for Congratulations

THE Breslau station, for some months has been a broadcasting station, and on the anniversary of their nineteenth birthday, and to couples who celebrate their "diamond" wedding. Official congratulations are now sent to mothers who have given birth to a family of ten children to the Fatherland.

How Many Listeners?

ACCORDING to statistics recently published in Switzerland, over forty million wireless listeners are heard daily on daily in the world. Of these, roughly 18.6 million are used in Europe alone.

Broadcasting a Hunger Strike

ONE of the most popular announcers of the broadcasting world who, having offended the station director, had not been paid for some months, instituted a hunger strike as a protest. In view of his situation, he was heard to carry out his duties, and daily, flanked by two hospital nurses, appeared before the microphone to broadcast the wild and vociferous protests made by his unconscious audience. The station authorities paid him to date and retained his services.
An Accumulator Dodge

No doubt, there are many readers who still have their pilot lamps connected to the filament terminals of the valve-holders, thus causing extra drain on the accumulator. A very simple method of overcoming this, and at the same time saving current, is illustrated in the accompanying sketch. An old accumulator is connected to the house lighting supply, as shown, and an extra switch incorporated at the left end of the circuit, connected to the house lighting supply, as shown, and an extra switch incorporated at the left end of the circuit. The accumulator is then charged, and while the main accumulator is at the low-tension, when used as stated, the charging station, the old accumulator can be brought into service for supplying the low-tension. When used as stated, the two wires that go to the accumulator should be connected together.—H. Hoerrick (Hull).

Loud-speaker Terminal Strip

Most loud-speakers have five terminals, two or three only of which are used. Various settings or ratios can be obtained by using alternative terminals, but once the speaker is in the cabinet, it is often very difficult to make these alterations without taking the speaker out of the cabinet. A simple method of remedying this difficulty is to fasten a strip of ebonite to the filament terminals of the valve-holder, thus causing extra drain on the (or other suitable material) along the bottom of the cabinet, near the back edge, with five-screw terminals placed at convenient distances apart, as shown in the sketch. Make permanent wire connections between these and the speaker terminals, and number them similarly. You can then experiment with various settings quite easily.—H. Pritchard (Wolverhampton).

A Straight-Line Dial

This handy device is made from an old slow-motion dial from which the scale has been removed. A piece of iron wire is then clamped under the fixing screw on the collar, as shown in the sketch. The length of this arm can be made to suit a scale of any length; it is half the scale length minus 4 in. The slow-motion gear should be placed a short distance from the panel to allow for free passage of pointer carriage.

The chief feature of this dial is that it is placed at an angle, and is, therefore, more easily seen. Other details of construction are clearly shown in the accompanying sketch.—A. Boxall (Anerley, S.E.).

An improvised radio-gram pick-up

A very efficient radio-gram pick-up can be made by using a moving-iron loud-speaker unit in the following way. Cut the reed to within 1in. of the moving iron, remove the cone washers from the connecting screw, and fix the set-out to the reed. A needle may now be fitted at the other end. A suitable arm, as illustrated, can be made from a piece of wood cut to shape. The unit can now be mounted at an angle of 60 degrees, and the two leads connected to the set as usual.—M. Pulver (Luton).

A wave-change indicator

A useful wave-change indicator is shown in the accompanying sketch. Two lamps (red and green) are attached close behind the dial, one terminal of each being taken to the L.T.+, while the remaining two are taken to the wave-change switch, which is shown connected to the wave-change switch.

An ebonite rod is mounted in two brackets (one of brass, and the other of ebonite) which, in turn, are mounted on an ebonite base. Three brass contact strips are made, and mounted, as shown, one on the brass bracket, and two on the ebonite bracket, terminals being fitted to each. Lastly, a strip of thin sheet brass is wrapped round the rod in such position that when the rod is moved one end it cannot touch both outside contacts at the same time.

To connect the two switch rods together, a thread is put on the end of the ebonite rod by heating it and screwing a nut along it, while the ebonite is still soft. The end is then screwed in the end of the plunger of the wave-change switch.

In operation, when the switch is pushed in, the green lamp is lit, and when pulled out, the red light is switched on, thus indicating the wavelength band.—R. S. McNeill (Dun Laoghaire, Co. Dublin).
**NEW COSSOR UNIVERSAL RECEIVER**

Universal A.C./D.C. receivers have now firmly established themselves on the British market although, generally speaking, our manufacturers were reluctant to introduce them, and rightly so, as this type of receiver should be more or less equal in performance to a similar A.C. or D.C. type, and equally reliable. Until comparatively recently this has not been possible, but to-day the universal receiver can hold its own.

The Cossor universal receiver, Model 369, is a recent introduction and is an addition to the Cossor Super Ferrodyne range of three-valve sets; although generally similar to its A.C. brother this receiver has one or two distinct features.

The H.F. Stage

The first stage is designed round the Cossor universal H.F. pentode, working with the same iron-cored aerial and anode coupling that distinguishes this range of receivers; these coils have efficiency quite above the average, and owe their success to the particular type of iron core used, and to the use of litz wire on glass formers.

The detector is also an H.F. pentode which gives the advantage of high gain, low coil damping and minimum high note cut; the advantage of the low coil damping is reflected in the receiver, as it allows foreign stations to be found without using reaction.

Although the first and second valves are pentodes this is not an all-pentode set, as a super-power valve is used. This choice was made for two reasons, firstly to eliminate hum which is liable to creep into the last stage as the valve must necessarily have a 40-volt heater. It is interesting to note that the control grid of this valve is brought out to a terminal on top of the bulb, like a screen-grid valve, as a precaution against hum.

The second reason for using a triode output valve is to secure adequate output with first-class quality at low anode voltages; it will be realised that since there is no transformer, the total H.T. supply is the mains voltage less the voltage lost across the smoothing choke and loudspeaker output circuit. On a 200-volt main the anode voltage would be 170 volts, or even less, but the output valve in this set—Cossor 402P—is capable of giving a really healthy output under such conditions.

**The Power Pack**

The power pack is designed on generous lines, and uses the Cossor 40SUA indirectly-heated rectifying valve. The whole is constructed on a thick pressed steel chassis, and is strongly made in the best possible manner. Plugs and sockets are fitted for aerial and earth, etc., thus avoiding exposure of the chassis which is undesirable on receivers that may be used on positively earthed D.C. mains. The cabinet is finished walnut, with an inlaid panel of contrasting grain, and is fitted with bakelite knobs and escutcheons to match. The controls are simple and consist of the usual single knob tuning with a concentric preset trimmer knob working a travelling pointer on a horizontal full-vision wave-band illuminated scale. The other two controls are variable-mu bias and reaction, giving variable control of selectivity and volume; the wave-change switch has a position for gramophone in addition to "off" and long and short waves.

**Performance**

Cossor model 369 acquired itself remarkably well on test, and was well above the standard expected from a three-valve set of the ordinary mains type; it certainly loses nothing by being universal in its application.

When used intelligently the receiver is capable of great selectivity, using the volume and reaction controls in combination with each other. In S.E. London only one channel was lost on each side of the local, which is a performance equal to many superhets.

**Stations Received**

The range is equaly good, and some thirty programmes were available at good entertainment strength and clarity. The quality of reproduction is particularly pleasing, and the moving-coil loud-speaker is quite free from any signs of distress, although the volume available is considerable when working on either alternating or direct current mains.

Perhaps the most remarkable feature of this receiver is the complete absence of mains hum on either type of current supply. We were so impressed that a special test was made on some D.C. mains known to be noisy and unkind to universal receivers. Once again the precautions against hum proved adequate as the set was silent.

