THE LEADING NATIONAL WIRELESS WEEKLY!

Practical and Amateur Wireless

3d. EVERY WEDNESDAY

Edited by F. J. CAMM

a GEORGE NEWNES *Publication*

Vol. 6. No. 155.
September 7th, 1935.

AND AMATEUR TELEVISION

New Season's Short-Wave Components

THE EDITOR'S REFLECTIONS ON RADIOLYMPIA.—P. 719

Practical and Amateur Wireless
Edited by F. J. CAMM
Technical Staff: W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.
VOL. VI. No. 155. September 7th, 1935.

ROUND *the* WORLD *of* WIRELESS

A Somewhat Misleading Call

LISTENERS who hitherto have been accustomed to hear the *Hier Huizen* call from the 301.5-metre Dutch 20-kilowatt transmitter at Kootwijk will be puzzled when finding that the station announces itself as Hilversum. The fact is that both this and the transmitter on 1,875 metres give out the same call (*Hier Hilversum*), but some indication is provided by the addition of the name of the Association responsible for the programme.

Those Monthly Instalments

THE result of permitting listeners to pay their licence fee monthly is clearly shown by the German broadcasting returns. In most districts during the holiday season owners of wireless sets stop payment of the tax, and consequently July showed a reduction of 72,722 registered licences. August figures will show a further fall.

Finland's New Transmitters

A NEW 25-kilowatt broadcasting station is now being erected at Oulu (Uleaborg) to replace the small transmitter now relaying the Helsinki programmes. The wavelength will be 696 metres (431 kc/s). Another station will be built at Vasa (Nikolaistad), a seaport on the east coast of the Gulf of Bothnia. It will operate on a national common wavelength allotted to Finland; the proposed power is reported to be 10 kilowatts.

The Solution of a Problem

ALTHOUGH originally it had been proposed to install a number of relay stations to cover the country, it is now considered that the new Brasov National transmitter will adequately carry out the service. To satisfy all districts the authorities are now considering the opening of studios in all important Romanian centres, and to connect them direct to the capital (Bucarest), thus permitting local talent to be included in the programmes.

Spanish Broadcasting Network

FOUR important radio organisations have been requested to tender for the establishment of the ten transmitters which the Spanish Government has decided to install for the broadcasting service. The stations to be erected are: Madrid (National), 150 kw., 1,639 metres (183 kc/s); Regional, 50 kw., 293.5 metres (1,022 kc/s); Barcelona, 50 kw., 274 metres (1,095 kc/s); Valencia, 20 kw., 352.9 metres (850 kc/s); Seville, 60 kw., 410 metres (731 kc/s); Corunna, 30 kw., 377.4 metres (795 kc/s); Bilbao, 30 kw., 238.5 metres (1,258 kc/s); Teneriffe (Canary Islands), 10 kw., 207.5 metres (1,447 kc/s), and 5-kilowatt relays at Murcia and Oviedo, to work on the Teneriffe channel.

Austria Forges Ahead

THE old 17-kilowatt Vienna Rosenhuegel transmitter has been transferred to Linz where, in the autumn, it will replace the present 500-watt station. Vienna has installed a 5-kilowatt transmitter in its War Office building to act as a stand-by for emergency; it may be used later for providing an alternative programme to the capital. Salzburg is to be endowed with a 5-kilowatt plant and the power of Innsbrueck is to be doubled.

First Again!

A NEW READER SERVICE!

Commencing with next week's issue we shall give, week by week, a

SERVICE DATA SHEET

Each sheet will deal with one of the Practical and Amateur Wireless Receivers, and will give current and voltage readings at all points in the circuit, thus enabling the constructor to carry out efficient tests, and to ensure that the receiver is functioning satisfactorily. SERVICE DATA SHEET No. 1 deals with F. J. Camm's £5 Battery Superhet.

Teaching Economy by Radio

IN view of the present necessity to retrench, the French authorities are broadcasting every morning at 8 a.m., through the National transmitters, standard daily menus based on seasonable and consequently plentiful food products. The housewife is also given instructions regarding prices to be paid for the various items.

Jerusalem Calling!

THE 20-kilowatt station which the Marconi Company is building at Ramaliah is now in its last constructional stage, and it is expected that it may start testing on 449.1 metres towards the middle of September.

Death of a Pioneer

FROM Orella, California, comes the report of the death of James Tresidder, who in his younger days was the assistant of Graham Bell, the inventor of the microphone. When the first primitive hook-up was being tested out, Tresidder's task was to shout "*hello*" to his employer, who was listening at the other end of the line. But this "*hello*" made history!

Kosice's Quaint Interval Signal

THE Czech station which listeners hear on 259.1 metres (1,158 kc/s) just below London National, broadcasts between transmissions a short recorded melody entitled *Hej hore Nazi* (O Mountains! O Forests!). It is played on the fujar, an old Slovak instrument.

Radio for the Faeroes

THE Danish authorities propose to transfer the old 1-kilowatt Copenhagen transmitter to Thorshavn, on the island of Strömö. Thorshavn, the principal town in the Faeroe Isles, already possesses a radio telegraphy station, and the site would be suitable for the relay and rebroadcast of the Danish programmes.

New High-Power U.S.A. Station

BROADCASTS from the 50-kilowatt WOR transmitter at Newark (New Jersey) are now being heard in the earlier morning hours. The station belongs to the Mutual Broadcasting System, which also includes WLW, Cincinnati, and WGN, Chicago. As a short-wave outlet on the 49-metre band in November next, it will possess the call sign W3XHI.

Interfering Harmonics

LISTENERS to Eiffel Tower, Paris, which broadcasts on 206 metres (1,456 kc/s), may have noticed that transmissions from Radio Paris are occasionally heard in the background. This is due to the eighth harmonic of the French National transmitter on 1,648 metres. Slightly above, on 208.3 metres, the ninth harmonic of Kootwijk (Holland) working on 1,875 metres, can also be picked up.

ROUND the WORLD of WIRELESS (Continued)

Broadcast from the Potteries

THE first outside broadcast from the Potteries in the Midland programme is to be a relay of variety from the Theatre Royal, Hanley, on September 12th. That part of Staffordshire was formerly within the boundaries of North Region.

Down on the Farm

THE third programme in the series "Down on the Farm" will be broadcast on September 11th, when Western listeners will be taken on a walk round a Devonshire farm.

"1935 Frolics Concert Party"

ON September 14th, another Morecambe Night will be broadcast, including George Pawsey's "1935 Frolics Concert Party," relayed from the Palace Theatre, Morecambe; Ernest Binns' Arcadian Follies, relayed from the Arcadian Pavilion, Morecambe; and Lionel Millard and his Band from the Winter Gardens Ballroom, Morecambe.

Popular Entertainers

LISTENERS will have the opportunity of welcoming the return of Murgatroyd and Winterbottom on September 11th. This amusing pair of entertainers is none other than our old friends Ronald Frankau and Tommy Handley. The number of wisecracks they pack into their short period is simply amazing.

Sheffield Orpheus Male Voice Choir

THIS well-known choir, conducted by S. Boyd Roberts, will give a concert on September 8th from a Leeds studio. The choir, which was formed in 1909, is very well known to listeners. It has a membership of about seventy and has appeared twice at Buckingham Palace for the Never Forgotten League, as well as on concert platforms all over the country.

Brass Band Concert

ON September 11th, a concert by the winning band in the Belle Vue Brass Band Contest held on September 2nd will be broadcast from the Northern transmitter. The soloist will be Melville Smith, who will provide an interlude of songs by Roger Quilter.

"The Mystery of the Seven Cafés"

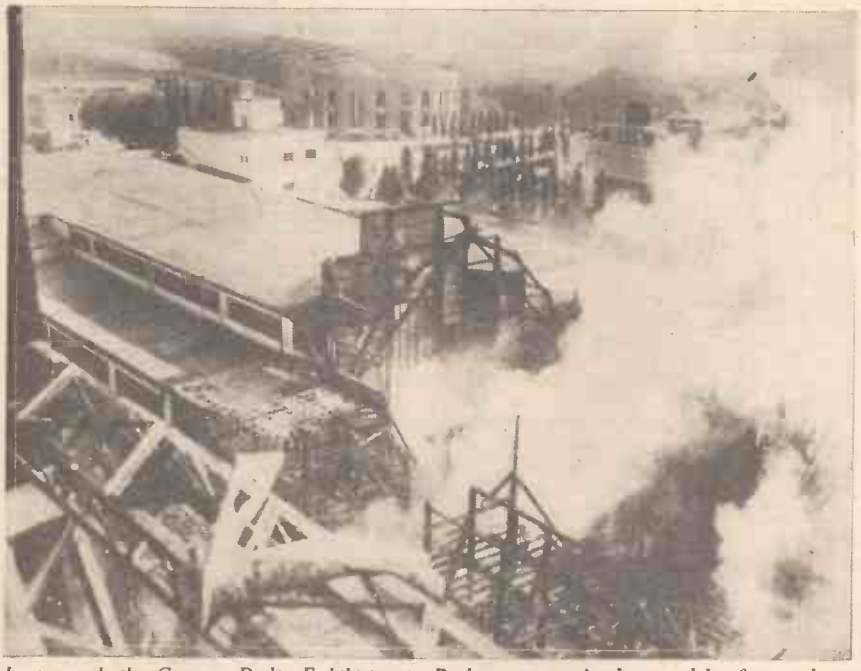
ANOTHER interesting episode in this exciting story is to be given on September 6th. This time the café is situated in Rome, where Tiger Standish catches up with his evil machinators. One thing of interest to listeners in this broadcast will be the return of Walford Hyden, who is now rapidly progressing in convalescence after his operation for appendicitis and who will again take the baton of the Café Colette Orchestra. Actually while recovering from his severe illness, he has been arranging the music for this popular feature.

INTERESTING and TOPICAL PARAGRAPHS

Sheffield Transport Band

IN the Northern programme on September 8th, a concert will be given by the Band of the Sheffield Transport Department, with Rowland Morfitt (baritone). This band, which was formed some years before the War, was re-formed after the Armistice and at present comprises twenty-nine performers. On more than one occasion it has figured in the prize lists at the National Brass Band Festival at Crystal Palace. The present conductor, George W. Hespe, L.R.A.M., A.R.C.M., took up his position on retirement from the service in 1933.

GERMAN RADIO EXHIBITION FIRE!



Last month the German Radio Exhibition in Berlin was partly destroyed by fire, and our illustration shows the burnt-out buildings. The photograph was taken while firemen and soldiers were searching amongst the debris.

"Who Remembers?"

RADIO "fans" who have held a wireless licence for ten years will welcome a programme entitled "Who Remembers?" to be broadcast on September 13th. Harry Pepper originally conceived the idea of producing this at old Savoy Hill. The plans were all settled, but Harry Pepper was beaten by the pick and excavator, for Savoy Hill is rapidly being demolished. The idea of "Who Remembers?" is to assemble artists who were in the original broadcasts way back in 1924, and to produce a programme which, perhaps, some listeners may remember having heard from Savoy Hill. Among the artists will be Tommy Handley, Alma Vane, John Rorke, Jean Alliston, Foster Richardson, Miriam Ferris, and Harry Pepper. The book is by Miriam Ferris, one of the earliest broadcasting artists, and production is in the hands of Gordon McConnel.

SOLVE THIS!

PROBLEM No. 155.

Jordan constructed a dual-range short-wave coil which required a three-point switch for wave-change purposes. He made a receiver to incorporate this coil, using the usual arrangement of metal panel, chassis, and low-loss components, but when he was assembling the various parts, he found that he had no three-point switch. He discovered an ordinary push-pull on-off switch, however, and decided to use this by joining one of the coil connections to the plunger and thus making this a third connection. When the receiver was tested, he found that tuning on the medium waves was more or less normal, but on the long waves he could not receive any of the long-wave stations. What was wrong? Three books will be awarded for the first three correct solutions opened. Envelopes must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 155 in the bottom left-hand corner and must be posted to reach here not later than the first post Monday, September 9th, 1935.

Solution to Problem No. 154.

When Jobbings removed the L.F. transformer lead he overlooked the fact that the reaction lead, which was taken to the plate terminal on the valve-holder, also had to be included in the anode circuit, and thus when he only removed the H.T. lead he was leaving the reaction circuit joined to the screening grid and this accounted for the lack of reaction.

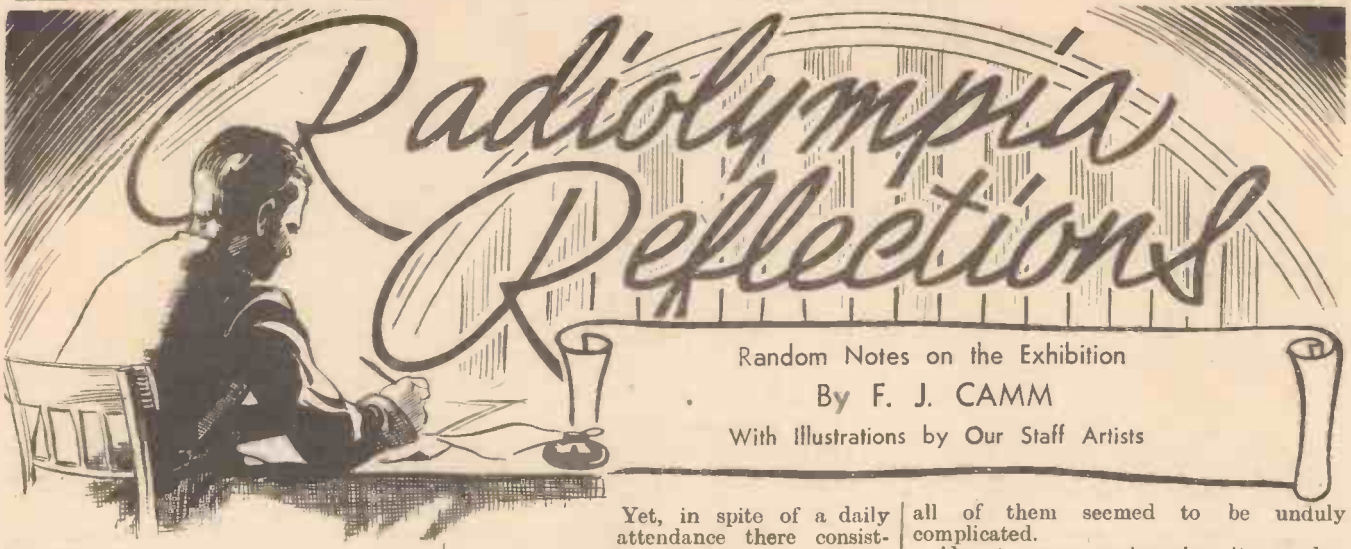
The following three readers successfully solved Problem No. 153, and books are accordingly being forwarded to them: C. B. Huxford, 303, Wellington Street, Grimsby, Lincs; J. Donaldson, 60, Beechwood Avenue, Londonderry; D. R. Fitch, 16, High Street, Chatteris, Cambs.

New Orchestra in Northern Programme

ON September 9th, Henry Reed, part-author of "The Music Shop," which was broadcast recently, is to bring a new orchestra to the Northern microphone in a concert arranged along rather new lines. He has specially orchestrated a selection of modern numbers, ranging from Ferde Grofe's "Three Shades of Blue" to Cole Porter's "You're the Top," which is to be "presented in a modern manner" by the orchestra under Mr. Reed's direction. The numbers will be compèred by Brent Wood.

"Within the Law"

WHEN Bayard Veiller's thrilling melodrama "Within the Law" was first presented on the stage in 1913, it met with deserved success, over four hundred performances being given at the Haymarket Theatre. It was successfully revived in 1920. Howard Rose, who has adapted the play for the microphone, will produce it in the National programme on September 24th and it will be heard by Regional listeners on September 25th. The plot concerns an intelligent and well-educated girl who is forced by circumstances to work behind the counter in a large London shop.



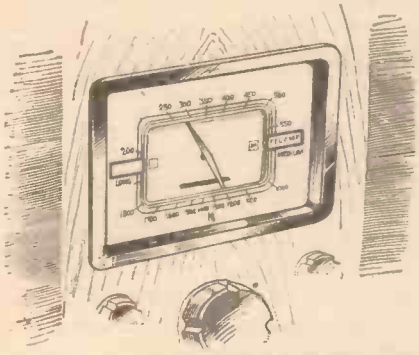
Radiolympia Reflections

Random Notes on the Exhibition

By F. J. CAMM

With Illustrations by Our Staff Artists

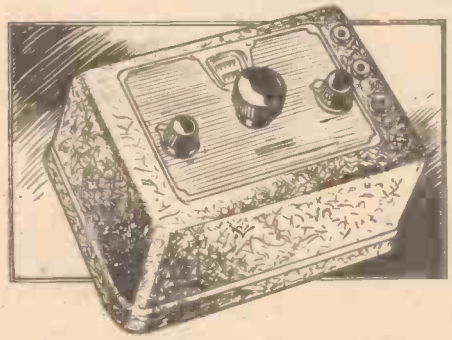
THE absence of television apparatus was naturally a severe disappointment to visitors. Manufacturers in many cases were not ready, and in others concluded that it would be unwise to exhibit vision machines until the programmes actually started. Even so, it is my opinion that it would have been wise for the Manufacturers' Association to have permitted such exhibits, for I believe I am correct in saying that the attendance this year was considerably down and that the volume of orders did not flow too readily.



The "Fototune" scale fitted to the Kolster-Brandes range of superhets.

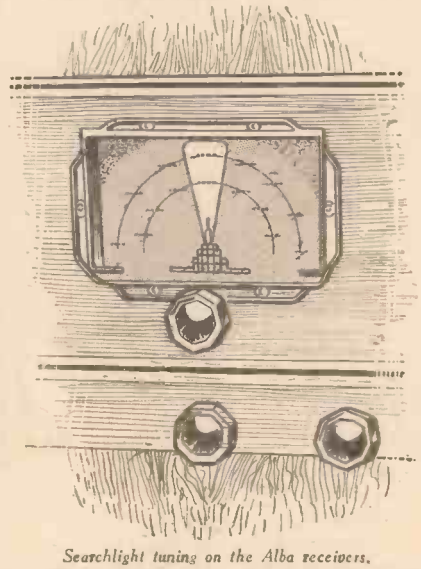
There seemed to be a mistaken notion abroad that television would render present broadcast receivers obsolete. This is, of course, an absurdity, since the two sciences are parallel but distinct. Had vision apparatus been on show, the public could have been made aware of this, and the erroneous conclusion scotched that its absence indicated manufacturers' fear of it as a powerful and successful rival.

I may be permitted to say that I am well known to all of the professional designers.



For the experimenter—this is a neat oscillator produced by the makers of the well-known "Avo" instruments. It is known as the "Avo-Oscillator."

Yet, in spite of a daily attendance there consisting of some hours I did not meet any of them. This, I think, is bad for home construction. A designer needs to visit the

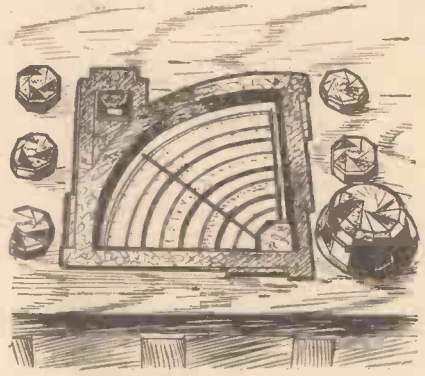


Searchlight tuning on the Alba receivers.

show, since he can, in a few hours, visit the entire industry and keep his ideas up to date. *Receivers which go out under my name are designed and made by myself, a practice not universally adopted among designers*, and in spite of my numerous journalistic activities, I do not neglect to study every exhibit or to have my draughtsmen sketch everything of interest. I set the idle thought on record.

The radio set to-day is regarded as a piece of furniture. I was, therefore, somewhat surprised to note that most firms are still listing table models. As a radio receiver of this type has to be supported, I cannot understand why manufacturers leave the purchaser to solve that problem. Very few table model gramophones are now sold. Why not take a lesson from the gramophone industry and produce only pedestal machines? Automatic record-changing mechanisms have been vastly improved, and now, in spite of their massiveness, gently handle the precious discs in the mechanical operation of dropping them on to the table, turning them over, and depositing them after the run. There were not many of them, however, and all of them seemed to be unduly complicated.

Almost every receiver has its speaker incorporated in the cabinet. This is a good point in many ways, although in some circuit arrangements better results can be obtained by having the speaker remote from the cabinet. All sets have provision for extra speakers, however. This is a decided move in the right direction. It is interesting to note that many firms are now making midget components, and I congratulate the Hivac Valve Company upon their production of a representative series of midget valves. They exhibited



This unusual, but easily-read tuning scale is a feature of some of the new Pye sets.

some excellent midget receivers made by users, and one or two firms marketed complete receivers of the pocket type. Midget coils, transformers, valve-holders, variable condensers, fixed condensers, and resistances are now available and of almost Lilliputian dimensions, enabling a really efficient and up-to-date receiver to be made for the car, for hiking, cyclists, etc. No midget mains

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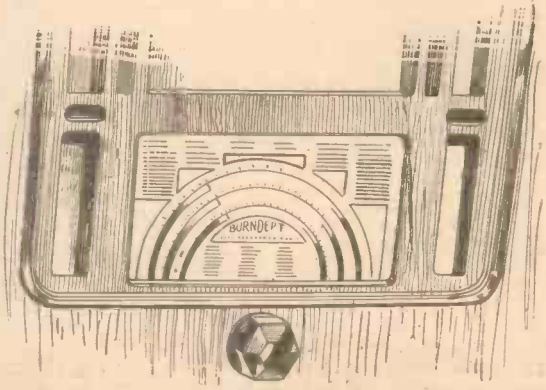

Another clearly-marked tuning scale, which is fitted to Burndept models.

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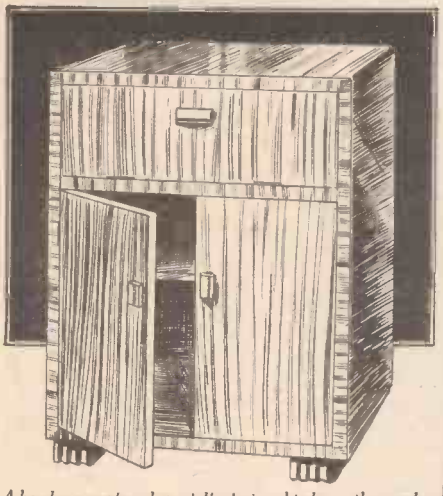
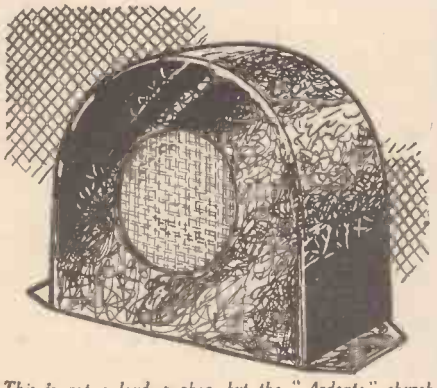


A handsome cupboard specially designed to house the popular Milnes H.T. units.

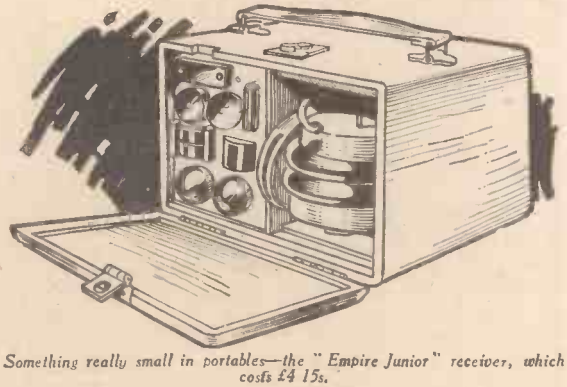
valves are yet available, but doubtless these will follow.

I had some illuminating conversations with readers who called at our stand. Many of them, as a result of reading our pages, now occupy important positions in the radio trade, and called to tender their thanks. Many others passed along ideas for improving the paper, and I have collected some valuable data as to readers' requirements for home-built receivers. Very few, I noted, required what are now known as high-fidelity receivers. Most of them wanted globe circlers, and only a few required all-



This is not a loud-speaker, but the "Ardente" church microphone.

wave receivers. About ten per cent. were interested in the short waves, which gives me pause. In spite of the correspondence appearing herein on transmission, only three readers out of the many hundreds who called specially requested articles on this subject. One or two readers asked for a design in which they could make most of the components themselves. I do not feel, however, that such a receiver is greatly



Something really small in portables—the "Empire Junior" receiver, which costs £4 15s.

in demand, although if you disagree let me have your views.

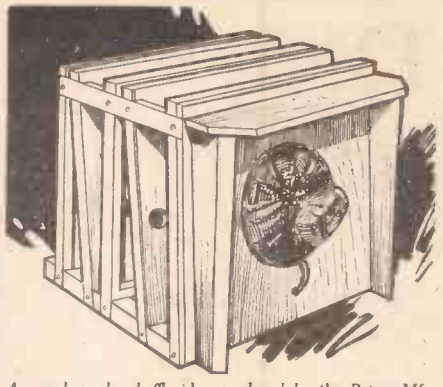
While I am dealing with this aspect of the Exhibition, let me tender my sincere thanks to those many readers who, unable to visit Radiolympia, spared the time to write a note to me, care of our stand. It is indeed pleasant to receive such letters, and I was able in many cases to perform a mild service to the writers in the form of arranging for the despatch of catalogues and information which they were unable to collect themselves. One reader suggested that I should organise a Radiolympia Banquet for readers of my journal. This would indeed be a formidable undertaking, but I am prepared to do it if a sufficient number would attend. Let me have your views on this suggestion.

A point which rather impressed me was the vast interest in superhets, and I propose to devote a considerable amount of space

This speaker is not suitable for use in the home, but it is ideal for public-address work. It is the Sound Sales 5-watt P.A. model, and costs £18 10s.

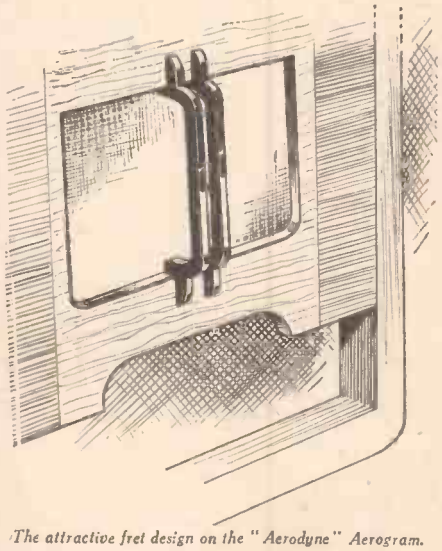
to this form of circuit in the near future. New readers may be unaware of my series of superhet designs recently given herein. As one would expect, battery models are by far the most popular—a surprising fact when it is remembered that fifty-seven per cent. of the homes of Great Britain have electric light. Those readers owning commercial mains receivers and who consulted me seemed uniformly dissatisfied with the quality. I cannot quite understand the reason for this, for I have found the excellent series of receivers made by A. C. Cossor, Ltd., Ferranti, Ltd., H.M.V., and some other leading manufacturers, under test, to be extremely reliable and trouble-free. The receiver is often blamed for troubles which should be placed on the doorstep of the aerial and earth system and the local power supply, but readers queries indicated what I have so often stressed, that the builder of a set has the distinct advantage of being able to tackle such problems himself, an advantage which in most cases is denied the owner of a commercial receiver.

Perhaps the most outstanding feature of the Show was the short-wave apparatus now available for constructors. This field until the past year



A novel speaker-baffle idea produced by the Prism Mfg. Co. There are a number of baffles arranged at carefully-chosen angles.

has been pioneered by two famous firms only, but impending television developments have fostered interest, particularly in ultra-short-wave components, of which a wide variety can now be obtained. Unfortunately, there are very few transmissions taking place on five metres, and the experimenter, there-



The attractive fret design on the "Aerodyne" Aerogram.

fore, must wait until the first experimental television transmissions take place from the Alexandra Palace towards the end of January. A few amateurs are operating on this wavelength, but the times of transmissions are uncertain and irregular. The experimenter may listen for hours and receive nothing.

What about this midget set, which was shown on the Hivac stand?

Designing Your Own Wireless Set

Further Notes are Here Given Concerning the Design of the Detector Stage, Diodes and Metal-oxide Rectifiers Being Explained

UNTIL comparatively recent times the types of detector dealt with last week—leaky-grid, power-grid, and anode-bend—were the only three which were in common use, but to-day the diode detector (in one of various forms) and the metal-oxide rectifier are used very extensively. The chief reasons are that these rectifiers are capable of handling considerably heavier signal voltages and that they can easily be employed to effect automatic volume control. As mentioned before, however, rectifiers of these kinds are not suitable when reaction is required; for this reason they are used principally for the second-detector stage of super-heterodynes.

More Efficient Rectification

Both forms of rectifier mentioned above are purely and simply rectifiers for, unlike the three-electrode valve, they do not provide any degree of amplification. For this reason alone they are, theoretically, able to effect more perfect and distortionless detection and are widely used in "quality" receivers. A simple diode valve comprises two electrodes only—a cathode and an anode—but double diodes are used more extensively than single diodes, in addition to which the diode electrodes are nearly always combined with others to form double-diode triodes or double-diode pentodes, the triode or pentode sections of which serve as first-stage L.F. amplifiers.

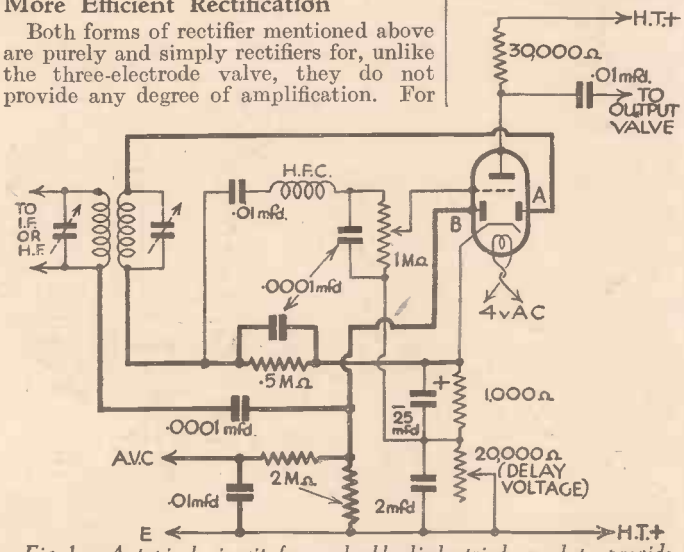


Fig. 1.—A typical circuit for a double-diode triode used to provide second detection, delayed A.V.C., and L.F. amplification. The diode circuit is in heavier lines.

The circuit arrangement of a double-diode triode of the A.C. type, used for second detection, delayed A.V.C., and first-stage L.F. amplification is shown in Fig. 1; for clarity, the diode connections are shown in heavier lines than those for the L.F. portion of the valve. The two diode anodes are marked A and B, that marked A being used simply for rectification of the signal voltages, and that marked B serving to supply the A.V.C. voltage. If it were not required to employ A.V.C. all connections to the anode marked B could be removed, leaving the remainder of the circuit as shown. It should be mentioned that the 20,000-ohm variable resistance shown in the cathode lead of the valve is to supply the "delay" voltage, and that the resistance is adjusted until the desired result is achieved; it should also be made quite clear that the resistance values indicated are average figures and do not necessarily apply to all valves. The corresponding values for various makes of valve can be obtained from the makers' literature or instruction sheet.

Suitable Components

The components employed in the circuit illustrated call for very little comment, since they are of standard types. It is, however, very important that the H.F. choke should be of reliable type, preferably screened, and having an inductance of not less than 250,000 microhenries, whilst the fixed resistances should be of the metallised or other non-inductive kind. The potentiometer used for L.F. volume control should be the best obtainable, since it is essential that it should work smoothly and without causing crackling or "rustling" noises. This generally means that a "carbon-track" or "composition" type of unit should be used. With regard to the 20,000-ohm variable resistance, the chief requirement is that it should be capable of carrying D.C. currents up to 4 or 5 milliamps. For this reason it is generally necessary to use a wire-wound component, although this is not really desirable. There are, however, one or two non-wire-wound components on the market which are capable of handling ½ watt (the rating required), among which may be mentioned the Bulgin "Chemical" volume control.

Delayed A.V.C. for Battery Sets

A battery version of the circuit shown in Fig. 1 is given in Fig. 2, and this is similar in principle, but does not contain any provision for delayed A.V.C.; this could be provided if desired by including a 3-volt battery in the A.V.C. line, so connected that it "opposed" the normal A.V.C. voltage, that is, with the positive terminal connected to that side which goes to the grid circuits of the valves. A delay voltage is certainly desirable, especially in a receiver which is not extraordinarily sensitive and when long-distance reception is an important requirement. The reason is that with ordinary A.V.C. a negative bias is applied to the controlled amplifying stages immediately a signal is tuned in. Thus, the degree of amplification afforded is reduced even when receiving a weak signal, whereas it may be desirable to employ the maximum degree of amplification in these circumstances. On the other hand, there are more pronounced "background" noises when the delay control is included—and reception of very weak stations is never very pleasant to listen to.