**Specification in Brief**

**Receiver:** Cossor J-valve Universal All-electric Receiver, Model 369.

**Makers:** A. C. Cossor, Ltd.


**Price:** £8 18s. 6d. For D.C. 200/250 volts (adjustable) and A.C. 200/250 volts (adjustable), 50 to 100 cycles.
H.F. Amplifiers on Short Waves

By "EXPERIMENTER"

Most short-wave receivers use a detector valve unaided by any high-frequency amplification because it is contended that no useful amplification can be obtained from such a stage below about 150 metres. This is not true, however. Admittedly, the amplification is not as great as can be attained on ordinary broadcast waves, but at the same time it is worth while, and the amplifier gives the additional advantages of increased selectivity and stability of operation.

An Untuned Amplifier

The simplest H.F. amplifier is untuned. Such a stage would be useless on medium waves, but on short waves it isolates the detector from the aerial, and so removes dead spots in the reaction control, where the detector valve refuses to oscillate owing to high damping of its grid circuit, and eliminates the effect of a swaying aerial on the signals received. It also gives some amplification.

The circuit is shown in Fig. 1. The grid circuit of the screen-grid H.F. valve V1 consists simply of a special short-wave high-frequency choke L1, made by winding fifty turns of 36 s.w.g. d.s.c. wire on a plastic, diamagnetic, or paroxin tube. The screen-grid valve is coupled to the detector by means of another H.F. choke (HFC) and a .0001 mfd. condenser C2. HFCs must have different characteristics from L1 or there is a risk of instability in the amplifier. C2 is a .01-mfd. mica screen-grid decoupling condenser. A non-inductive paper component may be used.

The detector circuit is standard, and the component values were given in a recent article in "PRACTICAL AND AMATEUR WIRELESS." Bandspread tuning is used, C5 being .000025 mfd., C6 .0001 mfd. and L4 and L5 plug-in coils. C3 is a .0001 mfd. reaction condenser and C4 .0001 mfd. grid condenser, B1 being a 3-megohm grid leak. HFC is a short-wave H.F. choke; its characteristics must not be the same as those of HFCs.

This circuit can be assembled without any screening between the H.F. and detector stages, although the components should not be crowded. No additional tuning control is introduced. In fact tuning is simplified, since there is no possibility of dead spots being troublesome.

Though not so simple to set up, the tuned H.F. amplifier offers the additional advantages of giving greater amplification and increased selectivity, as well as removing dead spots, etc. In this case the untuned choke is replaced by a tuned circuit L1, C1, C2 (Fig. 2). C8 and C9 have the same values as C2 and C6 of the detector circuit, namely .000025 and .0001 mfd. The smaller condensers C3 and C4 may be gauged together; the two separate .0001 mfd. condensers C5 and C6 are used for band setting. No difficulty need be anticipated in ganging since the H.F. stage tuning is relatively flat.

Careful Screening Necessary

As a rule, it is not sufficient merely to enclose the coils in screening cans or place a vertical sheet of metal between the stages. The whole of each stage has to be built into a separate screening box. A suggested lay-out is given in Fig. 3. Individual boxes may be used, in which case they must be connected together and to earth by a wire as at A, or the sides and ends of the boxes can be built up on a common metal base, in which case A is not necessary. It is important in both stages to have separate walls at B; a side common to both boxes often leads to instability, since it may actually couple the two stages together. The box need not be very large; 6in. by 6in. is a usual size.

It will be noticed that in Fig. 2 the H.F. stage is coupled to the detector by an H.F. transformer. This is merely to suggest an alternative method to that shown in Fig. 1. Either coupling may be used whether the H.F. stage is tuned or not, and experimenting with different couplings is very interesting. If the choke coupling of Fig. 1 is preferred for a tuned stage, the same component values are suitable as were given for the untuned stage. Fig. 2 also shows throttle control of reaction, again simply as an interesting alternative, both throttle and Reinartz control being equally applicable. When choke coupling is used with a tuned amplifier, the condenser C5 and the coupling choke HFC2 of Fig. 1 are placed in the detector stage screening box, at right angles to the reaction choke HFC3 and as far from it as possible.

Plug-in Coils

Suitable plug-in coils for the H.F. transformer coupling are sold by various makers. Should the constructor wish to make them himself the following data will be useful. The secondary L4 is wound...
Improving Efficiency

In this Article the Author Discusses the Ways and Means of Improving the Quality of Reproduction in Short-Wave Receivers. The Effect of Choosing Suitable Components is Discussed.

Radio and television enthusiasts often bemoan the poor quality of the programmes received on short waves, and wonder why more information is not published with regard to improving the tone of short-wave signals received.

This question of tone is going to be a very real one when high-definition television is definitely ready for transmission. For, as is well known, the essential feature for reception of a high-definition picture giving first-class detail is a good response to high frequencies, and there has been some rumour of the necessity for a high-frequency response in the low-frequency amplifier extending as high as a megacycle! This would give the owner of the average straight short-wave much food for thought, for it is in the top-note response that the straight short-waver fails.

There are four reasons why top notes may be cut, and these are as follows: (1) use of poorly-manufactured components; (2) reaction; (3) oscillation above audio-frequency level; (4) selectivity. It is proposed to deal with these in the order given and to suggest some ways in which each can be alleviated and the quality of the output of the short-waver improved.

Use Quality Components

Firstly, the components used must be of just as good quality in the short-wave set as are used in the medium-waver, if tone is to be good. It is here that many enthusiasts seem to find trouble, for, curiously enough, in a short-waver a team of first-class components often seems to do more harm than good, causing instability, "threshold" howl, and other annoying maladies. This has been found particularly true of the H.F. transformer which, however, is the most important link in the quality chain. The only remedy the writer can suggest is one which must succeed in the end, and that is decoupling—using electrolytic condensers as lavishly as necessary. High-tension, grid-bias, and low-tension should all be by-passed and decoupled—a matter which is particularly easily carried out by means of the high-capacity electrolytic condensers. Assuming that the set is now perfectly stable, and capable of a really high-quality output, it is found that as soon as reaction is applied—and in a simple short-waver it is essential that it is applied—it is found that quality at once suffers, for reaction invariably cuts the high-note response. It is in overcoming this loss, the main cause of short-wave bad quality, that fortunately quite an amount can be done. There is at least one make of transformer on the market—by Varley—which is specially made with a raising characteristic at the top end of the scale, and this is excellent for levelling-up the response and overcoming the top cut-off caused by reaction.

Danish Transmissions

How often do you listen to OXY Shamblewack, which relays the Copenhagen (Denmark) radio transmissions on 49.5 metres (6,060 kc/s) from G.M.T. 18.00 until 23.00 or 23.30 every weekday, and from G.M.T. 16.00 on Sundays? Now and again on special occasions the short-waver is brought into action in the morning, and although not of regular occurrence, the 31.6-metre channel (9,493 kc/s) previously used, has not been totally abandoned. The call is one we regularly hear from the Danish long-wave station: Kalundborg-København og Danmarks Korrespondenter, and the interval signal the familiar carillon on the musical-box. Although the aerial power is only 500 watts, OXY is one of the best stations to search for; the signals are clear and you will find its modulation excellent.