The Metal-oxide Rectifier

The function of the metal-oxide rectifier, or "Westector," is almost identical in principle to that of the diode portion of the multiple-electrode detector valve, and produces similar results. For this reason, the "Westector" may correctly be classed as a diode and used in circuits which are similar to those shown in Figs. 1 and 2. An advantage of the metal-oxide rectifier is that it is very simple to employ and obviates the need for multi-pin valve-holders, since it can be followed by an ordinary triode or pentode L.F. valve.

One of the simplest forms of "Westector" circuit is given in Fig. 3, where it will be seen that the rectifier follows an I.F. transformer and is in turn followed by a triode, which may be used to feed an output valve; an alternative method, of course, would be to replace the triode by a pentode output valve, feeding this through a high-ratio transformer, as in the popular £5 Superhet described in the issues dated October 27th and November 3rd, 1934. A .25 megohm load resistance is connected in parallel with the rectifier, and the voltage-drop across this can be used to provide A.V.C. if desired, by taking a lead from its upper (negative) end, as shown in broken lines. It is not necessary to give more complete details regarding the use of the "Westector," since these were given in the article entitled "The Ex-

(Continued overleaf)

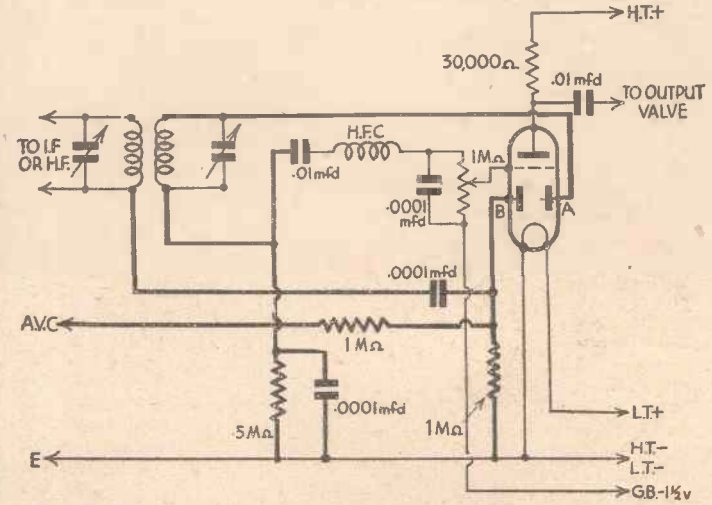


Fig. 2.—The circuit for a battery double-diode triode used as detector, or second detector, A.V. control, and L.F. amplifier.

(*Continued from previous page*)

perimenters Explain" in the issue of PRACTICAL AND AMATEUR WIRELESS dated May 25th, 1935. It should be added that this type of rectifier can be used successfully in a "straight" set (the 1936 Sonotone Three-Four, for example), and that the connections are similar to those given in Fig. 3. In this case a slightly different type of "Westector" should be used, because the "W" series are intended for use at frequencies between 100 and 200 kc/s (3,000 to 1,500 metres), whereas the "WX" series are for higher frequencies up to 1,500 kc/s or so.

The H.F. Pentode as Detector

We have so far confined our attention to what might be called standard forms of rectification, and no mention has been made of using screen-grid and H.F. pentode valves in a normal leaky-grid circuit, although this is frequently done. The connections are the same in both cases, and are as shown in Fig. 4, where an H.F. pentode is illustrated. A detector of this type is particularly satisfactory when a high degree of sensitivity is required,

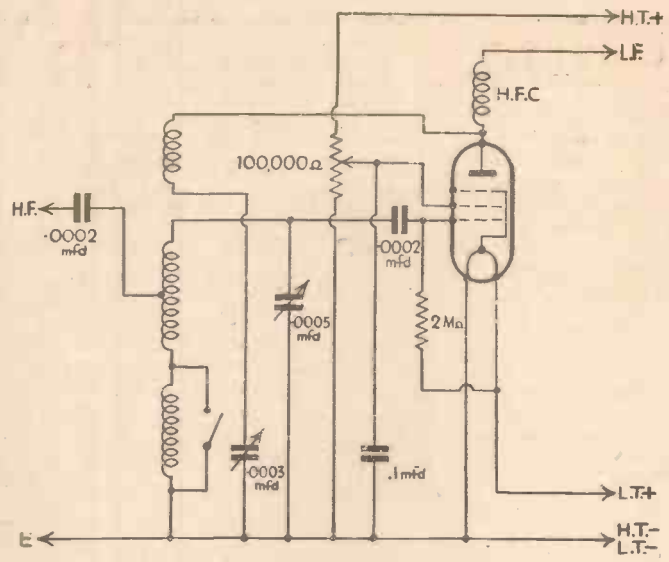


Fig. 4.—Extremely smooth reaction control and increased sensitivity can often be obtained by using an H.F. pentode as detector, as shown here.

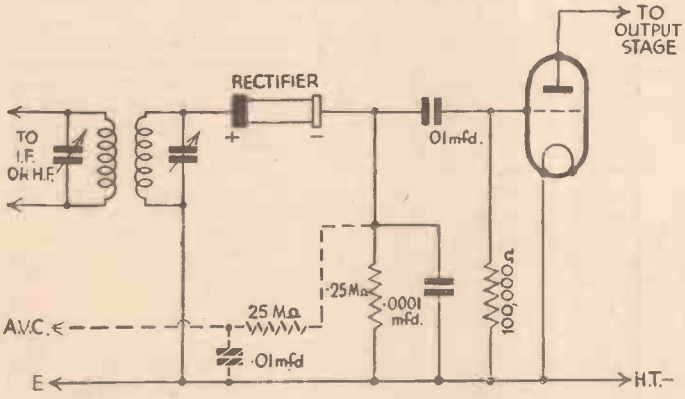


Fig. 3.—The connections for a half-wave "Westector" as detector or second detector. A.V.C. may be obtained if desired by using the connection shown by broken lines.

when there is only a single H.F. amplifying stage, and where a high detector output is not required. It will be seen that the control grid, filament, and anode are connected in exactly the same manner as when using a triode, the only additional wiring being that to the screening grid, which is supplied with H.T. and is decoupled by means of a .1-mfd. non-inductive fixed condenser. In the circuit given the H.T. supply is taken from a 100,000-ohm potentiometer by means of which the applied potential can be varied within close limits. The potentiometer provides an excellent means of ensuring perfectly smooth reaction control, and can often be used entirely for this purpose, after finding the best average setting for the reaction condenser. The arrangement is particularly suitable for use in a short-wave receiver, provided that the potentiometer is a good component of the "carbon-track" type.

In many cases of simple sets which are desired to be super-sensitive it is found that excellent reaction control can be obtained by using the circuit shown in Fig. 5, where the screening grid is used entirely for reaction, the anode merely dealing with the amplified output. This arrangement does not function satisfactorily with all tuners, due to the fact that the reaction winding requires to be rather larger than usual to ensure an adequate degree of feed-back. It is also found necessary to increase the screening-grid voltage beyond the normal figure.

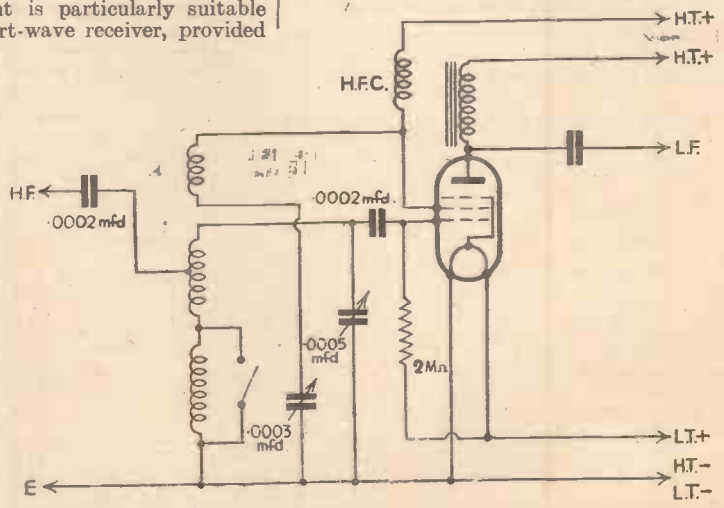


Fig. 5.—In this circuit an H.F. pentode is used as detector, reaction being obtained by feeding back from the screening grid.

The L.F.-coupling Problem

The greatest objection to the use of an S.G. or pentode valve as detector is that it is practically impossible to obtain a sufficiently high impedance in the anode circuit. Theoretically, the impedance at average frequencies should be equal to not less than half the A.C. resistance of the valve. As the A.C. resistance of an average H.F. pentode is 1,000,000 ohms, and of an S.G., 300,000 ohms, it will be seen that resistance-capacity or resistance-fed transformer coupling is out of the question, because a resistance of correct value would cut down the voltage almost to zero. In practice it is found possible to obtain very good results by using a choke of the power-grid type (see last week) in either a choke-capacity or choke-transformer arrangement, and although this is rather expensive it is worth while when the highest possible degree of sensitivity is required. The values of the components used in the other parts of the circuit may conveniently be the same as those used for ordinary leaky-grid detection when employing a triode valve.

There are many other forms of "stunt" detector arrangements, but it is not proposed to deal with these here, principally because they call for rather special consideration, but also because they rarely provide the high degree of quality now demanded. Passing reference might be made to the Armstrong super-regenerative circuit in which the detector valve is made to function in a constant state of self-oscillation, the oscillation being "broken" at a frequency slightly above audibility. The result of this is that greater output is obtained, although the usual oscillation "whistle" is not heard.

TELEVISION FOR ALL

C.R. Tube Reception Faults

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

ALTHOUGH quite a number of readers of PRACTICAL AND AMATEUR WIRELESS have no doubt used a cathode-ray tube as the television picture reproducer in connection with the present low-definition television transmissions, few have had the opportunity of either seeing or operating such a device for high-definition signals. This is not unexpected when it is realised that there is as yet no service of signals, and the only chance to look in arises from the experimental transmissions on ultra-short waves radiated from the equipment of the Baird Company at the Crystal Palace or the E.M.I. Company at Hayes. These transmissions, however, follow no fixed schedule, and it is only by painstaking (and sometimes almost heart-breaking) ether searching that one may happen to pick up the vision signals on a wavelength of about 7 metres.

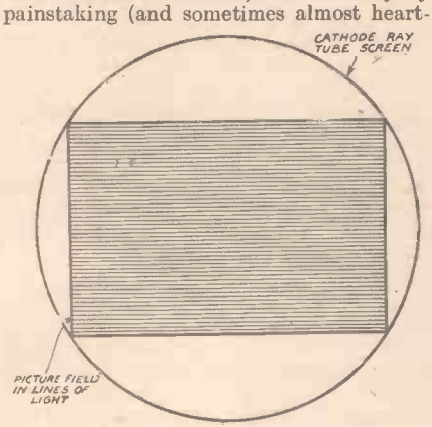


Fig. 1.—Utilising the full available screen space for building up the lines of light.

In spite of this, however, and anticipating the day when transmissions really become available at least in the London area, readers are anxious to acquire all the information they can in connection with cathode-ray tube working, especially in so far as faults are concerned, as they will then be in a far better position to eradicate them with their own apparatus. It is useful, therefore, to consider some of the more common defects and, in diagnosing them from a study of the built-up picture on the C.R.-tube fluorescent screen, find ways and means of eliminating them.

A Standard

In the regrettable absence of complete transmitting data, we will take as our standard a picture scanned sequentially with a definition of 240 lines and reproduced at the rate of 25 pictures per second. This, at least, will conform to one type of signal which will be available ultimately. Recalling for a moment the picture building-up process involved, the scanning takes the form of a series of almost horizontal lines traced, say, from left to right and appearing in turn one below the other in sequence until an area in terms of light fluorescence is built up as shown in Fig 1. Only a few lines are shown here, but in practice with such a high definition the lines will not be visible at a distance of a few feet from the screen, the eye appearing to see a plain, uniformly-lit surface within the picture-area limits.

With a signal modulation of the constant-velocity variable-density type applied to the control cylinder of the tube, the rapidly-moving spot of light of constant small area has its intensity varied during every moment of its trace to conform to the strength of the received signal, which in turn is generated by the light and shade of the scene being scanned at the transmitting end. Under perfect conditions of reception, therefore, the television picture watched will be really a reproduction in miniature of the indoor or outdoor scene, or the talking film which forms the subject matter, coming within the range of the scanning equipment at the transmitting end, whether this is mechanical or electrical in character. A television picture produced under such conditions as these, but having only 180-line definition, is shown in Fig. 2. Although seen as a mirror reflection from the end of the tube, it will furnish a good standard with which comparisons can be made.

Fig. 3.—An imperfect image resulting partly from misfocusing and over-modulation.

A Focused Spot

Before attempting to build up the scanning lines, or "raster" as the Germans have called it, the first essential is a properly-focused spot small enough in size to prevent any line overlap. This size is, of course, a direct function of the maximum picture depth (assuming horizontal scanning) which can be accommodated on the circular C.R.-tube fluorescent screen. It is quite usual practice to specify tubes in terms of the diameter of the fluorescent screen, the units being either centimetres or inches. Thus in a 12-in. tube one can very easily accommodate a rectangular picture 8in. by 6in. This will mean that the maximum spot size is a circle one-fortieth of an inch in diameter for a 240-line picture, and each individual line will then touch its two neighbours. With smaller or larger tubes the spot sizes will, of course, be less or greater than this quantity.

Now to obtain a very small uniform spot of this nature is not the easy matter it at first appears. It is no good having a spot with a bright centre and a fringe of jagged light surrounding it. The spot must be sharply in focus, otherwise the image will have a fluffy appearance with no clearly-defined detail. This is shown very clearly in Fig. 3, although, in addition, the poor picture has also been contributed to by a large measure of over-modulation on the control cylinder, a point which will be referred to later.

Means Adopted

In general the focusing of the beam of electrons into a sharp, clean-edged spot is

Fig. 2.—A properly-produced 180-line television picture, shown as a masked reflection in a mirror from the end of a cathode-ray tube.

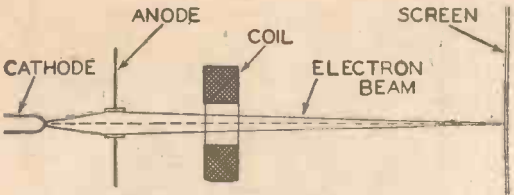


Fig. 4.—Method of bringing the electron beam under the influence of a magnetic field.

effected by either electro-magnetic or electro-static methods, although, in addition, results are often obtained by a combination of the two schemes. Focusing by magnetic means consists primarily of surrounding the neck of the C.R. tube with a large solenoidal coil whose position relative to the main electrode system can be altered, while the current through the coil must also be under the control of the user. The arrangement in its simplest form is shown in Fig. 4, and by carefully positioning the coil and making the magnetic field strength of the right magnitude the spot can be brought to the correct dimensions as a "pin point" of concentrated light, whose movement is then effected by the particular deflector system in use with the equipment.

With electro-static focusing the scheme employed is really an electrical replica of an optical focusing system. In addition to the main accelerating anode, or gun, a further one or two anodes perforated with a small hole are placed certain distances away in the tube neck. By a suitable proportional adjustment of the positive potentials applied to these electrodes the electron beam is focused on the fluorescent screen, it being essential in this and other methods of focusing to maintain that focus irrespective of the spot position on the built-up field of lines of light.

Using both Methods

In many cases an improvement in focus is brought about by combining electro-magnetic with electro-static focusing, and with the present state of cathode-ray tube development it requires a measure of acquired skill to secure the desired size of focused spot. Any time spent in this connection, however, is well repaid, for the resultant picture seen by the observer exhibits a much cleaner and sharper appearance. That is why particular stress has been given here to this focusing question (technically known as fasciculation) so that the reproducing device has a chance to "start fair" before other faults are diagnosed.

Assuming now that the tracing spot is correct, attention must be turned to the line-scanned area which it builds upon the screen through the medium of pulsing electro-magnetic fields applied from external coils, or pulsing electro-static fields derived from the two pairs of metal deflector plates set mutually at right angles inside the tube neck. Neglecting for the moment whether the H.F. and L.F. frequencies are correct, the first thing to watch is the sweep voltages. Different types of tubes require varying voltage limits for the condenser-charging action in the time-base equipment in order to make the spot of light trace right across the screen and reach the full allowable picture depth. The voltage available is a function of the gas-filled relay, being dependent on the applied anode and grid voltages together with the factor known as the grid-control ratio.