When you have logged the Dane, make a special effort to find VQ7LO, Nairobi (Kenya Colony). The search must be started in the early evening hours, as at the latest the station closes down at G.M.T. 20.00. The wavelength is the same—within a hair's-breadth—as OXY, i.e., 6,060 kc/s, but I have been able to separate them at times. As a rule, the call is put out at G.M.T. 16.00, and as the announcer possesses a pure English accent you cannot mistake the broadcast for one from across the Atlantic. It might be worth while to give the dial a twist between 10.30-11.30 on a Monday, Wednesday, or Friday, or on a Tuesday between 08.00-09.00, on Thursday between 13.00-14.00, but the channel is not a favourable one for these daylight hours.
A Short Article which Explains the Difficulties of Describing any Receiver in Terms of the Distance Over Which It Will Receive.

Range of Reception

Transmitting Power

It used to be the custom in the very early days of wireless broadcasting to state the approximate range of a receiver, but at that time conditions were somewhat different; for one thing there were fewer stations in operation and those there were operated on similar power inputs. To-day, however, the power used by the better-known transmitters varies from less than 1 kilowatt to at least 150 kilowatts, so that, although a transmitter using the first-mentioned power might be easily receivable at 50 miles, one using the higher power would probably come in at similar strength on the same receiver at a distance of 500 miles or more.

The question of transmitter power is by no means the only point to be considered. Location and the situation of the aerials of both the receiver and transmitter can have an equally-pronounced effect. As an example of the effect of these points mention might be made of a number of tests which were carried out in the early part of 1933, when there were very few British broadcasting stations in operation. It was found that a receiver situated at equal distances from Newcastle and Birmingham and the latter station could be received at comfortable strength with a single-valve set, whilst the latter was generally inaudible. On the same receiver used in the same conditions it was observed that the signal strength from the Bournemouth and Cardiff transmitters was greater than that from either of the nearer stations mentioned, whilst the London transmissions came through at a strength somewhere between those of Newcastle and Glasgow. Despite the fact that all of the stations in question were working with approximately the same power the difference in reception was most marked, and could certainly not be accounted for by the distances separating the transmitter and receiver.

Reasons for the Differences

After carefully making a note of the average signal strengths from the various transmitters, a large-scale map was obtained and lines drawn from the receiver to the various transmitters. This being done, the "path" of the signals was carefully examined in an attempt to find what geographical differences existed. Unfortunately, it was not possible to pursue these experiments as far as would have been desirable, but it was definitely established that smoky towns, high hills (especially when containing mineral beds), rivers and valleys did appear to have varying effects. The reason is probably that a smoky atmosphere or a mineral bed, or even a river acts as a conductor in such a way that the electro-magnetic currents which comprise the transmitted signals are caused to leak away to earth. In the same manner it is easily conceivable that tall buildings, particularly those built around a steel framework, may act as earthed aerials and so conduct away an appreciable amount of the energy which would otherwise be available for actuating the receiver.

The above suggestion that rivers may cause signal losses may be open to challenge, since it is an accepted and proved fact that the range of wireless signals is considerably greater over the sea than over land. At the same time, however, the absence of hills and mineral deposits near the surface may have a far more pronounced effect than the conductivity of the sea water.

What Affects the Transmission?

It might be easier to appreciate the points raised above if reference is made to the illustration on this page, which is a form of sketch map showing the hypothetical range of a transmitting station. Two lines are drawn round the transmitter to join together all points at which signal strength is the same; the first one is taken at an average distance of ten miles from the transmitter, the second being at an average distance of twenty miles. It is very evident that the lines by no means follow even an approximate circle, but take a very irregular path. Hypothetical reasons for the uneven "distribution" are the presence of towns, hills, etc., whilst it will further be seen that the range is somewhat greater along an imaginary line drawn through the transmitting set than it would apply in the case of many modern aerial systems which are often arranged so as not to have such marked directional properties.

When it is considered that similar maps could be prepared to show the range of the receiver varied in different directions there is no difficulty in appreciating the fact that the range of reception can be a very variable factor. The position is made still more difficult when it is understood that the "range lines" might follow an entirely different path during hours of darkness than they do in daylight, and when the question of fading and reflection of the radio waves from the upper atmosphere is gone into.

Rough Approximations

Having considered the more theoretical aspects of the case it is possible to give very approximate information concerning the type of receiver required for reasonably reliable reception over the distance of doing an average receiving signal must be assumed, and by an "average" signal is meant one which is not less than about twenty feet high. In this connection, however, it must be explained that local conditions, and the position of the aerial with regard to nearby (Continued overleaf)
LEAVES FROM A SHORT-WAVE LOG

By J. G. ABRAHAMS

During the past ten days or so there has been considerable activity in the band extending from roughly 40 to 50 metres. Many nights it has been possible to listen to a number of South American transmissions. In particular, the broadcasts from Colombia, the Caracas medium-wave transmitters, EASAF, EASBB, and EASAB, have been logged at a readable strength. It will be worth while devoting a short period nightly to this portion of the wave band until British Summer Time is introduced, when some of the transmitters may be due to change over to other channels.

Moscow and Colombia

To facilitate a search, take three jumping-off points of the 40-50 metre range. If, for example, you pick up a few transmitters, as some of the South Americans are working comparatively long wave-lengths, it may be possible subsequently to work on the straight portion of the screen grid, as the curvature, and the amount of rectification obtained owing to this curvature, and the characteristics of the amplifying valves, cannot be obtained from any other than the local station and from the call you are listening to. It is probably true that the reproduction from any station more than 200 miles away is impossible to obtain real quality as cross modulation, which has a long straight solution is the use of a variable μ valve, which is definitely tunable, and occurs at a characteristic and, at the lower sensitivity, a modulation hum; and is due to the presence of the factors mentioned above, is modulated by the mains frequency.
THE B.T.S. SHORT-WAVE ADAPTER

An Efficient Instrument which can be used as a Detector Unit with Battery or A.C. Receiver, or as a Superhet Unit

This adapter converts an ordinary receiver, either battery or A.C. mains operated, to short-wave reception, and may be used either as a complete detector unit with reaction or as a superheterodyne unit. The wavelengths are 13-52 metres with the two coils supplied. The red spot coil covering from 13-26 metres and the white spot coil covering 24-52 metres.

The superheterodyne method of connection is advised where possible, but this is only possible where the receiver has one or more screen-grid high-frequency stages, and providing your set covers the long waves, i.e., 1,000-2,000 metres. If the receiver does not employ screen-grid high-frequency stages, the detector method of connection must be employed.

Where the receiver employs, either a screen-grid, or a 7-pin type detector valve, the adapter can only be used as a superheterodyne unit, but the unit works at its greatest efficiency when employed in conjunction with receivers employing such valves. Where the receiver employs two or more stages of L.F. amplification, or more stages of H.F., no matter whether battery or mains operated.

When used as a detector unit, in conjunction with the simple detector valve and 2 L.F. receivers, the results equal those obtainable from any 3-valve set.

As a Detector Unit with Reaction

When using the adapter with an A.C. receiver the following adjustments must be made: Remove the back of adapter and insert the red wander plug in the black socket. The plug is attached to the aluminium support of the tuning condenser.

For use with battery receivers place the red wander plug in the red socket.

Next remove the detector valve from the existing receiver and place it in the adapter valve-holder marked "Valve." Place the 5-pin plug attached to the detector valve socket of your set from which the valve has just been removed. Should the valve-holders be of the 4-pin type, the centre pin of the plug should be inserted by unscrewing with a pair of pliers. Now plug one of the coils into the coil-holder in the adapter. In the battery-operated receiver, the red and black wires on the 5-pin plug should be connected in the correct order of polarity, i.e., red wire to pin corresponding to red on receiver, and black wire to black on receiver. If any difficulty in deciding the polarity is experienced, the effect of reversing the red and black wires on the 5-pin plug should be tried; it will be found that one direction gives much better results than the other.