Using a potentiometer in either or both of the grid and anode circuits, it is possible to widen the picture area and increase its depth, since the time base is a dual unit. The effects which one must guard against are illustrated simply in Figs. 5, 6, and 7. In Fig. 5 there is insufficient sweep voltage with both the horizontal and vertical deflecting plates, while with Fig. 6 the horizontal sweep is excessive and the vertical

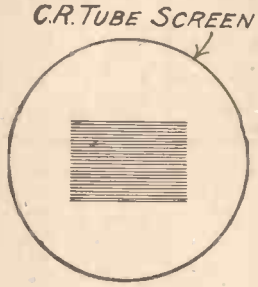


Fig. 5.—A picture area made too small by insufficient sweep voltages on each pair of deflector plates.

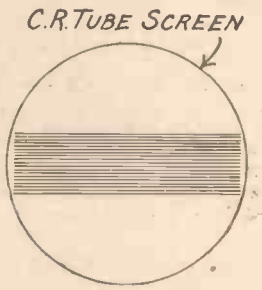


Fig. 6.—Using too large a voltage sweep on the vertical deflector plates, and too little on the horizontal deflector plates.

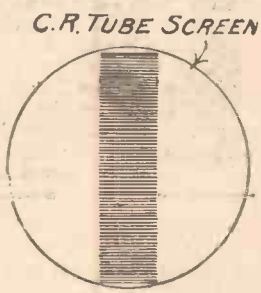


Fig. 7.—The picture-area shape with the reverse conditions shown by Fig. 6.

too small. Coming to Fig. 7, however, the effects of Fig. 6 are reversed. The two sweep-voltage controls are entirely under the jurisdiction of the user, so that the rectangular-shaped picture of the true ratio conforming to the transmitted standards is readily obtained and can then be left set for the whole transmission.

Hum

While on the question of time base it is as well to point out another very annoying fault which can be observed unless proper precautions are taken. The high-tension

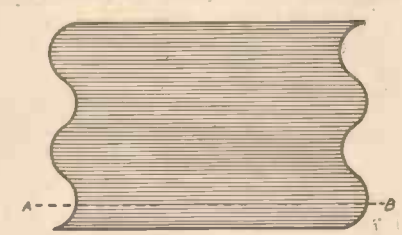


Fig. 8.—A wavy edge in the scanning field is brought about by "hum" in the time base.

voltages required for feeding the time base, and also for supplying the anodes of the cathode-ray tube itself, are derived from A.C. mains rectifier units. The presence of mains transformers is liable to cause leakage fields unless careful shielding or statically-wound components are in use. Any 50-cycle mains disturbance which finds its way into the time-base generator equipment will cause the normal vertical edges of the rectangular light field to become wavy. With the full number of lines in use and working at 25 pictures per second, two complete sine waves will be noticed at each edge, somewhat as shown in an exaggerated form in Fig. 8.

Obviously, this will distort the picture very badly, and steps must be taken to remove the A.C. mains hum if pictorially good results are the aim of the user of the cathode-ray equipment. For radiated high-definition television signals using the medium of ultra-short waves a certain number of the total 240 picture lines are masked off at the bottom of the "raster" (this is, of course, carried out at the transmitting end) in order to provide the short time duration of the low-frequency or picture-repetition synchronising pulse. Therefore, the received picture under these conditions, and assuming an induced time base hum, will not show two complete sine waves, since part of the second one at the bottom of the scan is not seen owing to the "black" synchronising signal. Thus, the cut off would probably be at the line AB in Fig. 8, but in spite of this the effect illustrated is most annoying, and must be removed at its source without delay. It is as well to point out here that with an interlaced form of scanning this hum effect will be even more damaging. This is easily appreciated when it is remembered that every other line is traced for the first picture while the second picture trace fills the interstices between the original lines. If the hum is very bad the effect can become almost intolerable, and in some quarters this is regarded as yet another objection to interlacing when compared to the linear sequentially-scanned picture.

(To be continued.)

Concert Broadcast from Teignmouth

A PROGRAMME by The Summer Revellers' Concert Party, presented by George Hay, will be relayed from the Pavilion, Teignmouth, on September 13th, for Western listeners.

"Five Hours Back"

AS already announced, the weekly transatlantic relays, under the above title, will be resumed on the first Saturday in October. The relays are again coming

Programme Notes

to British listeners from the National Broadcasting Company of America, and will be taken from the programme that is actually going out to American listeners at that time, namely, 12.30 mid-day, New York. These broadcasts are radiated by the N.B.C.'s short-wave transmitters and are picked up by the B.B.C.'s receiving station at Tatsfield.

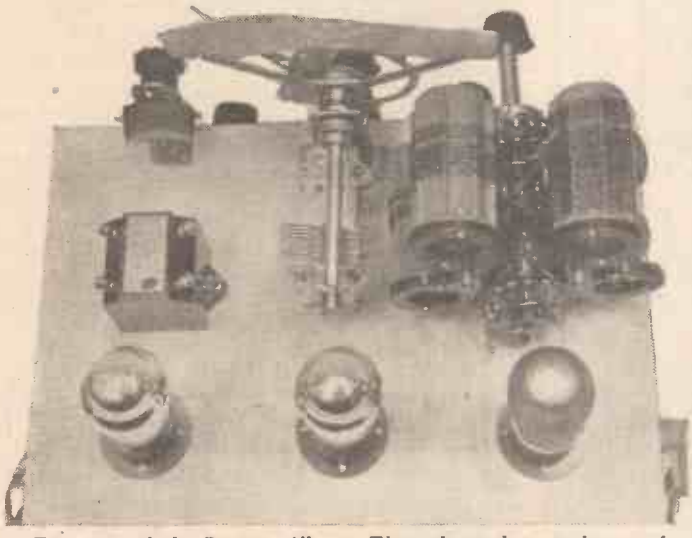
The "Air-do-Wells"

EFFIE ATHERTON and Marjery Wyn will again be heard by listeners, together with the rest of the cast of the "Air-do-Wells," on September 9th and 10th. Max Kester has evolved a most entertaining book. It will definitely be influenced by the atmosphere of the grouse moors, for Ronald Hill has written a new number entitled "Huntin', shootin' and fishin'." It is probable that a popular number by Ray Noble called "Why do stars come out at night?" will also be included.

The Battery Allwave Three

Further Details of the Battery Version of our Latest All-wave Receiver, with Useful Hints on Using the Set for Short-wave Reception

OUR correspondence indicates that the Allwave Three has met with instant success, and it would seem that the popularity of the battery model is even greater than that of the mains version. We have received many inquiries from prospective constructors concerning the results obtainable on the short-wave band, however, and therefore it is proposed to give a few hints concerning short-wave reception for the benefit of beginners. It was mentioned last week that the medium wave-band should be chosen for preliminary tests. This band is tuned in when the wave switch is on the second stop. After satisfactory results have been obtained on medium waves the short wave-bands may be explored by rotating the switch knob in a clockwise direction. The third stop gives the higher of the three short wave-bands, and when on the fifth stop a minimum wavelength of approximately 13.5 metres may be tuned in. It is probable, however, that best results will be obtained on the fourth stop, as the stations operating on wavelengths in the region of 30 metres may be picked up in this position. Given good reception conditions no trouble should be experienced in picking up the U.S.A. broadcasts, and Australian stations may often be picked up at reasonable strength. To obtain best results the listener must be prepared to keep late hours, however, as the American stations are best heard after 11 p.m., with the exception, perhaps, of those working on approximately 19 metres.



This view of the Battery Allwave Three shows the neat layout of components.

If a long aerial is being used it may be found necessary to make use of the aerial series condenser C3 when listening below 50 metres, as the effect of the aerial-earth capacity becomes very pronounced below this wavelength. For preliminary tests this condenser should be set at maximum, as maximum volume will be obtained in this position. If spots are found on the tuning range where no reaction can be obtained, the setting of C3 should be reduced until reaction is again obtained. The setting at which reaction can be obtained at all points on the tuning range can soon be found by experiment, and the condenser control can then be left at this position until long- or medium-wave reception is desired.

Constructors who wish to cover the 150 to 600-metre band should use Coil Unit 961 instead of 960, but it is pointed out that the long-wave coil is omitted in this unit. This should not, however, deter readers who wish to receive up to 600 metres, and also between 1,000 metres and 2,000 metres, from building the set, as both bands can be extended by connecting an extra .0003 mfd. variable condenser in parallel with the existing tuning condenser. The fixed vane terminal of the extra condenser should be joined to the fixed vane terminal of C1, and the moving vane terminal to the metallised surface of the chassis; this condenser should be disconnected (by means of a switch or plug), when short-wave reception is desired. If this addition is effected Coil Unit 960 should be used. Constructors who are interested in morse reception will then be able to pick up ship transmissions on the 600-metre band, and also the continuous wave transmissions between 2,000 metres and 2,300 metres.

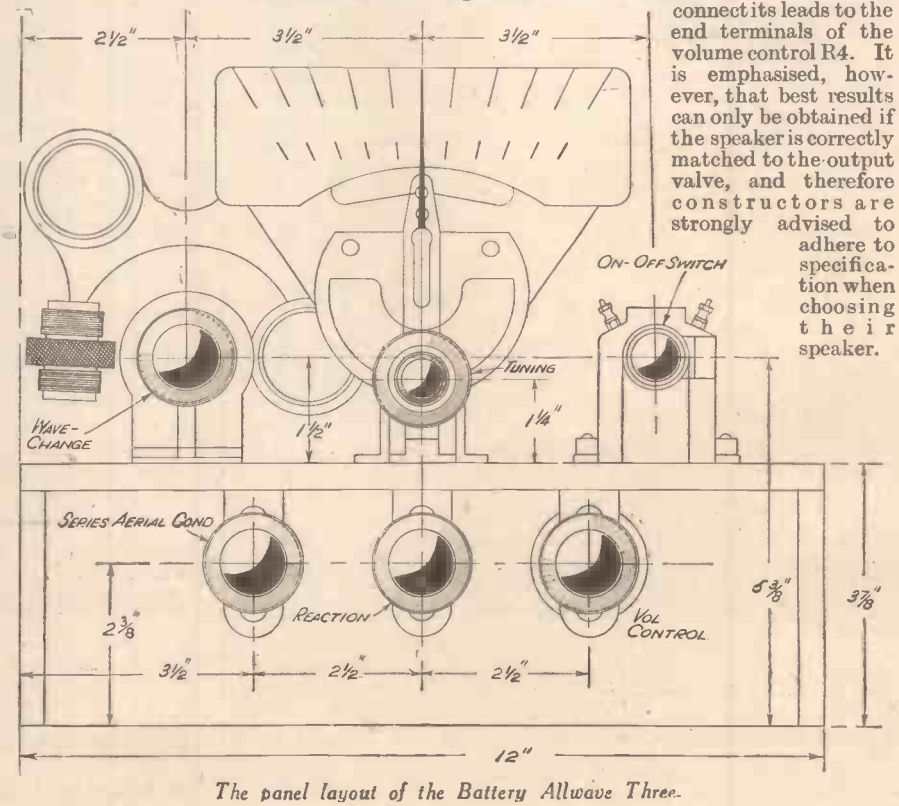
It is often found very desirable to use headphones for short-wave listening, and therefore this receiver has been fitted with an ingeniously-wired 'phone-jack.

Using the Pick-up

The P.P.220 used in the output stage has a high undistorted output for a battery type of valve, and therefore good quality reproduction is obtained when a pick-up is employed. In most cases it will be found desirable to connect the pick-up to the pick-up sockets, but if a very sensitive component is used it may be advantageous to connect its leads to the end terminals of the volume control R4. It is emphasised, however, that best results can only be obtained if the speaker is correctly matched to the output valve, and therefore constructors are strongly advised to adhere to specification when choosing their speaker.

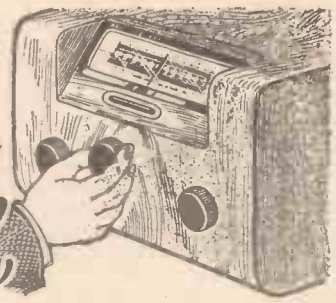
LIST OF COMPONENTS

One Multi-wave Coil Unit No. 960 (Eddystone).
One .00016 mfd. Condenser, Type E (C1), with micro drive horizontal (Polar).
One .00025 mfd. (C3) Aerial Condenser (B.T.S.).
One .0002 mfd. Reaction Condenser (C2) (B.T.S.).
Seven Fixed Resistances, 2 meg. (R1), 50,000 ohms (R2), 10,000 ohms (R3), 25,000 ohms (R7), 50,000 ohms (R5), 5,000 ohms (R6), 10,000 ohms (R8), 1 watt type (Dubilier).
Seven Fixed Condensers: .0001 mfd. (C4), .01 mfd. (C5), three 1 mfd. (C6, C7, C10), .5 mfd. (C8), .005 mfd. (C9) (T.M.C.).
One L.F. Transformer 1 to 3.5 Niclet (Varley).
One Potentiometer, 500,000 ohms (R4) (B.T.S.).
One All-wave H.F. Choke, Type H.F.O. (Wearite).
One Change-over Jack, with plug (B.T.S.).
One 2-point Switch, Type S.91 (Bulgin).
Three Terminal Strips, A.E., P.U., L.S. (Clix).
Three Valve-holders, 4-pin type (Clix).
Four Plugs: H.T.+, G.B.+, G.B.—1, G.B.—2 (Belling-Lee).
One Fuse Plug with 60 m/a fuse (Belling-Lee).
Two Spades: L.T.—, L.T.+ (Belling-Lee).
One Metaplex Chassis, 12in. by 8in. by 3½in. (Peto-Scott).
Three Valves: D.210, L.210, P.P.220 (Hivac).
Four 2½in. Component Brackets (Peto-Scott).
120-volt H.T. Battery (Drydex).
16½ volt G.B. Battery (Drydex).
2-volt L.T. Accumulator (Exide).
One Permanent Magnet Speaker, Type F.720 P.M. (Rola).



The panel layout of the Battery Allwave Three.

On Your Wavelength



By Thermion

Visions of the Future

I HAVE been trying to visualise some of the possible developments of radio in the next century. They say there is nothing new under the sun, and whilst I cannot find any written record of stereoscopic-coloured-television receivers being used in the past, there is a possibility that something approaching it was used by the ancient Greeks. However, bearing in mind that it is now possible to photograph objects by the use of the infra-red rays and thus take pictures of objects which are invisible to the naked eye, and remembering that the photo-electric cell can be affected by these rays, does it not seem possible that the time will come when we shall, in fact, be able to see through solid objects at a distance? The Röntgen ray penetrates practically anything with the exception of lead, and it only remains for the scientist to develop a method of combining these rays with the photographic infra-red process, and then adapting the combination to the "Noctovisor," or similar television apparatus, when we will have a most remarkable piece of apparatus. I think it will come!

Long-distance Reception

AS a change from the metaphorical kick in the pants which is sometimes administered by well-meaning baiters, I recently received a missive from Frank Mastin, of Sheffield, who says that he likes my "sermon" each week. "By gum! The way you trounce those jazz bands is fair grand. I cannot tell one band from another, so when you say they are tripe you are right. Now a word about short waves—none around this district knows what short waves are when I mention them, but I get more enjoyment out of them than the broadcast items. I recently coupled up my adapter, and, try as I might, I could get nothing for about ten minutes, when in rolled a stranger. He was speaking English: 'Hello, London, Sydney speaking. Will you kindly tell us how that modulation came through?' He seemed to get the answer straight away, for he then said: 'Oh, too deep. Give us two minutes, ten seconds, and we will try to remedy that.' Later on they put on a record of an address to the King. Sydney then said: 'They have the man there whose voice was recorded and that he would repeat the message on the record himself.' I gathered that I was getting one side of a conversation, so I fiddled about until I received the other side. The Aussie came in at about R.7 and the English R.4. Neither of them faded. The coil I used consisted of five turns of No. 20 copper wire for the grid coil, and five turns of the same gauge for reaction, both wound on a 2½in. former. I have seen reports of a lot of H.J. stations, but have not heard of anyone getting H.J.3. XXF. I had him one morning on three different wavelengths." This reader ends up with a request for a set using Class B output. Regarding jazz music, did any of you study the crowd who waited upon the kings of jazz at Radiolympia? For the most part they were vacuous and vapid and left an ordinary football crowd trotting. Riotous scenes followed the appearance of some of the members of the band. Solomon in all his glory was not arrayed like some of these. The Battle of Bannockburn must have been a tame affair by comparison. Just think of it! In the year 1935, a crowd can go frantic because some ordinary individuals are members of a band playing comic instruments and comic noises composed by all the Als, Eds, and Lews of Tin Pan Alley. Moreover, they are paid thousands a year to do so. Are we mere listeners not insane?