The aerial should be connected from your receiver to the "A" socket of the adapter, and a length of rubber-covered wire connected from the "F" socket to the earth terminal on the receiver, leaving the outside earth wire connected to the receiver. The socket marked "O" is ignored when using the detector method.

Operating Details

After the adapter has been connected and the receiver switched on, the main tuning dial is rotated from zero to maximum, and then slowly towards the right. When a rushing noise is heard, and if the main tuning dial is rotated slowly by means of the small concentric knob, signals should be heard. As the main tuning dial is rotated from zero to maximum, the reaction (right-hand knob) will have to be increased slightly in order to keep the adapter on the verge of oscillation, and it will probably be found that in certain parts of the scale the reaction will not oscillate. These dead spots are caused by the natural wavelength of the aerial, and can be overcome by adjustment of the series aerial condenser (the left-hand knob). This is at maximum when turned horizontally to the right, and minimum when turned horizontally left. In the event of difficulty in obtaining reaction this should be decreased.

Using the Adapter as a Superhet Unit

When using the D.T.S. short-wave adapter as a superhet unit with either battery or A.C. mains receivers, should the receiver be fitted with two stages of H.F. amplification, either valve may be used for inserting the plug. If the construction of the receiver does not allow the fitting of the plug to one of the H.F. valve sockets, that valve other than the A.C. rectifier will do.

The maroon-coloured lead is used to obtain a maximum of H.T. current to the valve in the adapter, and good results are usually obtained when this lead is connected to the screening grid of one of the H.F. valves, and the unit is connected with the maroon lead connected to the screen pin (Continued overleaf)
The B.T.S. Short-Wave Adapter

The B.T.S. Short-Wave Adapter, which makes this connection automatically.

In those cases where it is impossible to employ the plug in conjunction with one of the S.G. valves, and the plug is used with any other valve, then the main lead must be removed from the anode pin of the plug, and attached to another point where H.T. current is available. Such a point is the side terminal of the pentode valve. Any choke or transformer coupling of the output valve is not used to the L.S. terminal of the receiver. In some cases good results may be obtained by connecting the main lead to the side terminal of the S.G. valve, but this is not always so; generally speaking any H.T. point may be used, and where an alternative point is available, it is as well to test on both, so that best results are finally obtained.

In those cases where the main receiver will not operate with lid open or back off, it is essential to provide an aperture through which the leads from the unit must pass. The main lead should be switched on to the long-wave range and tuned to the highest wavelength possible, which, in the case of the average receiver, is in the vicinity of 1,800-2,000 metres. Should the receiver have more than one tuning control, excluding reaction or volume controls, all such circuits should be tuned to maximum wavelength. The receiver should be tuned to its most sensitive condition, but must not be oscillating. Transfer the aerial lead from the main receiver to the aerial socket of the unit and connect the "O" socket to the aerial terminal of the main receiver. A length of wire must be connected between earth terminal of set and earth terminal of unit, leaving the earth wire connected to your receiver.

Reaction Control

The reaction control—which is the small knob on the right-hand side of the adapter—should be decreased until a point is reached where signals are heard. This is done by rotating the main tuning condenser, using the slow-motion centre knob for this purpose. The adapter control should be turned up, but the whistle usually heard when tuning signals will be absent. This adjustment should hold over a large scale. The reaction control should not be advanced beyond a point where signals are heard, or a continual howl will result. Should no signals result with the reaction control fully in, the series aerial condenser (left-hand knob) should be adjusted. This is at maximum when turned horizontally to the right and minimum when turned horizontally left. In the event of difficulty in obtaining reaction, this should be decreased.

The price of this adapter is £2s. 6d., and any further particulars concerning its operation can be obtained from the manufacturer, British Television Supplies, Limited, Bush House, London, E.C.2.

Dual-purpose Components: A Correction.

In the last issue, the adapter should bear the above heading, which appeared in our issue for March 9th, it was stated the resistance offered by a 2-mfd. condenser to frequencies of 1,000 ohms is only about 80 ohms. This should, of course, read 1,000 cycles, and not 1,000 ohms.

Auto-bias Problems

(Continued from page 42)

however, has one slight disadvantage, namely, that the negative side of the output circuit is at a potential above earth to an extent equal to the bias voltage. Should, therefore, the speaker or its transformer be inadvertently earthed, or should a fault to earth develop, such as a breakdown in the transformer insulation, this would have the effect of short circuiting the bias resistor and output valve would probably be ruined through running it without grid bias.

The last illustration (Fig. 5) indicates the circuit of Fig. 3 arranged for a directly-heated output valve. The centre tap of the filament transformer is connected to the common cathode bus-bar. This circuit, of course, is used for all directly-heated output valves.

Satisfactory for Pentodes

At this point it is as well to note that the circuits given in Figs. 1 and 2 are quite satisfactory for indirectly-heated output pentodes. In such valves the load impedance is always very high compared with the bias resistance, the former being usually of the order of 1,000 ohms and the latter in the neighbourhood of 500 ohms. Thus, the loss occasioned by including the bias resistance in the output circuit is quite small and certainly not worth worrying about.

Listeners sometimes find it difficult to understand the reason for, and the operation of, the grid-bias diagram. A few words, shown in several of the grid-bias diagrams. Referring once more to Fig. 1, it will be agreed that in addition to the D.C. voltage drop across the bias resistance, R, due to the mean value of the anode current, there is also an audio-frequency voltage drop due to the audio-frequency variations of the anode current. This audio-frequency voltage drop is also applied to the grid of the valve viz. the secondary winding of the inter-valve transformer. Now the A.C. drop across R is in opposition to the signal voltage, and therefore it tends to reduce the effective signal. Owing to the presence of the condenser in Fig. 1, the higher audio-frequency components are absorbed and do not affect the signal seriously; but the lower audio-frequencies are certainly badly cut. By including the decoupling resistance, D.C.R., in Fig. 2, which is generally of 50,000 to 100,000 ohms resistance, the impedance of the path R, plus D.C.R. to all frequencies is made greater than the shunt path in the grid of the valve.
THE CROYDON RADIO SOCIETY

Mr. E. J. CAMM, Editor of Practical and Amateur Wireless, lectured on "The Constructor, and the Press" to the Croydon Radio Society, and the Short-wave Radio and Television Society of Thornton Heath, at St. Peter's Hall, Croydon, on Tuesday, March 12th.

He stated that even now a revival in club and amateur interest was taking place, the great search for quality reproduction and the intrusion of television being responsible. He knew as a fact that the Croydon Society's attendance was 200 during three times what it was five years ago, and considerably more than at any " boom" period. There was always a thrill in making one's own receiver, and time and trouble could be spent on it which were impossible in the mass-produced article. Thus there were some very marvellous home-made receivers in existence, each incorporating a pet " whim" of its owner.

Mr. Camm argued that members of the two societies should preach the gospel of home construction, and by so doing educate the public to appreciate how good radio reproduction could be. Not the least interesting part of the evening was the discussion on how the ideal technical wireless journal should be run, and he welcomed this opportunity of having views from typical readers of Practical and Amateur Wireless.

Indeed, many a helpful hint was given and taken in the arguments, which showed that in Croydon and Thornton Heath at least the amateur movement was not so small as was usually supposed. Finally, the chairman, Mr. W. J. Bird, thanked Mr. Camm for so invigorating a lecture.

Hon. Sec. the Croydon Society: Mr. E. J. Camm, 112, Cheltenham Road, Croydon.