Dance Tempo

BEFORE I conclude and say my final word about dance bands, have you ever observed anyone dancing to radio music, and could they? The tempo is all wrong, and I am sure that, short of shuffling about, none of the steps are ever correctly performed. This nightly dose of jazz muck is producing a neurotic race, trembling and nervous like the aspen leaf. When will it stop?

Excelsior

IN literature you will find saga which make heroics out of nonsense. When I was compelled to learn "Casabianca" as a boy, I often wondered at the lunacy of the miserable little wretch without the spunk of a gnat who, fearful of his father's wrath, stood upon the burning deck whence all but he had fled. He is an object of derision, not of hero-worship, a coward, unworthy, and ought to be unwept, unhonoured, and unsung. Then there is the case of that half-wit youth who bore 'mid snow and ice a banner with that strange device. A youth who did those things nowadays would be promptly clapped into an asylum, and yet we are still taught to revere these idiotic creations of still more idiotic poets. Radio does not provide an exception to this rule. We are expected to worship at the shrine of new names. Give some old and well-tried device a highfalutin name, and the public thinks it is a miraculous discovery. Do you not feel with me that, on the principle that good wine needs no bush, a firm adopting this stunt practice condemns itself? Take tuning dials—a wealth of attention is devoted to them each year, as if they were the only parts of a radio set in need of perfection. The most elaborate tuning scale is fitted to the most unselective set. One receiver I wot of having a band spread on the London National of 35 degrees has about a dozen stations engraved on its scale within that angle. No one could ever receive those stations

(Continued overleaf)

This photograph from Quetta, India, shows a "Stentorian" speaker working under rather unusual conditions. We understand that the instrument has withstood several severe sandstorms, which speaks well for the efficient dust protection provided on these well-known instruments.

(Continued from previous page)

on that set, but the public imagines, I suppose, that they would not be printed thereon if they were not receivable. It is not until they have actually purchased a receiver and installed it in their own homes that they appreciate that a tuning scale is merely an index recording the efficiency or otherwise of the high-frequency portion of the receiver. Let us sing the praises of the good points, by all means. Don't let us create them out of the bad ones. In spite of the attention bestowed upon tuning scales, they still cockle after two or three days' use! 'Tis true 'tis pity, and pity 'tis 'tis true.

Where were the Designers?

I CLAIM to know every designer of radio receivers, and although I searched diligently at Radiolympia, I found them not. Their patronage was not bestowed even upon the bars, nor did they visit the quaint and amusing Exhibitors' Club. Where were they? Thinking out more epoch-making designs? You would naturally expect designers of receivers intended for home constructors to visit the annual show. And yet I did not spot any of them during my session there, which consisted of a fair number of hours each day, the only exception being the Editor of this journal, who was accompanied by his draughtsmen. Worth setting on record, eh?

Mains Aerials

I HAD a little experience the other night which, although by no means new and unheard of, will probably interest several readers who have a mains set which they feed from a mains aerial. You know the kind of arrangement I mean—simply a fixed condenser between one of the A.C. connections to the mains transformer and the aerial terminal on the set. The receiver which I have been using recently is a four-valve A.C. superhet, and as I rarely listen to other than the three comparatively local stations, a mains aerial gives all that I require and free from interference. Anyhow, to revert to my original point, the set had been in use on the Sunday evening and we had enjoyed a very good programme from the National; the volume control had been set about one quarter "on," which setting normally provides ample volume. When on the Monday I came to switch on to listen to the news I found that the volume level was distinctly low, and certainly insufficient to provide comfortable reception. I tried the tuning knob to see that this had not been moved, but it made no difference. Next, I "turnedup the wick "on the volume control, but signal strength was only just comfortably loud with this set to the full-on position.

I listened to the news—all the time itching to see what was wrong—and when this had been concluded I tried the other stations. Reception from these was just the same, and it seemed impossible to obtain anything like full volume.

It was some minutes before I remembered that the room had been thoroughly cleaned that day, and that the set might have been moved. Yes, that provided the clue, for I found that the mains plug had been removed and replaced in the opposite direction. This changed, everything was "as you were."

The Earthed Main

THE reason for the lack of volume with the mains plug in one position is that one of the mains leads is effectively earthed by the electricians when wiring the house. And one can hardly expect to get good results by connecting the earthed lead to the aerial terminal, especially when the earth terminal on the set is also connected to earth. This hint might be helpful to others who use a mains aerial, whether the set is home-made or a commercial instrument. By the way, if you have not yet tried a mains aerial, you should do so, provided that the full sensitivity of the set is not required. It does not always prove to be an unqualified success, and its efficiency depends upon various characteristics of the mains supply, but it usually provides good reception free from interference.

Notes from the Test Bench

Inefficient Aerials

A FRIEND of mine who recently moved into a new house complained that he was not obtaining very satisfactory results from his receiver, and asked me if I would give the set a check. I found that the overall sensitivity of the receiver was very low and I immediately suspected that one of the valves had lost its efficiency, as they have been in use over twelve months. Exhaustive tests proved that the valves were quite in order, however, and the voltages and currents in the receiver were normal. I therefore suspected the aerial/earth system: this was of the modern indoor type with the aerial and earth terminals connected to a terminal board screwed on to the skirting board.

First of all I removed the earth lead of the receiver from the earth terminal and connected it to a gas pipe which happened to run quite close to the set. This modification provided a marked improvement, indicating, of course, that the lead attached to the legitimate earth terminal on the skirting board was not making good contact with earth. The sensitivity was still low, however, and therefore I decided to climb into the attic in order to examine the so-called roof aerial. I was amazed to find that the aerial lead was passed through a narrow metal tube which reached from the attic to the aerial terminal downstairs, and the wire that actually protruded from this tube was carefully coiled up and placed on the upper side of the ceiling. The reason for the low sensitivity was, of course, immediately obvious; the tube acted as an efficient screen for the aerial lead passing between the attic and the set and the remainder of the lead which was neatly coiled on the ceiling was a very inefficient pick-up. When a lead of equal length was passed through the window, up the side of the wall and under the eaves into the attic, signal strength increased three-fold and normal reception was obtained. This experience may serve as a warning to readers who have an aerial-earth system of this type fitted; neatness is its only redeeming feature.

Supplying S.G. Screens

IT would seem from our correspondence that many constructors are of the opinion that S.G. valve screening grids may be satisfactorily supplied from the 70 or 80-volt detector terminals of a mains unit. Although in some cases this method of connection may be adopted, we cannot recommend it for general use, as the normal current consumption of the detector valve is much higher than that of the screen of an S.G. valve. Most eliminator designers allow a current consumption of 2 m/a. for the detector valve and calculate the required value of the detector dropping resistance from this current value. As the current consumption of the screening grid of most S.G. valves is only approximately half an ampere, the voltage actually present at the detector terminal will be much higher than the specified value of 80 volts if the only lead connected to this terminal is that joined to an S.G. valve screening grid.

The Super-regenerative Circuit

IT would rather appear from many conversations which I had at Radiolympia that the super-regenerative circuit is going to become popular again. Several readers told me that they were using it in their portable receivers, and at least one firm has adopted it in the design of a neat pocket receiver. Those whose experience of wireless construction goes back for ten years or so will remember what wonderful results were then to be obtained from a single-valve Armstrong arrangement, even when using the smallest of frame aerials. The main difficulty in those days was in connection with obtaining reasonably good quality without the annoying background hiss which normally characterises the super-regenerative circuit. With modern valves and other components it is possible to reduce the background interference very considerably without introducing any very great attendant loss in sensitivity. In fact, it is probable that this type of circuit will become more or less standardised in midget pocket portables, where a minute frame aerial is almost essential.

"Straight" or "Super"?

THE controversy regarding the relative merits of the "straight" and superheterodyne circuit is as old as broadcasting, and we have seen a constant reversal of opinion from year to year. About a couple of years ago, however, the superhet returned into strong favour, and it seemed that it would survive for many years; but there are already many experienced designers who say that the superhet is doomed for quality reception. One firm in particular is backing this opinion by producing "straight" sets almost exclusively, and they make some very forceful arguments in its favour.

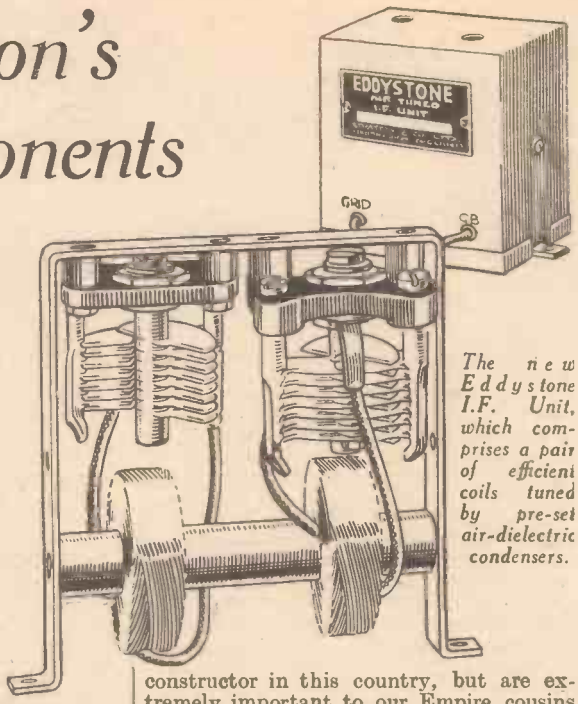
Au Revoir to 30-line Television

THE announcement that the B.B.C. proposes to drop the 30-line Television transmissions, which take place twice a week—Mondays and Wednesdays—gives me a pang. I have been looking-in regularly for the past three years, and confess that I get a greater kick out of television experiments than from radio. On September 15th, the present transmissions will cease, in order to give the B.B.C. breathing time to prepare for the new High-definition service promised for January. This cessation is in distinct opposition to the recommendations laid down by the Television Committee. What will happen to all the old disc machines? Lots of apparatus will be scrapped, and I am wondering whether 30-line operators will arise in their wrath and let the B.B.C. know all about it. I have been operating a cathode-ray television receiver for some months, and am delighted with the results—steady pictures, excellent picture brilliancy, and unfailing results. I merely switch on like the electric light and the pictures appear. I only have to twiddle the synchronising knob now and again to keep my pictures in step.

The New Season's Short-wave Components

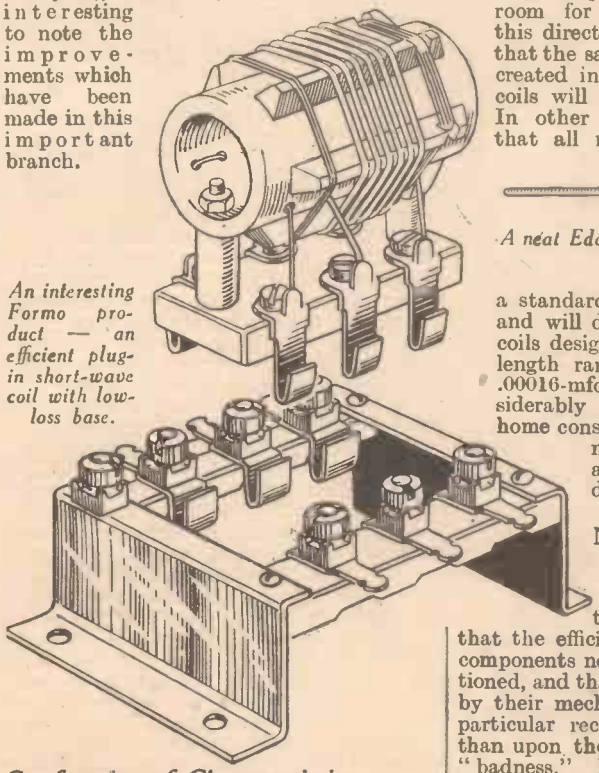
There is Now an Extremely Wide Range of Short-wave Components Available for the Constructor, and Reference is Here Made to Most of those of Outstanding Interest.

By FRANK PRESTON



The new Eddystone I.F. Unit, which comprises a pair of efficient coils tuned by pre-set air-dielectric condensers.

WHETHER or not it is agreed that home construction has been less active during the past year, there is little doubt that it will show a marked improvement during the season 1935-36, at least so far as short-wave receivers are concerned. For a few months past it has been very evident that more manufacturers than ever before were giving their closest attention to the production of efficient short-wave components at mass-production prices, and the results are most encouraging to the home constructor. PRACTICAL AND AMATEUR WIRELESS has always paid particular attention to the short-wave side of radio (the Short-wave Section was enlarged at the beginning of this year), and it is therefore all the more interesting to note the improvements which have been made in this important branch.



An interesting Formo product — an efficient plug-in short-wave coil with low-loss base.

Conformity of Characteristics

Whereas a year or so ago there were very few firms producing a complete range of specialised low-loss S.W. parts, there are to-day numerous manufacturers of "broadcast" components—and manufacturers with a high reputation for quality—who are ready to supply every requirement of the short-wave enthusiast. Thus we find such names as Wearite, Bulgin, Varley, Colvern, J.B., Polar, Clix, and Formo among those of Eddystone, B.T.S. and others who have specialised in short-wave materials alone.

Another very gratifying aspect of the situation is that there is a good deal of conformity of characteristics in the components produced by the makers. For example, most of those who supply short-wave tuning condensers make at least one model with a capacity of .00016 mfd. or .00015 mfd., a capacity which has proved particularly satisfactory. Also, there is a closer correspondence between the connections used for short-wave coils, those for plugging into a four-pin or special six-pin valve holder predominating. There is still room for a certain improvement in this direction, however, and it is hoped that the same difficulty which has been created in connection with broadcast coils will not be allowed to develop. In other words, it is to be hoped that all manufacturers will agree on a standard terminal or pin connection, and will decide to make "standard" coils designed to cover definite wavelength ranges when tuned by, say, a .00016-mfd. condenser; this would considerably simplify the task of the home constructor, who would be able to memorise the connections for all types of coil, just as he does for valves.

A neat Eddystone ultra-short-wave H.F. choke. It has wire ends for ease of connection.

New Insulating Materials

It is a great tribute to the industry as a whole that the efficiency of the many S.W. components now offered is rarely questioned, and that they are judged more by their mechanical suitability for the particular receiver to be constructed than upon their mere "goodness"—or "badness." Numerous high-grade insulating materials have been produced and developed for the construction of valve holders, coil formers, condenser insulating bushes and the like, and although these are known by various names they all have high insulating properties, combined with low dielectric losses, in addition to which they are comparatively impervious to moisture and unaffected by varying temperatures. The latter points are not, perhaps, of great moment to the constructor in this country, but are extremely important to our Empire cousins who live in countries where the climate is hot and humid.

Smaller Dimensions

Another interesting change which has been effected in recent S.W. components is in connection with their dimensions, which have been reduced rather appreciably. The result is not only that a more compact receiver can be built, but that the stray fields formed round the parts are much smaller, with the consequence that efficiency is enhanced. An example of this is to be found in tuning coils, the diameter of which is now rarely more than 1¼in., and often much less, whilst the corresponding figure used to be about 2½in. High-frequency chokes, also, have been considerably reduced in size, and a number of those now available are only slightly larger than the metallised and composition fixed resistances which have become so popular. These chokes consist of three or four series-connected honeycomb windings on a ceramic-type former closely resembling a grid leak, and having metal

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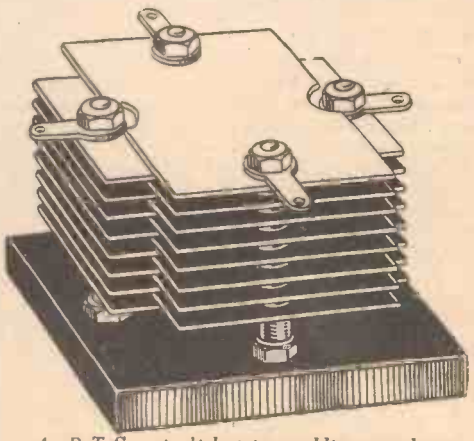
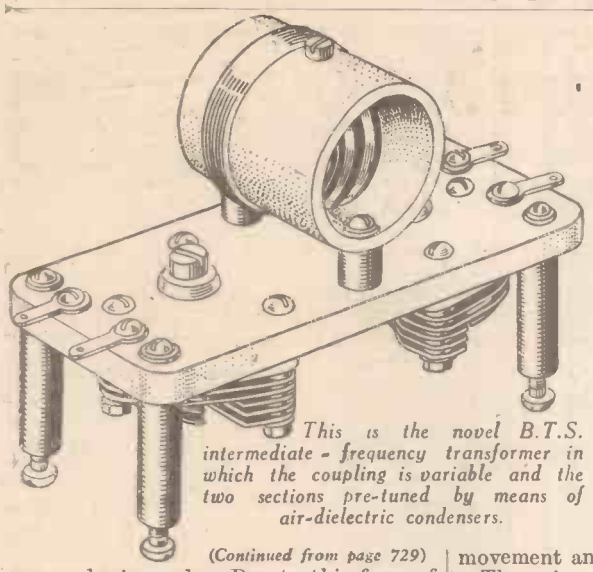


A B.T.S. air-dielectric padding condenser which is suitable for a variety of uses in short-wave and ultra-short-wave receivers.



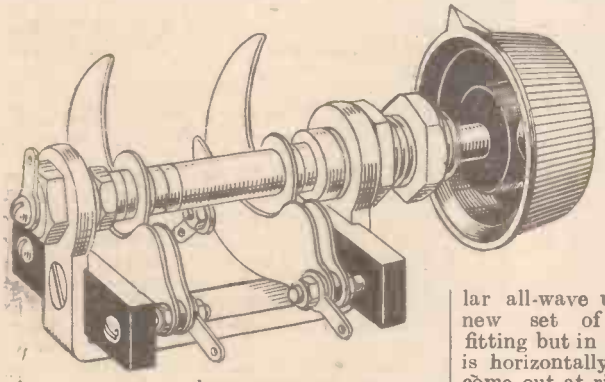
This is the novel B.T.S. intermediate-frequency transformer in which the coupling is variable and the two sections pre-tuned by means of air-dielectric condensers.

(Continued from page 729)

caps and wire ends. Due to this form of construction the chokes are extremely compact and convenient to use; they are made by such firms as Eddystone, B.T.S. and Bulgin and supplied at very attractive prices.

New I.F. Condensers

Another direction in which considerable improvement has been made is with 465-kc/s intermediate-frequency transformers for use in short-wave superhets. These new components—interesting examples of which are made by Varley and Eddystone—comprise two high-efficiency windings tuned by a pair of low-loss air-dielectric trimmers. The result is a component of extreme efficiency, which can be adjusted over a wide range of frequencies and which can be tuned with perfect accuracy.



A new two-gang low-capacity tuning condenser which has recently been introduced by Jackson Bros.

There are other new I.F. units intended for use in ultra-short-wave superhets. These are tuned to an average frequency of 15 megacycles, and have a band-width coverage of about 1 megacycle, such as is required for the good reception of high-definition television. Representative examples are made by Bulgin and B.T.S. (British Television Supplies, Ltd.), the prices being very modest in both instances.

Improved Short-wave Condensers

With regard to S.W. and U.S.W. variable condensers, the main point is that they are now made by a greater number of manufacturers, among which may be mentioned Polar, J. B., Eddystone, B.T.S., Formo, and Colvern. In each case an extremely high degree of efficiency is assured by the use of the smallest possible amount of high-grade insulating material for supporting the rotor, and by the use of special materials for the vanes. For example, the vanes of the B.T.S. condenser are silver plated to resist oxidation, whilst in many other cases the vanes are of hard brass, which is also treated to prevent the formation of oxide. Many and varied are the methods employed to ensure perfect contact with the moving vanes, so avoiding crackles and other objectionable noises when tuning, and whereas some manufacturers prefer to use a long, plain spindle bearing, others favour a ball race, and others an insulated pigtail; in most cases provision is made for varying the "stiffness" of movement and for taking up end play.

There is a number of two-gang condensers for use in superhets and other receivers employing two tuned circuits, and the Polar components are worthy of mention, as are those made by that other well-known condenser firm, Jackson Bros. The Polar condenser is built on a Steatite base, and the J.B. can be obtained with plain and slow-motion drive.

Coils

It would be impossible to mention by name, and to describe the full range of available S.W. coils, but reference can be made to a few of differing types. Eddystone, as for many years past, have a very complete range of 4-pin and 6-pin types wound on their formers made of "DL-9" insulating material; the B.T.S. 6-pin coils are on special bakelite formers; Wearite have a complete new range of high efficiency; Formo have produced a neat set of double screened coils mounted on a metal base containing a low-loss switch; Bulgin have a wider range than ever, in addition to their popular all-wave unit; and Colvern have a new set of S.W. coils with 6-pin fitting but in which the cylindrical former is horizontally disposed so that all leads come out at right-angles to the winding.

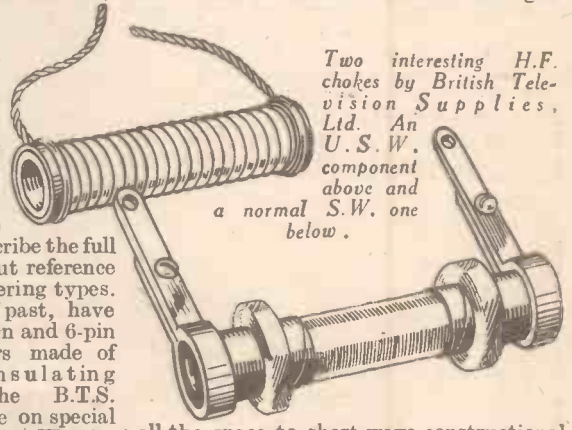
Low-loss Valve Holders

Among the smaller, but by no means less important, items are the many low-loss valve-holders now on the market. Most of these—Wearite, Bulgin, Eddystone, B.T.S., etc—employ some form of ceramic base, whilst the Eddystone is particularly designed for above- or under-chassis mounting. Another new S.W. valve holder of entirely different type is the Clix, made by Lectrolinx. In this, the sockets are mounted on the bakelised material which has characterised Clix holders for years, but this socket support is mounted on three short ebonite legs whilst the terminal contacts are bent outward to reduce capacity to a minimum, and to simplify the making of connections.

Two Novelties

Among the new and useful "novelties" reference should be made to the slow-motion head lately introduced by Eddystone, and to the Hivac midget S.W. valves. The former is a handy 9-to-1 reduction drive suitable for use with condensers mounted with an extension spindle; it is provided with a pointer which moves through 180 degrees. The latter are similar in construction to the ordinary Hivac midgets (such as were used in our "Cameo" range of sets), but they are fitted with low-loss Frequentite bases.

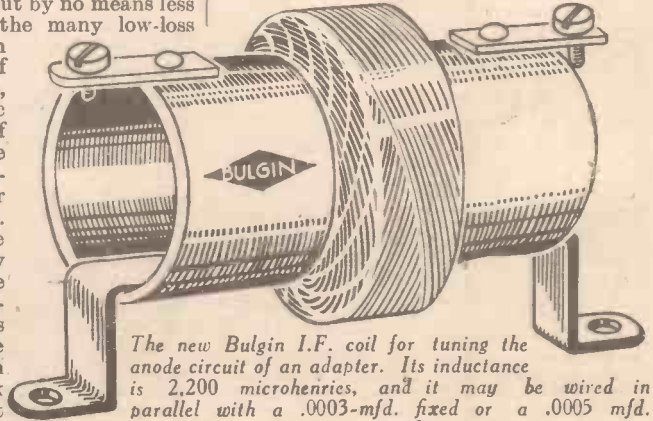
In summing up the position of the short-wave constructor one cannot do other than come to the firm conclusion that his needs are better catered for than has ever been the case before, that he can pursue his hobby in the knowledge that the makers can supply his every need at low cost, and that they can give him genuine service. PRACTICAL AND AMATEUR WIRELESS will give all the space to short-wave constructional work that this important branch merits.



Two interesting H.F. chokes by British Television Supplies, Ltd. An U.S.W. component above and a normal S.W. one below.

It is appropriate to mention here that several designs for short-wave receivers, adapters, and converters have previously been given in these pages, whilst a number of general and technical articles on short-wave reception have appeared from time to time. Back numbers of issues containing all these articles are available from: The Publishing Dept., Geo. Newnes, Ltd., Exeter Street, Strand, London, W.C.2, at 4d. each, post paid.

I would also remind all readers of the Free Advice Bureau which is operated by this journal. The Technical Staff will be pleased to answer all readers' queries, provided that they are in keeping with the simple rules given on the "Replies to Readers' Queries" page.



The new Bulgin I.F. coil for tuning the anode circuit of an adapter. Its inductance is 2,200 microhenries, and it may be wired in parallel with a .0003-mfd. fixed or a .0005 mfd. pre-set condenser.

PETO-SCOTT

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Direct from Factory to you . . . saves middleman's profits. Gives a wide choice of foreign stations with amazing perfection of tone and volume.

Built with all the latest improved components including Peto-Scott Moving-Coil Speaker. SCREENED COILS, high efficiency S.G., Detector and super power output valves. Low H.T. consumption. Full-Vision scale. Modern Walnut Cabinet. British valves of guaranteed life. Ready to play. Complete with Oldham Accumulator and H.T. Batteries. Cash or C.O.D. Carriage Paid £6 6s., or 5/- down and 18 monthly payments of 7/9. STRAIGHT 3 MODEL. Cash or C.O.D. Carriage Paid £4/19/6, or 5/- down and 18 monthly payments of 6/-.

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Model 36S. Incorporating improved Mansfield Magnet, which gives previously unobtainable flux density. Can be matched to any output. Cash or C.O.D. Carriage Paid. £2/2/0, or 2/6 down and balance in 11 monthly payments of 4/-. Fitted in W.B. Non-Resonant Cabinet. Cash or C.O.D. Carr. Paid. £3/3/0, or 5/- deposit and 11 monthly payments of 5/9.

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DETAILED PRICED LISTS of PARTS on REQUEST. *Any item supplied separately. Orders over 10/- sent C.O.D.—carriage and post free.*

SONOTONE 3/4

BATTERY VERSION

KIT "A" Cash or C.O.D. Carriage Paid. **£4:13:6**

Author's Kit of first specified parts less valves, cabinet and speaker.

Yours for 12 monthly payments of 8/6.

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Author's Kit of first specified parts, less valves, cabinet and speaker. OR YOURS FOR **10/0**

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KIT "B" Cash or C.O.D. Carriage Paid, £3/5/9, or 12 monthly payments of 6/-.

KIT "C" Cash or C.O.D. Carriage Paid, £4/0/9, or Deposit 7/6 and 11 monthly payments of 7/3.

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MODEL A.C.12 (illustrated). For A.C. Mains 200/250 volts. Output 120 volts at 12 m/a. Four tappings: 60 v., 75 v., 90 v., and 120 v. Cash or C.O.D., Carriage Paid. £1/10/0 or 2/6 down and 10 monthly payments of 3/-.

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MODEL M.A.10/30, with Trickle Charger. Cash or C.O.D. Carriage Paid. £2/19/6 or 5/- down and 11 monthly payments of 5/6.

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AMPLION LION SUPER P.M. Speaker, can be matched to any output. Cash or C.O.D. Carriage Paid, £2/15/0. Balance in 11 monthly payments of 5/-. Send 5/- Only

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ROLA F620-P.M.T. Dustproof construction, and fitted with universal transformer. Cash or C.O.D. Carriage Paid, £1/12/6. Balance in 11 monthly payments of 3/- Send 2/6 Only

BRAND NEW MODERN RECEIVERS AT HALF PRICE!

McMICHAEL 5-VALVE BATTERY

"LODEX"

7/6 DOWN and 17 monthly payments of 10/9.

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● 2 H.F. Stages, Detector, Driver and Class B Output. ● Moving Coil Speaker. ● Exceptional degree of selectivity. ● Long range. ● FINE VOLUME. ● Complete with all valves, H.T. battery and accumulator. ● Ready to play.

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LISSEN BAND SPREAD SHORT-WAVE 3 KIT, complete with Valves. Covers 13-55 metres. Band Spread tuning. Cash or C.O.D. Carriage Paid, £3/9/6. Balance in 11 monthly payments of 6/6. Send 5/- Only

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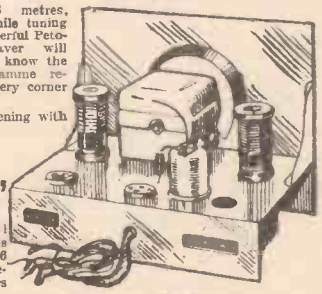
RADIO FOR THE MILLION, "NEW MASTER THREE." 3 valver. Complete Kit of components with valves. Cash or C.O.D. Carriage Paid, £1/17/3. Balance in 10 monthly payments of 4/-. Send 2/6 Only

New DISCOVERER H.F.P.3

PETO-SCOTT SHORT-WAVER

Covering 13-96 metres, with a 12,000-mile tuning range, this wonderful Peto-Scott Short-waver will enable YOU to know the thrill of programme reception from every corner of the world.

Built in one evening with simple tools.



KIT "A"

Comprises all necessary parts to build, with 6 coils (13-96 metres), less valves and cabinet. With Full Size Blueprint and detailed instructions. Cash or C.O.D. Carriage Paid. £4/15/0, or 7/6 Deposit and 11 monthly payments of 9/-.

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FINISHED INSTRUMENT

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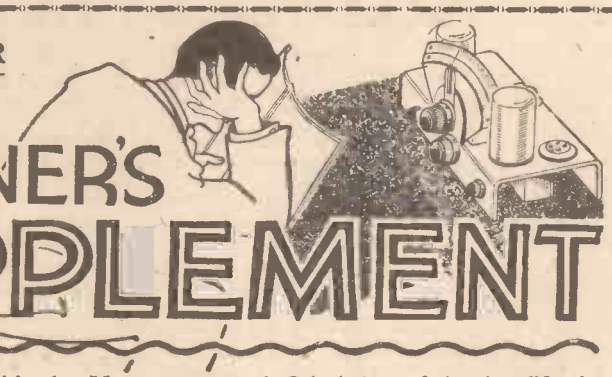
BEGINNER'S SUPPLEMENT



This Week We Deal with the Measurement and Calculation of the Amplification Factor and Impedance. Important Features of the Output Valve are also Discussed

By W. J. DELANEY

ALTHOUGH the most important features of the valve characteristics have been dealt with, it is useful to be able to check the amplification factor and the impedance. Although not essential, squared or graph paper will be found useful, but to save costs a sheet of paper may be ruled up in the form of small squares, the actual size of which will depend upon the degree of accuracy required. The bottom of the graph (the co-ordinates) must be marked off to represent grid bias voltages, whilst the side of the graph (the ordinates) must be marked off to correspond with the anode volts. It will be seen that the range of figures in both cases will depend upon the particular valves being measured.

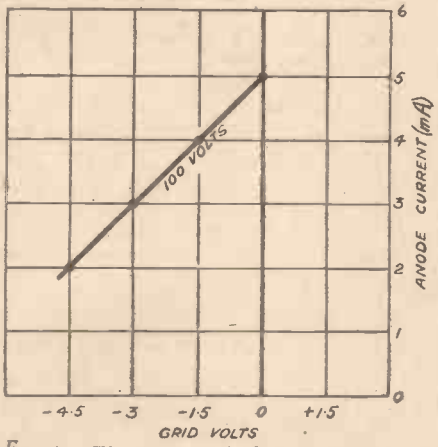


Fig. 1.—The method of plotting a characteristic curve.

Setting Out the Curve

Now with the apparatus shown last week the valve should receive 100 volts H.T. and the grid bias should be varied from zero to a value at which the anode current falls to zero, and at various values a dot should be marked on the graph corresponding with the intersection of the anode-voltage figure and the grid-bias figure. Thus, in the example given in Fig. 1, the valve with 100 volts H.T. and zero grid volts shows an anode current of 5 milliamps. When the grid bias is increased to 1.5 volts the current drops to 4 milliamps, and when 3 volts grid bias are applied the current is 3 milliamps. At 4.5 volts grid bias the anode current is 2 milliamps, and the procedure is continued in this manner until zero current is recorded. The dots are then joined together and so the well-known characteristic anode-current grid-volts curve is formed.

Now the H.T. is increased to 120 volts and a similar process is carried out, which will result in a second row of dots and a curve immediately above the first one. Any number of curves may be made in a similar manner with various H.T. voltages, and these may be checked with the curves published by the manufacturers in order to ascertain the condition of the valve.