Hon. Sec. the Thornton Heath Society: Mr. J. T. Webber, 368, Brigstock Road, Thornton Heath.

SLADE RADIO

This Society hold their first meeting in their new room at St. Peter's Hall, Croydon. Their new headquarters for the future. A number, Mr. J. Wally, gave a talk about a new receiver he had just built. It could be operated by remote control, which consists of a small box having tuning, volume, and selectivity controls. It would be possible to control the set in a shop or hotel, leaving the remote control attached by means of about 6 ft. of screened wire, and then dispense with the necessity for a cabinet. Alterations to the set were not likely to prove difficult, and almost any of the parts could be home-made. There were no condensers, and there appeared to be no part that an ordinary constructor could not build without difficulty.

Hon. Sec. the Slade Radio Club: Mr. E. L. Cumbers, 77, Camden Road, South Croydon.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

The members of the London Chapter were afforded another treat when at the meeting held on Friday, March 15th, Mr. S. A. Stevens, B.Sc., gave a lecture entitled "Westinghouse Metal Rectifiers." Mr. Stevens paid particular attention to Westectors, and with the aid of some very interesting lantern slides illustrated the use of these rectifiers, which included the detector valve in circuits having one or more stages of H.F. amplification. Mr. Stevens stated that even now a revival in club and amateur interest was taking place, and almost any of the parts could be home-made.

Hon. Sec. the International Short-Wave Club (London): Mr. J. T. Webber, 504, Buxted Park Road, Thornton Heath.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on receipt of an order for any of our advertisers' catalogues, and address it to "Catalogues," Practical and Amateur Wireless, 8-11, Southampton St., Strand, London, W.C.2.

NEWNES, the Croydon Society's address, was thanked for the information sent to the Croydon Society.

BARGAINS IN PLENTY

This new catalogue issued by the Electradix firm consists of no less than seventy pages of closely-printed and well-illustrated matter, and will prove of considerable assistance to all wireless enthusiasts.

The firm is able to offer numerous remarkable bargains.

For instance, a limited number of compact, type-gas-filled, photo-electric cells whose usual price is £8 10s. each, but which they are prepared to dispense of for £1 5s.

Many experimenters will welcome this opportunity to obtain one cheaply.

The British Talking Picture company's potassium photo-electric cells are also listed, and in fact, it would be hard to find any piece of electrical apparatus of the kind in which the amateur is interested that has not been omitted, it itit, even in this remote circumstance quotation can usually be made by return of post.
PRACTICAL WIRELESS

BLUEPRINT SERVICE

There are many wireless enthusiasts who find the construction of a wireless set to be a fascinating challenge. Whether it is a simple receiver or a more complex transmitter, the process of assembling and tuning the components can be both rewarding and educational. The Blueprints Service offers a wide range of blueprints for various wireless and wireline sets, suitable for both amateurs and professionals.

AMATEUR WIRELESS AND WIRELINE MAGAZINE

Print)

SUPERHERBS

For those interested in constructing their own sets, the Blueprints Service provides detailed instructions and diagrams. These blueprints are full-size, allowing for easy reference and implementation. They are provided in sets, with each set covering a specific model or type of set.

PORTABLES

For those interested in portability and convenience, the Blueprints Service also offers blueprints for portable sets, which can be easily carried and used in various locations.

SHORT-WAVES

Wireless enthusiasts can also explore the realm of short-wave radio, which allows for reception of signals from around the world. The Blueprints Service offers blueprints for various short-wave sets, enabling enthusiasts to build and tune into the vast international broadcast spectrum.

Mains Operated

Wireless enthusiasts who prefer mains-operated sets can also find blueprints suitable for their needs, allowing for a reliable and consistent power supply for their wireless devices.

For more information on the Blueprints Service and the various sets available, please refer to the full magazine issue or contact the service directly.
The Mills Brothers give us another new record: "Sweet Georgia Brown" and "Sweter than Sugar," on Brunswick RL224. In two months they will be with us again with another medley of new songs. In the meantime, you will enjoy their mid-March offering.

Panachord Records

The Street Singer gives us a medley of the songs he has made famous on his records in England, starting with "Marta," which must be the outstanding seller of the last four years—and including "Home," "Play to me Gipsy," "Call me Darling," "Masquerade" and "Auf Wiedersehen, my dear." This record, Panachord 25702, should be very popular.

Another interesting record is a piano medley by L. Green on Panachord 25602. As the titles included in this new medley are outstanding favourites, this record should be very well received, especially at one sitting.

Tessie O'Shea has recorded two titles well suited to her style in "She Fell for a Fellow from Ooglesia" and "The Girl's Secret," on Panachord 25708. As I have written before, this great music-hall artist, only just of age, has an enormous future before her. Her effervescent style, so reminiscent of the really spacious days of the old music hall, is contagious to a degree.

Decca Records

AMBROSE and His Orchestra offer two distinct and unusual recordings for this month. The first is "A Story of London Life," on Decca F5478, a "potted" drama which was first broadcast by him a fortnight ago, and which I hope you will make a special signature tune—which he recently recorded all our mid-month releases.

"Rhapsody in Blue," on this record, and quite the most outstanding of a recording of "Rhapsody in Blue," on another label, I am glad that Ambrose has made a move into best-selling class. I prophesy that he will make better comedy records than most bands. I, prophesy that "Stunt" records, such as this, are unusually popular with the public, although I can't think why. When an orchestra can play dance music as Ambrose can, it seems a pity to produce sketches with a minimum of musical background. To me it is like the Berlin Philharmonic Orchestra playing at a circus. But that appears to be my own personal opinion, because the public go mad over a record like this, and I must therefore be in the minority. I am not denying that the result is amusing; that is not my point. I am sorry that Ambrose should be the orchestra that the public prefer to make such records. In fact, the sales of his other "comedy" records, such as "No, No, a Thousand Times No," and "Home James, and don't Spare the Horses," already look like becoming record records. They are running neck and neck into huge figures. Of course, Ambrose has, apart from his "comedy" records, such as "No, No, a Thousand Times No," and "Home James, and don't Spare the Horses," already look like becoming record records. They are running neck and neck into huge figures.

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"When Day is Done" (K745)—his signature tune—which he recently recorded on a 12" record, is another such classic as this, and I hope you will make a special point of hearing Ambrose's version of "Rhapsody in Blue."

Brunswick Records

I will give you the "Folies Borgerde Paris" records first: The Dorsey Brothers' Orchestra makes a brilliant show with "Au Revoir Amour" and "Singing a Happy Song" on Brunswick RL223. This band also make another record, "Rhythm of the Rain," and "I was Lucky" on Brunswick RL234.

Since this band have been on the new red label (1s. 6d.) series, they seem to have changed their English following enormously. I do not wonder at this. The arrangements and performance of this band are superb. I have already mentioned that the Dorseys and Ambrose often interchange their arrangements, which is a splendid move on both sides.

DE LUXE MODEL "ALL-IN-ONE" RADIOMETER

This popular "All-in-One" Radiometer for battery sets, has a dial of 3½ ins. and is finished in mottled bakelite. Indispensable to electricians, radio engineers, and to all who make a special business of testing electrical equipment. Price £2 2s. 6d.

"ALL-IN-ONE" RADIOMETER

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PIFCO ELECTROMETER.

This popular Pifco Electrometer is indispensable to radio engineers, electricians, radio enthusiasts, and to all who are interested in electrical measurement. Price 12/6. A case can be supplied at 2/- extra.

PIFCO LTD., SHUDEHILL, MANCHESTER or 150, Charing Cross Road, London, W.C.2.

Service your own Radio

IT'S CHEAPER!

GAINING knowledge from other people is apt to be expensive. You owe it to yourself to find out what is wrong with your radio receiver with absolute certainty before running up expensive service bills. Any kind of radio fault is easily traced with a Pifco Radiometer. The possession of a Pifco Radiometer is the finest insurance against expensive repair bills and disappointments. There is a model for both mains or battery sets.

PIFCO ON THE SPOT WILL TRACE YOUR TROUBLES LIKE A SHOT

PIFCO LTD., SHUDEHILL, MANCHESTER or 150, Charing Cross Road, London, W.C.2.
PRACTICAL AND AMATEUR WIRELESS March 30th, 1935

Let Us Send You This 28-Page Booklet—Free

It gives full information regarding various I.C.S. Courses of instruction in 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 broad-casting as well as British wireless practice. It is a modern education, covering every department of the industry.

OUR COURSES
Included in the I.C.S. range are Courses dealing with the installing of radio sets and, in particular, with their Servicing, which to-day unfortunatly concerns every wireless dealer and his employees. The Operating Course is vital to mastery of operating and transmitting. There is also a Course for the Wireless Salesman. This, in addition to inculcating the art of salesmanship, provides that knowledge which enables the salesman to hold his own with the most technical of his customers. Then there are the Preparatory Courses for the City and Guilds and I.W.T. Exams. 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.

International Correspondence Schools, Ltd.,
Dept. 94, International Buildings,

Without cost, or obligation, please send me your "Radio" booklet of information about the Courses I have marked X

☐ COMPLETE RADIO
☐ RADIO EQUIPMENT
☐ RADIO SERVICEING
☐ RADIO SERVICEING AND SALESMAHNSHIP
☐ ELECTRICIANSHIP
☐ EXAMINATION (state which)

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W. S. T. (Mitcham). The H.T. negative return was taken to the wrong side of the bias resistance, but this would cause no Transformer. There must be some error in your wiring.

R. F. (Landor). "What do you do with the output stage, and how do you refer to? Other stations or static? Method of cutting the trouble will depend upon the type of interfering station." We suggest that you build the receiver exactly as described. It should work.

J. E. M. (East Ham). Probably mains unit is unsuitable. Try a dry battery to make certain that the receiver itself is in order.

W. G. H. (Edinburgh). Mains, Headband, can supply a transformer to replace that in your eliminator. Write to them for details.

E. A. (Gloucester). Regret no details obtainable. Protole resistance is on neighbourhood of 400 to 500 ohms, and inductance round about 20 to 30 henries. A.R.A. A.P. 150 to 1.

J. M. H. (Gloucester). Condenser you have is probably suitable.


J. D. A. (Northumberland). Arrangement you specify is quite in order, the transformer output from which can be connected to the output of your receiver. There is no suitable choice on the market so far as we are aware.

H. V. (Finley). We do not advise the modification to a 1932 receiver.

S. S. (Leicester). Output with transformers for half-watts, and with 250X1 it is 450 milliamps. With this particular circuit you would probably not notice the difference between the two Transformers.

E. R. S. (Hull). We do not re-cond the addition of another stages to your two-valve receiver. An inexpensive 802G0. is advisable to use.

H. C. (Lincoln). The Class B unit described in PRACTICAL AND AMATEUR WIRELESS No. 110 may be added to your receiver. In the opinion of some the output of a particular PM4 will be a suitable speaker.

W. G. A. (Birkenhead). We suggest that you obtain the "Modern Wireless Sets and How to Make Them" (obtainable from bookstalls for 4½d.), and con-struct the "Baby Grand Three" described therein.

S. G. (Hove). We suggest that you build the £5 Superhet (Bagpiper PW40). This is a very subjective and sensitive receiver.

L. F. (Balsam). H.T. may be supplied from the mains through an H.T. eliminator without the neces-sity for any wiring alterations in the receiver, but all mains-operation is designed indirectly-heated mains valves should be used and the eliminator circuit altered to suit them.

W. A. T. (Swansea). The cranking experience may be due to a dirty switch contact, or to bad contact between the valve base and the telephone sockets.

W. G. P. (Royston). Although it is advisable to use the No. 168 valve (or a similar type) may be employed. 120 watt transformers are marketed by Collier Ltd., 125, New Bond Street, London, W.1.

G. M. (London, W.1). A 30,000 ohms nicad resistance and a 4 mfd. coupling condenser should be used in your L.F. circuit.

T. Y. (Haig Keng). As an electric gramophone is used in the transmitting studio, it is possible to get as good quality from one's own electric gramophone as from record receipts. A reliable pick-up (such as E.T.H., or Lionspot, etc.) should be used between the grid of the first L.F. valve and the common negative line.

S. W. (New Mills). The Class B unit described in PRACTICAL AND AMATEUR WIRELESS No. 119 may be added to the All-Frequency Tube if it is desired to increase the current available from the output valve.

R. C. (Motherwell). We regret that we cannot supply a blueprint of your output valve or transformer.

T. W. H. (Camberwell). An H.F. choke is not essential in the circuit described, and where economy is of paramount importance this component may be omitted.

R. S. (Heidelberg). It is not unusual to obtain reproduction after the speaker has been disconnected.

J. W. R. (Reed). Your Colvern coils, Ferranti transformers, and the following of your valves may be used in a Class B unit described in PRACTICAL AND AMATEUR WIRELESS No. 119, and E. M. F. P.U. E. There are several Class B four-valve blue-print transformers for sale on our present List, No. 12, P.W. 2.

E. W. (Dundee). We recommend the use of a straight two-terminal reaction condenser in short-circuit, the use of a straight two-terminal reaction condenser in short-circuit. The following of your valves may be used in a Class B unit described in PRACTICAL AND AMATEUR WIRELESS No. 119, and E. M. F. P.U. E. There are several Class B four-valve blue-print transformers for sale on our present List, No. 12, P.W. 2.

J. W. R. (Reed). We recommend the use of a straight two-terminal reaction condenser in short-circuit.

T. W. (Wolverhampton). We suggest that you check the wiring carefully, and if this is in order test the valves (especially the output valve), detector, middling and grid condenser.

G. B. (North Lancs). The trouble you are ex-periencing tends to indicate that the voltage of your H.T. battery is too low, the complete refu-ling referred to is connected to the tap of the H.T. valve. We advise you to test the H.T. valve.

H. W. (H.M.S. Renown). The address of R. Robertson, 87, Great Marble Arch, London, W.1. We suggest that you build the receiver exactly as described. It should work.

C. S. (H. B. Sheffield). We suggest that you use more care with the connections of the H.T. output valve. The pass circuit of the first valve. Distortion may be due to insufficient H.T. voltage, or incorrect adjust-ment of the B. voltage of the output valve.

P. (Tipton). The contents of your letter may be used. It appears that the mains unit is suitable for supplying a 1,000 ohms connected between the centre tap of the filament winding feeding the output valve and H.T.-

H. W. S. (Harrow). We suggest that you try the use of an extra tuned stage to your receiver. A reliable pick-up (such as E.T.H., or Lionspot, etc.) should be connected in parallel with the tuning sections of a gangcondenser for the purpose of balancing stray circuit impedances.

A. B. (Rotherham). The trouble experienced tends to indicate that the valves you are using are unsuitable. Try a dry battery to make certain that the receiver itself is in order.

J. B. (Birmingham). The one-valve low-frequency amplifier referred to in your letter should prove satisfactory for your type of receiver.