Amplification Factor

The amplification factor is the ratio of the voltage in the anode circuit to the applied grid volts, and is ascertained in this manner. Apply 100 volts H.T. and 1.5 volts grid bias, and note the anode current reading. Let us assume that this is 4 milliamps as in Fig. 1. Now increase the grid bias by, say, 3 volts, and note the new anode-current reading. If we take our original example we shall find that it is 2 milliamps. Now, without altering the grid bias, increase the H.T. until the anode current returns to the original value, in this case 4 milliamps. Note the new H.T. value and subtract this from the original value, and you will have the number of volts increased H.T. and this must be divided by the number of volts increased grid bias, which gives you the amplification factor. In the example we will assume that a further 15 volts H.T. had to be applied to obtain 4 milliamps with the 4.5 volts grid bias, and thus we have 15 divided by 3 (the increase in grid volts), which gives us an amplification factor of 5. The calculation can, of course, be made from the set of curves which have been prepared, so long as the various figures produce intersections at definite points and thus eliminate fractional working.

The Impedance

The anode impedance is calculated from figures which have already been taken and no further measurements are required for this factor. It is ascertained by dividing the amplification factor by the slope and multiplying the answer by 1,000. Thus, if the amplification factor is 12, and the slope is 4 mA/V, the impedance would be $\frac{12}{4} \times 1{,}000$, which equals 3,000, and the answer is in ohms.

Anode Dissipation

An output valve, especially when of the larger mains type, is always rated by the makers to have a certain anode dissipation, and the maker's figure must on no account be exceeded, unless you are prepared to shorten the life of the valve. This dissipation is not to be confused with the speech output and is a simple electrical calculation of wattage. As every reader knows, wattage is the product of volts and amps., and, therefore, the anode dissipation is obviously the product of the maximum anode volts and the maximum anode current, and these figures are always given by the valve makers. Thus, if a valve is rated at 200 volts H.T., at which figure, with the correct grid bias, the anode current is 50 milliamps, the maximum anode dissipation would be 200 x .05 (expressing the current in amps.), which equals 10 watts. This figure is useful when calculating the undistorted output and in plotting the load line, although for these calculations it is necessary to draw up another set of curves, which are known as dynamic curves.

Standard Abbreviations

As most valve manufacturers quote the various characteristics, or show on the curves the various ratings in abbreviated form, it would, no doubt, be as well, before going further, to give the standard abbreviations which are used in this connection. Current is represented by the letter I, and voltages are represented by the letter E. In some cases, however, it may be found that the letter V is used for voltage, although the correct electrical symbol is E, as first mentioned. For the anode the small letter a is used, and for the grid the small letter g is employed, whilst in the case of S.G. valves, the screening grid would be referred to by the letters "sg." Thus, instead of writing out in full "anode volts," the abbreviation Va would be employed, and for the anode current the letters Ia would be used. Eg represents the voltage on the grid (or the grid bias), and so on.

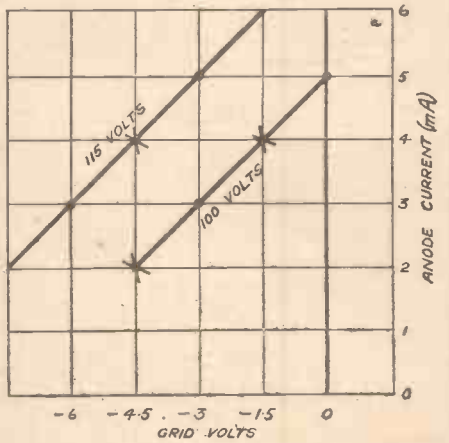


Fig. 2.—In this example the amplification factor may be seen from the two curves. At 100 volts H.T. the current is 4 mA., and an increase of 15 volts H.T. and 3 volts G.B. produces the same current figure. Therefore the amplification figure is $\frac{15}{3}$ or 5.

The undistorted output which a power valve will give is a wattage calculation, but the speech currents are alternating. Therefore, it is not possible to measure the output with ordinary meters, and a special A.C. meter is necessary. It is possible to construct such an instrument from a D.C. meter with the aid of a special metal rectifier of the small instrument type, but it may be calculated.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

A Remote Control Device

A VERY simple and efficient remote control device, made from a length of Bowden cable and a few junk-box oddments, as in the accompanying sketches.

Fig. 1 shows the distant control made with an angle bracket to which is fitted a brass strap for fitting to the steering column of a car, etc. (see Fig. 4). As the knob is turned the swivel arm pulls or pushes the wire in the cable. Fig. 2 shows the control switch that is fitted to the panel of the set by means of a small bracket, and is operated by the wire pulling and

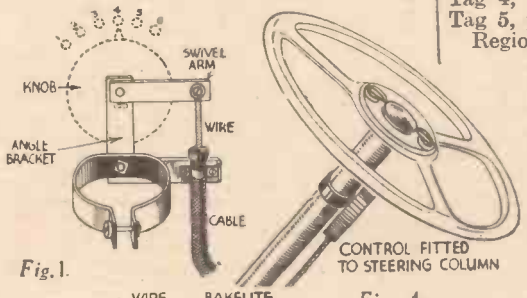


Fig. 1. Fig. 4.

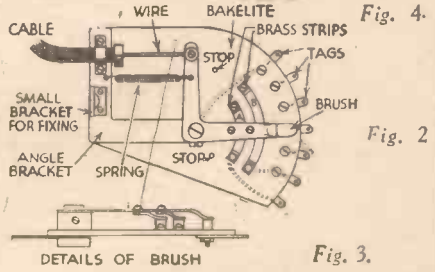


Fig. 2 Fig. 3.

Details of a remote control device operated by a Bowden cable.

pushing a contact brush over a series of studs, each of which is connected to a soldering tag. The switch is mounted on a piece of bakelite or sheet ebonite. The two brass strips are for wave-change and low-tension battery switching. Details of the brush are shown in Fig. 3, and it will be seen that there are two small pieces of strip brass fixed under the main arm.

On turning the knob to No. 1 (Fig. 1), the set is switched off. Stud No. 2 is for long-wave Droitwich, the brush having engaged brass strip B, thus switching on L.T. and shorting tag 2. Nos. 3, 4, and 5 are for three medium-wave stations (London National, Midland, and London Regional), the brush engaging brass strip A and shorting the wave-change point. On stud No. 6 the set may be used with a pick-up.

No measurements are given, as the switch may be made in several sizes to suit different sets. Hand-capacity is nil, the whole switch being earthed. Connections for the switch are as follow:

Tag 1, earth on set.
Tag 2, pre-set condenser set for Droitwich, long wave.
Tag 3, pre-set condenser set for London National.

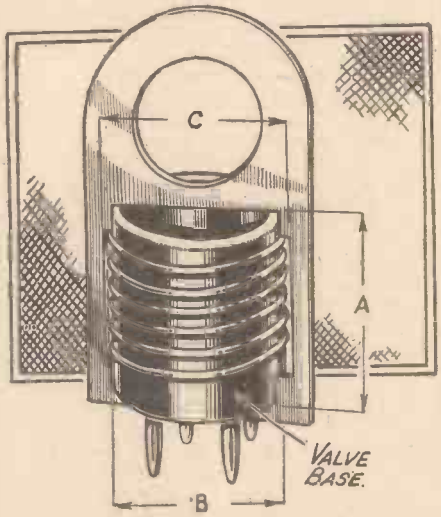
THAT DODGE OF YOURS!!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

Tag 4, pre-set condenser set for Midland.
Tag 5, pre-set condenser set for London Regional.
Tag 6, wave-change on coil.
Tag 7, low-tension negative.—MAURICE PULVER (Luton).

A Short-wave Coil Holder

THE dodge shown in the accompanying sketch facilitates the handling of short-wave coils constructed from valve bases. I found that the constant changing of the coils was displacing the windings, so

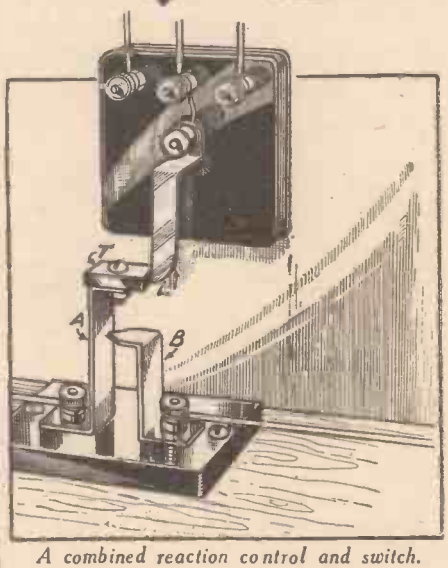


A holder for facilitating the handling of short-wave coils.

from a piece of 1/16in. fibre sheet I made a handle with an opening cut out to fit tightly over the valve base, and fixed it in position with a little Chatterton's compound. The dimensions A and B are to suit the size of the valve base, while the width of opening C must clear the windings. —S. R. BRADFORD (Coventry).

Reaction Control and Switch

THIS useful combined reaction control and switch is made as follows: A small brass lever (L) is drilled at one end and clamped under the end spindle nut of a reaction condenser or volume control, as shown in the sketch. When reaction is turned off this is adjusted to press against a small ebonite tip (T) of the



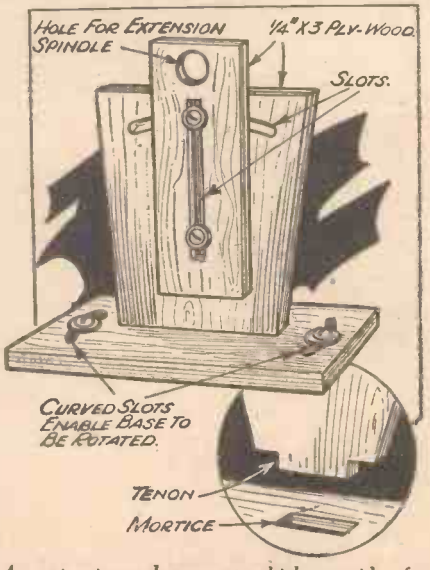
A combined reaction control and switch.

spring brass contact strip A, thus breaking the contact with the other strip B. The strips A and B are connected in the low tension circuit. The lever (L) is bent in order to clear the condenser terminals.—JAMES H. ROWE (Dublin).

An Extension-rod Support

THIS easily-made contrivance in the form of an extension rod support allows universal adjustment instead of the usual vertical movement. It compensates for errors in fixing mount to the baseboard, thereby preventing strain on the condenser or other component mounted.

It is of particular use in short-wave sets, and the construction of the device will be quite clear from the accompanying sketches. —P. T. JONES (Tonyrefail, Glam.).



An extension-rod support which provides for universal movement.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

A. F. D. (Widnes). No alteration, beyond the substitution of broadcast coils, is necessary, and we can recommend the set for the purpose you name. The condenser should, of course, be 40 mmfd. and not 40 mfd.

E. T. R. (Marfleet, Hull). The unit would be suitable for the two push-pull valves, but would not supply sufficient current to feed any further valves in a set, and therefore two separate mains units should be used, one for the first portion of the receiver and one for the output stage. The transformer in question is for a push-pull output stage, the two terminals marked P being joined to the two anodes of the push-pull valves, and the H.T. terminal being connected to the H T. positive supply. The terminals marked speaker are joined to a loud-speaker of high resistance.

G. Y. (Penge). We would not advise you to use the component as it is at least three years old.

D. P. O. I. (N.17). Both of the speakers are good instruments and you should hear them on your set before buying. Remember that a good baffle is essential to maintain good bass response.

C. A. B. (W.C.1). The idea is very sound and if you can construct the device (even if it is only a rough model) you should submit it to one of the large companies. It would be worth while to protect the device by means of a provisional patent if you attach any importance to the scheme.

F. L. K. (Leeds). Your local electrical supply company could give you the information. You must not interfere with the fuses on the mains side of the supply, and it is not advisable to modify the house fuses unless you are fully aware of what you are doing as you may easily remove the protection which these fuses provide.

S. W. (Watford). The tree may be used, but there are several points to watch. Leaves must not touch the wire in view of the possibility of short circuit when the leaves are wet. Spiders may construct a web from the wire to the branches and these, when laden with moisture, can provide a very leaky path. It would be preferable to use a length of heavy cord between the tree and the aerial, with a chain of insulators joining the two outside the range of the branches. The shortening of the wire will be offset by the increased efficiency of the aerial.

B. P. M. (Llandudno). An economiser may be fitted and a suitable component is obtainable from the Benjamin Electric Company.

B. S. (Glasgow). From the various details you submit we should say the pentode stage would be preferable. The current would be less and the reduction in valves is counterbalanced by the increased amplification of the pentode. The L.T. supply would also last longer with this valve. The range would not be affected.

A. V. C. (Portsmouth). We suggest that you obtain a multiple plate accumulator of reliable make, as this will supply a heavier current than the mass plate type.

K. S. (Porlock). The specified condensers are of the 4 mfd. paper dielectric type having a voltage rating of 300 volts or higher. Electrolytic condensers may be used provided that they are wired correctly; the positive terminal must be connected to the positive line and the negative terminal to the negative line.

W. H. G. (Haverfordwest). We have checked your diagram and find that the wiring is in order. It is therefore concluded that one of the components is defective, or that the aerial-earth system is not efficient. The components should be tested and it should be ascertained that the aerial is well insulated from earthed points. We suggest the addition of an H.F stage for your locality.

W F. (Blackburn). It is advisable to supply the H F pentode screening grid (even though valve is used as detector) by means of a potentiometer connected across the H.T.+ and H.T.— leads of the eliminator. If a variable control is incorporated in the eliminator for supplying the screening grids, the H.F. Pen. valve in the H.F. stage and the detector H.F. Pen. may be supplied from this. The detector anode may be joined *via* a 30,000 ohms resistance to the H.T + terminal.

D. A. H. (Cold Blow). We suggest that you obtain the booklet "Make Your Own Wireless Set" from the Publishing Dept., G Newnes, Ltd. Constructional details of simple receivers that will meet with your requirements will be found in this.

R. M. (Morayston). It is impossible for us definitely to diagnose the fault from the information given in your letter, but if the wiring is in order the lack of signals will be due to a defective component. We suggest that you test the components, especially the valves and coil.

J. R. M. (Bristol). Cossor valves 210Det., 210LF, and 220PA may be used. The bias voltage for the 220PA should be 4.5 volts for H.T voltage of 150 volts.

B. P. (Alderley Edge). The conversion of an A.C. receiver for operation from D.C mains cannot be effected cheaply It is suggested that you exchange the A.C. set for a universal (A.C./D C) model.

W. S. M. (Biggleswade). You do not state the valve type used and, therefore we cannot calculate the required value of bias resistance. Forward details of output valve and enclose stamped addressed envelope for return of diagrams

J. H. D. (Barrow-in-Furness). The price you mention is very low for a reliable converter unit Constructional details of a suitable unit will be found in PRACTICAL WIRELESS No. 66, page 740

J. H. (Blackpool). The volume would be greatly increased if a resistance capacity coupled L.F. stage were interposed between the detector and super-power valves. We regret that we do not know of a club in your immediate locality.

H. N. R. (Enfield). A four-valve S.G. receiver using Lissen coils was described in PRACTICAL WIRELESS dated Oct. 15th, 1932. This back number may be obtained from our Publishing Department for 4d.

E. L. H. (West Moors). If the output of your eliminator is 35 m.a. in excess of the requirements of your existing valves, and the voltage is approximately 150 volts, two Cossor 41MP valves may be used in the output stage. The heaters of these may be supplied from your L.T. transformer

W. C. (Chorley). We regret that we cannot supply blueprints of Telsen receivers, and do not know where these can now be obtained.

H. D. S. (London, N.8). Constructional details of a two-valve short-wave receiver were given in *Amateur Wireless* dated July 14th, 1934. The blueprint of this set is No. A.W.440.

W. F. (Winchester). The pick-up may be wired in the manner suggested for the original three-valve circuit arrangement, but if a very sensitive pick-up is used, it may also be tried across terminals 1 and 4 of the Max transformer. It is advisable to pass the pick-up leads through a braided metal screen. The leads from the extension speaker may be connected *via* 1 mfd. condensers to the anode terminals of the Class B valve.

P. J. S. (London, N.W.1). One of the following sets will probably meet with your requirements: Ferranti Nova, Marconiphone Universal 3, Philips 585/U.

B. V. (Kingsbury). It is probable that the pentode valve is defective. If this in order, the wiring should be checked, and it should be ascertained that the correct bias voltage is being applied and that the output transformer attached to the speaker is of the pentode type.

J. A. T. (Ossett). The diagram and details of a Ford coil used for supplying H.T. will be found on page 710 PRACTICAL WIRELESS dated Aug. 19th, 1933.