A. W. (South Shields). The trouble you are ex-pecting to experience is due to insufficient H.T. voltage, or incorrect adjustment of the valves you are using. We suggest that you use more care with the connections of the H.T. output valve. The pass circuit of the first valve. Distortion may be due to insufficient H.T. voltage, or incorrect adjust-ment of the B. voltage of the output valve.

E. D. (Hull). The components are generally of good quality from one's own all-electric gramophone.

T. W. (Chesterfield). The coil unit you supply to the receiver itself is in order.

W. G. A. (Swansea). The trouble you are ex-pecting to experience is due to insufficient H.T. voltage, or incorrect adjustment of the valves you are using. We suggest that you use more care with the connections of the H.T. output valve. The pass circuit of the first valve. Distortion may be due to insufficient H.T. voltage, or incorrect adjust-ment of the B. voltage of the output valve.

W. J. (T. H. C. Belfast). As you do not state the type of receiver, we cannot help you, and you will point out that coil terminal numbering is not standardized.

A. W. (Bradford). The trouble experienced tends to indicate that the valves you are using are unsuitable. Try a dry battery to make certain that the receiver itself is in order.

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"Experimenter's S.W. Three" in South Africa

Sir,—As a regular reader of your paper I have noticed that many of your readers in South Africa are asking for a powerful mains and/or battery S.W. receiver. Might I recommend them your “Experimenter's Short-wave Three.” Up till recently I have used this with great success here. Regarding the question of selectivity on 25 m., this particular set, when used with a 150 ft. aerial, had no difficulty in separating Zeezen and Daventry. As far as volume goes this set, when used with a M.C. speaker, gave large room volume on Daventry (25 m. and 31 m.), Paris, Zeezen (both 25 m.), Bombay, Buenos Ayres, Round Brook, besides many others on phones.

If they desire a little more volume and selectivity without sending up the cost of batteries let them use, as I am now doing, a pentode detector and pentode L.F. This gives results equal to many of the 5-valve American sets. This I have also adapted for mains use, but it is not sufficiently heatproof to allow of the use of phones. Sets of this type (i.e., untuned S.G., det., hum free to allow of the use of 'phones) for mains use, but it is not sufficiently heatproof to allow of the use of 'phones. If they desire a little more volume and selectivity without sending up the cost of batteries let them use, as I am now doing, a pentode detector and pentode L.F. This gives results equal to many of the 5-valve American sets. This I have also adapted for mains use, but it is not sufficiently heatproof to allow of the use of 'phones.

A Suggestion from India

Sir,—I noticed in PRACTICAL WIRELESS some time ago a suggestion from an overseas reader for a short-wave and medium-wave receiver. May I second this, and suggest a four-valve receiver—H.F., L.F., Q.F.P. with a 'phone jack clink in the detector or low-frequency stage.

I would also like to see the short-wave feature increased, and by at least one valve per week. I think that this would be appreciated by a large number of readers, as the short-wave fraternity is definitely increasing. I doubt whether the manufacturers are developing anything out of date and of little use. Here in India we had only two papers giving such a list, but one of them is no longer obtainable, while the other has discontinued giving it. Now we have no reliable means of seeing a correct and up-to-date list. What we get is usually out of date and of little use: therefore, this addition to PRACTICAL AND AMATEUR WIRELESS will be greatly appreciated over here.

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THE EDISWAN HIGH-VACUUM CATHODE-RAY TUBE

We have recently received for test the new Ediswan cathode-ray tube, illustrated below, which is of the high-vacuum type, utilizing an electrostatic system of "electronic lenses" to focus the electron beam to a fine point on the fluorescent screen. As it is a high-vacuum tube with no gas filling, many advantages over the original "soft" tube are present.

Firstly, better life is obtained at high accelerator voltages, as the cathode is not subject to any damaging effect due to the presence of positive ions.

Secondly, complete scans of the fluorescent screen do not reveal any distortion of image due to "origin" or "threshold" effect.

Thirdly, almost perfect modulation of spot intensity is obtainable, as concentration of the beam is not dependent within limits upon beam current. This property of the new tube renders it permanently suitable for the reproduction of television images up to 150 lines or more.

The grid-or negative-cylinder modulation characteristic anode current (beam current), grid volts curve is similar in form to the thermionic valve, beam current and intensity varying practically in a linear manner over wide limits with changes of negative cylinder voltage; also, because the tube is high vacuum, high accelerator voltages may be used attaining high electron velocities, enabling the device to record recurring and transient phenomena of extremely rapid speed. Due to the special design of deflector plates, the sensitivity is only slightly less than that of the original gas-filled cathode-ray tube.

All deflector plates are brought out to terminals on the base of the tube and should be used and connected in the usual manner, care being taken to ensure that all plates have a conducting path to the final condenser. This property of the new tube renders it permanently suitable for the reproduction of television images up to 150 lines or more.

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THE WEARITE WAVE-TRAP COIL

A new type of wave-trap coil that will give first-class results can be made by using an "on-off" switch and a wave-trap condenser in conjunction with the wave-trap coil shown on this page.

This coil consists of a highly efficient iron-cored coil specially designed for use in a wave-trap coil. The circuit diagram showing the connections of the coil, condenser and switch is shown on a pamphlet supplied with the coil, also the method of connecting the trap in the aerial lead. To operate the trap, the condenser should be set at zero and the interfering station tuned in on the set to give maximum volume. Next increase the trap condenser until the volume of the station is reduced to a minimum, and leave it in this position. The set can now be used in the usual manner. If the interfering station is on the long-wave, it will be necessary to open the switch to bring the long-wave coil of the trap into circuit. The price of the coil is 7s. 6d. and it is supplied with a core, costs 5s. 6d.
SPECIAL NOTE

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

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

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

(5) Grant instructions to queries.

Adding a Pick-up

"Reading about gramophone pick-ups in your journal, I am desirous of fitting one to my set, but as there are no pick-up sockets provided I do not know where the leads should be connected."—F. W. (Sheffield).

Assuming that your receiver is of the battery-operated type, one of the pick-up leads should be connected to the grid terminal of the detector valve and the other to the -41 volt socket of the G.B. battery.

60s. Three Connections

I have built the 60s. Three described in "Practical Wireless" dated December 2nd, 1935, but I have an extra valve and I am building a two-valve set for use on long and medium waves. I want to know if there is any difference between the A.C. mains unit, using two 2 volt 2 amp. valves. Would it be possible to supply the filament current from the mains ?—F. W. L. (Birmingham).

It is permissible to supply the valve filaments from the D.C. mains, but slight hum is to be expected when this method of supply is employed. The mains + lead should be connected via a 40-watt 220 volt lamp to the L.F. + terminal of the receiver, and the mains — lead direct to L.T.—terminal. An article on this subject appeared in PRACTICAL WIRELESS dated August 4th, 1934.

Adjusting the Summit Three

I have built the Summit Three, but I cannot get it to take more than 3 volts grid bias on the output valve, and the potentiometer volume control has very little effect. I would also like to improve the selectivity.—A. R. A. (Banor).

Your trouble indicates that you have interchanged the leads. The G.B. lead connected to the G.B. terminal of the L.F. transformer should be connected to the —0— or —4— socket of the G.B. battery, and the G.B. lead of the potentiometer to the —0— socket. Selectivity may be improved by connecting the coupling condenser C5 to the third terminal of the second coil instead of to the first terminal, and if a very long aerial is used a .0003 pre-set condenser may be connected between the aerial terminal and terminal 3 of the first coil.

Signal Generator Details

I am building the Signal Generator described in the July 14th, 1935, issue of "Practical Wireless," but there are a few points that I am rather hazy about. Does the meter read in actual A.C. volts, or are the readings only comparative? If the former, what voltage is to be expected from, say, a set giving 2 watts output? What is the highest A.C. voltage that the meter will handle? What is the relation between the static readings ?—G. H. (Birmingham).

The output meter is an A.C. voltmeter. The paragraph "Calibrating the Meter" shows how it is adjusted by its bias to give one volt deflection. In this way it is possible to read actual microvolts because the lower attenuator tapping gives 3 volts per division. The most satisfactory way of obtaining the A.C. output of a receiver is to measure the resistance of the output coil of the loudspeaker, then, when the equation V²/R can be obtained the wattage output. The 5 ohm stud gives a lift of the output obtained from the second stator. The sketch of G.B. connections you enclosed is correct.

Coil Construction

"Could you tell me how many turns of 24 s.w.g. D.C. wire I should require to wind on a paxolin former 2½ in. in diameter to tune from 200 to 500 metres, and from 1,000 to 2,000 metres, the coil to be used as a Class B transformer? How many turns can I wind on in the same manner?"—D. D. (Edinburgh).

We suggest that you use 47 turns for the medium-wave secondary winding, 140 turns for the long-wave secondary winding, 20 turns for the medium-wave primary winding, 50 turns for the long-wave primary winding, and 60 turns for the common reaction winding. The coil may be used in the aerial circuit or between an S.O. valve and the detector, but it cannot be satisfactorily used as an inter-valve coupling if the H.F. valve is of the triode type.

A.C. Hall-Mark Speaker

"I am at present using a receiver with Class B output and a Rola P.M. speaker. The speaker has only two leads, and is coupled to the Class B valve by means of a Class B transformer. I intend building your A.C. Hall-Mark, and would like to know whether my existing speaker and Class B output transformer can be used."—W. G. H. (Kirkcaldy).

The speaker used in the Hall-Mark Four is of the energised type, having a field-winding resistance of 2,000 ohms, and an output transformer attached suitable for matching two 41MP valves in push-pull—optimum load 6,000 ohms. Therefore, we cannot recommend the use of your existing speaker and transformer.

Choosing a Set

"I want to build an all-mains A.C. three-valve set for use on long and medium waves. Good quality is most important, but it should be as selective as possible."—J. P. L. G. (Dublin).

We suggest that you build the A.C. model of the £5 Superhet. (Blueprint No. 45), but if a straight receiver is preferred the A.C. Three (Blueprint No. 29) is recommended. The selectivity of the superhet is superior to that of the straight set, however.

The coupon on cover iii must be attached to every query.
MISCELLANEOUS ADVERTISEMENTS

Advertisements are accepted for these columns, 10 lines per advertisement, in black face type and/or capitals are charged half-line price. 3 lines per advertisement, 2/- per paragraph. Display lines are charged at 6/- per line. All advertisements must be prepared. Radio components advertised at below list price do not carry manufacturer's guarantee. All communications should be addressed to the Advertising Manager, "Practical and Amateur Wireless," 9, Southampton Square, London.

PREMIER SUPPLY STORES

ANNOUNCE a new Branch at 145 and 152A, Fleet Street, E.C. (near St. Paul's Cathedral). Conveniences of all offices; post orders and calls to High Wycombe.

OFFER the following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 6/-, under 6/- post paid extra. 5/- and above carriage extra; orders under 5/- cannot be sent C.O.D.; please send for price lists.

PREMIER SUPPLY STORES announce the Purchase of a World-Famous Cautious Valve Manufacturer, all the following goods are now 15/-, 49/-; without volume control, 46/-.

1. Blue Spot 29 D.C. Moving Coil, with Multi-ratio standard mains types, fully guaranteed, 4/6 each.

2. Magnavox D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 156, 2,500 ohms, 17/6.

3. Potentiometers by Best Manufacturers, 200, 2,500 micro-farads, 2/6; 2,500 ohms, 12/6; D.C. 152, 2,500 ohms, 17/6.

4. Blue Print for Short Wave Adaptor, fully screened, 7/6, with trimmers, for Short Wave sets. Please send for free copies.

PARALLAX. OFFER Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps. Rectified output, 2-3 amps, 4-5 volts; 1,300, 100-250 volts, 50 milliamps, 1,350, 2-3 amps, 4-5 volts, 1,330, 2-3 amps, 3-4 volts, 1,340, 2-3 amps, 2-3 volts, 1,350, 2-3 volts.

SPECIAL OFFER 250, 30 milliamps, and 4 volts, 15/- each pair.

US.A. 5 gang Co-ductor, 0.00005, with trimmers, 3/6; a really solid job, 150, 200, 250, 1,500 volts, 1,62.

DARRO VALVES, 4 volt battery type, H.F., R.C., power 1/6 each; 4 volt directly heated power 1/6 each.

LARGE Selection of Pedestal, table and radio-grain cabinets by best manufacturers on manufacturer's original cost: send for list.

NEW Blue Print P.M. Speaker, Multi-ratio transformer, 110 volts, 2,500 and 7,500 ohms.

T.V. Supplies, Ltd., Bush House, Dept. PR, W.1. Lotus 3-gang Band-pass Coils; Blue Spot 29 D.C. Moving Coil, with Multi-ratio transformer, 71 Ohms, 2,500, and 7,500 Ohms.

T.G.C. Electrolytic Condensers, 15 mfd., 50 volt, working, 1 mfd., 12 volt, working 1/4; 15 mfd., 12 volt, working 1/2.

B.T.H. TRANSMISSIONS, 400 volt, working, 100 volt, 10 volt, 1 volt, 1/2 volt, 1/4 volt, 1/8 volt.

MAGNOVO D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 156, 2,500 ohms, 17/6.

MAGNOVO D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 156, 2,500 ohms, 17/6.

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PRACTICAL AND AMATEUR WIRELESS - March 30th, 1935

- Southern Radio's Wireless Bargains
- McMichael Radio 4-Valve D.C. Supervox
- Radium-Mart, the Shortwave Specialists
- McMichael-Silver Valve LodeX
- Birmingham Radiomart
- Pearle & Pearl
- Cabinets

**SOUTHERN RADIO'S WIRELESS BARGAINS:**

- **Super-Boost Permanent Magnet Speakers:** Universal Transformers for Power, Super-Power, 45 F.M., 24 F.M., 45 F.M. (List 39/6). All condensers are guaranteed brand new. (List 45/6).
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**WESTMINSTER BARGAINS**

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**SPECIALS**

- **Telesonic Receivers (Latest Edition):** 44 F.M., Full size, New Model, 30 F.M. (List 30/6).
- **Super Four:** Three-Valve Battery receivers, and a Quality 3-Valve Receiver. Superior Quality for Superior Price.
- **Three-Valve Short-wave Three:**
- **Price:**

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**SOUTHERN RADIO WIRELESS UPDATE**

- **Amateur Wireless and Radiophones:**
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**CABINETS**

- **List Free:**
- **Price:**

**SOUTHERN RADIO WIRELESS UPDATE**

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- **Price:**
MORE ASTONISHING BARGAINS BY OLYMPIA RADIO LIMITED.

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ASTONISHING offer of Telefun 395, 395/280 V.Superhet. Receiver, complete with radios, and in perfect condition. Please mention this paper when replying. Please mention this paper when replying.

BATTERIES — The Battery Model is supplied complete with all Batteries.

CAES: Permanent Type Microphone. Nickel Plated Syringing type. On Bakelite stand, in perfect condition. Please mention this paper when replying.

THE Battery Model is supplied complete with all Batteries.

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