V. H. (Leicester). It is suggested that you connect the detector grid leak to the L.T.— terminal of the valve-holder, and decouple the detector anode circuit by means of a 2 mfd. condenser and a 20,000 ohms resistance. You should also ascertain that the correct number of reaction turns are being used, and try the effect of connecting a .0001 mfd. variable condenser between aerial lead and aerial terminal of the coil.

D. S. (Kingsland, E.8). We suggest that you obtain the booklet "Make Your Own Wireless Set," and the "Wireless Constructors' Encyclopædia" from our Publishing Dept. The price of the former is 6d. (by post, 7d.), and the latter 5s. (by post, 5s. 6d.).

P. J. G. (Kenilworth). The short-wave coil should be wound in accordance with the following data. Grid winding, four turns of 18 s.w.g. wire; aerial winding, three turns of 18 s.w.g. wire; reaction winding, five turns of 34 s.w.g. wire placed at the earth end of the grid winding. The turns of the grid winding should be spaced about ⅛in.

H. E. B. (West Norwood). The kit of parts for the Allwave A.C. Three may be obtained from Peto-Scott, Ltd., for £9 13s. 6d. (less valves).

T. A. (Liverpool). We regret that we have not published the design of a receiver using your valves. We think that your receiver is of reliable make, and therefore suggest that you have it tested by a reliable radio mechanic.

W. L. M. (London, S.W.8). There are several types of Telsen coils on the market having different terminal numbering, and therefore we cannot decide how yours should be wired unless you can supply a diagram of the internal wiring. Your two-valve receiver may be made into a three-valver by the addition of an H.F. stage. Constructional details of an H.F unit will be found in PRACTICAL WIRELESS, No. 62.

F. M. (Anerley). We regret that we have not published a receiver design employing the components enumerated in your letter.

J. N. S. (Manchester). We advise the use of 26 s.w.g d.c.c. wire for the windings of your frame aerial. The Pix Invisible Aerial is intended for use indoors, and may be stuck to the picture rail.

F P. C. (Southport). We suggest that you connect the detector grid-leak to the L.T.— terminal of the detector valve-holder, and try the effect of reducing the voltage on the anode of the detector valve. It is also advisable to decouple the detector anode circuit by means of a 2 mfd. condenser and a 20,000 ohms resistance if two L.F stages are employed.

P. W. (Plymouth). It is not intended to give constructional details of a universal version of the two-valve superhet at the moment, but the design of a universal superhet may be published before the commencement of the winter season.

R. E. (Bow). We thank you for your suggestions and would assure you that they will be given careful consideration.

R. G. W. (Surbiton). We suggest that you couple the detector to the push-pull pentodes by means of a high ratio transformer; the pentodes will not be fully loaded if resistance coupling is used. We would refer you to the constructional details of the Half-Mark Four.

T. C. (Dagenham). It is not likely that the lack of bias voltage will have damaged the S.G. valve, but it is very likely that the output pentode will have lost its efficiency. The ineffectiveness of the volume control may be due to a faulty potentiometer, a break in one of the leads to the control terminals, or to a short-circuit across the grid bypass condenser.

LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.

All letters must be accompanied by the name and address of the sender (not necessarily for publication).

An Excellent S.W. Log

SIR,—I have read with much interest the short-wave logs published in PRACTICAL AND AMATEUR WIRELESS, and I have been prompted thereby to send in my own log, as follows :—

Between 11 a.m. and 1 p.m. (Sunday, August 18th).—F8NV*, OZ8D*, F8GD*, OZ7JM*, OH2ND*, W2XL*, F8NR*, G5LC, G6XQ, G5LP, G5ZA, G5PS, G6DL, G5ML, G6LD, G5YY, G6SR, QH8NB*, W2MB*, W3LDH*.

Between 4 p.m. and 5 p.m.—EA7AO*, VS1IJ*, U3DS*, V3WG*, W2RS*, W4EG*.

Between 9.30 p.m. and midnight.—W2BXA*, S3AG*, W2CZV*, W2HFS, W2IBQ, W3DQ, W2BCR, W1GED, W2AMD, VE3HC, W4KH, W2HN, W2AL, W3MV, W2ALK, W1VH, W1IFA, VE2BG, VE2BE, SM1ZR*, EA3EE*, PAOYB*.

Those marked with an asterisk are C.W. stations.

All the "G" stations and eight of the "W's" were very good on the speaker, the "G" stations being some of the strongest signals I have ever received.

My set is a home-made four-valve outfit, det. and 3 L.F., with two R.C. stages and one transformer stage. It has band-spread tuning and reaction, and is used with a 60ft.-top outside aerial, which is ideal for the 40-metre band.

In the fourteen days from August 4th my "bag" totalled 274 stations, and of these 140 were American amateurs. Among the rest were: JNB, VE1IN, VE8GR, CT2BC, CT1ED, YM4ZO, EA5CG, SM6UI, OE7JH, OZ7A, VP6YB (Barbados), HI7G (Santa Domingo), CO8YB, CO2HY, CO2RA (all in Cuba), VE2FI, VE2BG, VE2HK, VE2BE, VE3UG, VE2CA, VE4UI (all in Canada), HB9J, SP1CM, LA1G, and CT1BY.

I have left out broadcasters and all the commercials save JNB for the sake of brevity.

The tuning coils are of bare 12-gauge copper, air spaced, and self-supporting, as in a transmitter.—R. A. TITT (Salisbury).

A Handbook for Amateur Transmitters

SIR,—I notice in your correspondence columns that there have been inquiries recently for information regarding the construction and operation of transmitters. May I suggest that any reader interested in this branch of short-wave work should obtain a copy of "The Radio Amateur's Handbook," an American publication, obtainable in this country from The Radio Society of Great Britain, 53, Victoria Street, S.W.—ERIC F. WARREN (2ADG) (Balham).

An S.W. Enthusiast

SIR,—As I am greatly interested in short-wave work, with which I was very successful last year on the 16-, 25-, 38-, and 49-metre band with a three-valver using pre-set condenser and home-made coils, I thought perhaps Mr. R. B. Mutch might be interested. My age is thirty-two years and I have been a regular reader since the first issue of PRACTICAL WIRELESS. I have had three years' experience in short-wave work.—HENRY R. TUCKER (Slough, Bucks).

CUT THIS OUT EACH WEEK.

Do you know

—THAT it is possible to vary the respective amplification of different types of broadcast matter by a new arrangement of special valves.
—THAT the above circuit arrangement is referred to as automatic-volume-expansion.
—THAT in a superhet it is possible to fit a second frequency-changer after the first I.F. stage to obtain even greater selectivity.
—THAT certain ultra-short-wave components are now being supplied in a silver-plated condition in order to reduce the H.F. resistance.
—THAT odd values of resistance or capacity may be obtained by connecting resistors and condensers in series or parallel, or by combinations of these two.
—THAT when using two loud-speakers care must be taken to avoid cancelling effects due to "reflection."
—THAT at least one new commercial radiogram employs dual speakers arranged in different parts of the cabinet for the above reason.

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

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

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

TOTTENHAM SHORT-WAVE CLUB

THIS club is holding its Field Day on September 15th, at Broxbourne. Reception tests of all the amateur bands will be carried out, and it is hoped that some interesting results will be obtained, especially on the 5m. band. Any reader who is interested, and would like to be present, should communicate with L. Woodhouse, secretary, 57, Pembury Road, Bruce Grove, Tottenham, N.17.

THE SHEFFIELD AND DISTRICT SHORT-WAVE CLUB

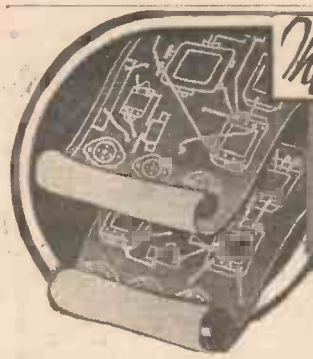
THE above society commenced active work on September 4th, 1935, at the Railway Inn, Princes Street, Norfolk Bridge, Sheffield, when the Session Business Meeting was held. This club was formed last year to increase interest in short-wave work, especially listening. New members are welcomed and problems are always invited by our more technical members. Visits are arranged to local amateur transmitters, and all types of sets are reviewed and inspected. Further particulars may be had from D. H. Tomlin, 32, Moorsyde Avenue, Sheffield 10.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

WEARITE COMPONENTS

SEVERAL new lines are included in the new Season's catalogue just issued by Wright and Weaire, Ltd. Most of their well-known and popular components have been continued, but in addition there are some entirely new components, such as the new "Wearite" Iron-cored coils, Unigen coils, Potentiometers, Short-wave coils, and Set-testing apparatus. The new coils, with iron dust cores, although quite small, are of high efficiency. There is a complete range of these coils to meet the requirements of any set, whether "straight" or superhet. A new-type volume control is provided with a carbon element of entirely new design, the surface track being prepared by a special process which enables the element to stand hard work without any trouble due to wear. The new ultra-short-wave coils are arranged to plug into a 4-pin standard valveholder. They are available in sets of three, having tuning ranges of from 13.4—27.7, 24.6—51.0, and 48.3—100 metres respectively. At the end of the catalogue reference is made to a new series of testing instruments, and a separate booklet giving full particulars of these is now available. Both these useful booklets, which can be obtained from Wright and Weaire, Ltd., 740, High Road, Tottenham, N.17, should be in the hands of all discriminating constructors.



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

Where date of issue is omitted that particular number is out of print.

These blueprints are full-size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—"Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7½d., and "Wireless Magazine" at 1/3d., post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS.

Blueprints, 1s. each.	Date of Issue.	No. of Blprint.
Long-Range Express Three	—	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	15.10.32	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Selectone Battery Three	14.1.33	PW10
Fury Four	—	PW11
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	4.3.33	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag. Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	—	PW22
Double Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	—	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	3.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	—	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47
Hall-Mark Cadet	23.3.35	PW48
Short-Wave Converter-Adapter	23.2.35	PW48A
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	11.5.35	PW50
Genet Midget Three	*June*, '35	PM1
Cameo Midget Three	8.6.35	PW51
F. J. Camm's 2-valve Superhet	13.7.35	PW52

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	—	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.		
B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449
Two-valvers: Blueprints, 1s. each.		
Melody Ranger Two (D. Trans)	—	AW388
Full-volume Two (SG-Det, Pen)	17.6.33	AW392
Iron-core Two (D, Trans)	—	AW395
Iron-core Two (D, Q.P.P.)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
Family Two (D, Trans)	—	M278
Three-valvers: Blueprints, 1s. each.		
8 Radiogram (D, RC, Trans)	—	AW343
P.T.P. Three (Pentode-Triode-Pentode)	*June* '35	WM389
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF Pen, D, Pen)	14.4.34	AW431
£5 5s. Three: De-luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C-B Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378
Four-valvers: Blueprints, 1s. 6d. each.		
65/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four	*Mar.* '35	WM384
Five-valvers: Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (2SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM370
Mains Operated.		
Two-valvers: Blueprints, 1s. each.		
Consoelectric Two (D. Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Three-valvers: Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A. C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	*Nov.* '34	WM374
Four-valvers: Blueprints, 1s. 6d. each.		
A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	—	AW380
A.C./D.C. Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	—	WM379
All Metal Four (2SG, D, Pen)	*July* '33	WM329
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.		
1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375
Mains Sets: Blueprints, 1s. 6d. each.		
1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super A.C.	—	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apl.* '35	WM385

PORTABLES.

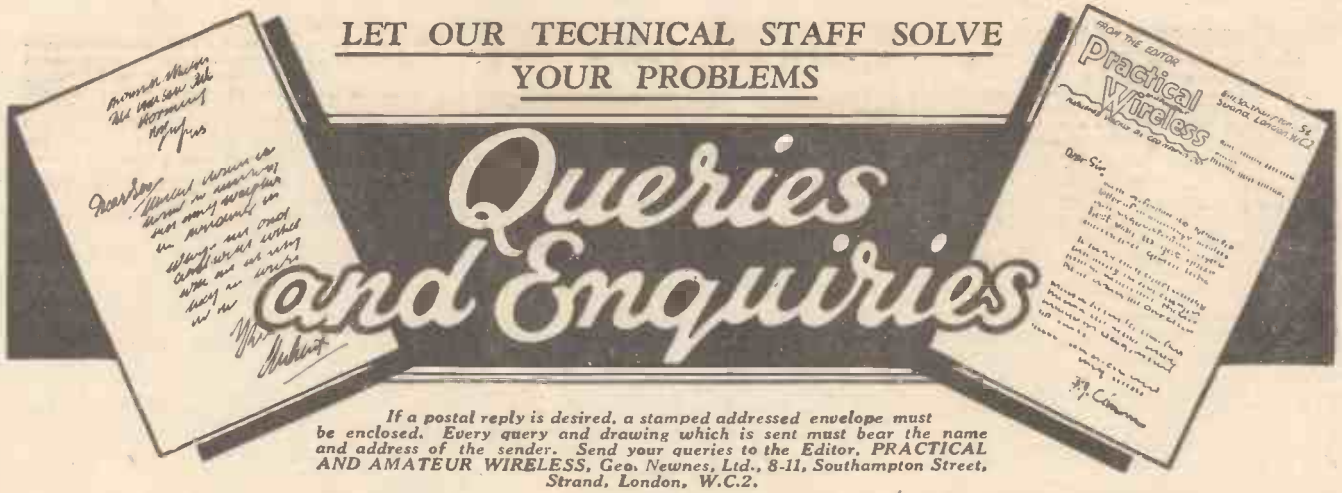
Four-valvers: Blueprints, 1s. 6d. each.		
General-purpose Portable (SG, D, RC, Trans)	—	AW351
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	—	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.		
S.W One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452
Two-valvers: Blueprints, 1s. each.		
Home-made Coil Two (D, Pen)	14.7.34	AW440
Three-valvers: Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenters' 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet, Converter	*Dec.* 1, '34	AW457
The Carrier Short-waver	*July* '35	WM390
Four-valvers: Blueprints, 1s. 6d. each.		
"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318
Standard Four-valve Short-waver	*Mar.* '35	WM383
Mains Operated.		
Two-valvers: Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave-Converter	*Jan.* '35	WM380
Three-valvers: Blueprints, 1s. each.		
Emigrator (SG, D, Pen), A.C.	—	WM352
Four-valvers: Blueprints, 1s. 6d. each.		
Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	Jan. 5, '35	AW402

MISCELLANEOUS.

Enthusiasts Power Amplifier (1/6)	*June* '35	WM387
Newstyle Short-wave Adapter (1/-)	*June* '35	WM388



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

SPECIAL NOTE

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

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

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

Modifying the Ratio

"I believe some time ago you described in your paper how to change the ratio of a transformer by certain methods of connection, and as I cannot trace the issue in question, I should be glad if you would give me again the connections required. I want to increase the present ratio of 3 to 1."—G. R. (Balham).

THE parallel-fed method of connection must be adopted and the transformer must then be used, to gain a step-up of 1 to 1, with the H.T. and G.B. terminals linked together and joined to the coupling condenser, and with the P terminal joined to grid bias. The G terminal is joined to the grid as usual. When the coupling condenser is joined to the P terminal and the G terminal is joined to the following grid, and terminals H.T. and G.B. are linked, the ratio is exactly the same as marked on the transformer. If the coupling condenser is joined to terminals P and G.B., and the H.T. terminal is joined to grid bias, the ratio will be 1 less than the transformer ratio.

A Doublet Aerial

"I have recently seen reference to a doublet aerial and I should be glad if you could explain—non-technically—just what this is. I am new to wireless, and do not yet understand all the various technical terms."—S. K. O. (Manchester).

THE doublet is a special short-wave aerial which is designed to reduce or eliminate various forms of electrical interference, and thus produce a wireless signal without a noisy background. It consists of two horizontal wires which may be regarded as a normal horizontal aerial with an insulator arranged in the centre. Leads are then taken from each length of wire immediately next to the central insulator, and these leads are taken down to the wireless receiver in a peculiar manner. Special insulators known as crossfeeder blocks are inserted between the two leads, and the latter are crossed at each insulator. These insulators are fitted at every 18ins. or 2ft. The two ends of the leading in wires are coupled to the receiver through a small coil, although other coupling schemes may be adopted in special circumstances.

A Recording Meter

"I am carrying out some experiments and have come up against a small snag. I have a milliammeter mounted on the chassis of my set and this is hidden away inside a large radio-gram cabinet. I do not want to remove the meter, but I want to make some form of record so that I can tell at the end of an evening's listening what maximum current has been passed. Is there any simple way in which this may be done? I might mention that I am handy with tools and have fairly good workshop facilities."—W. T. R. (Gorleston).

THERE are special recording meters on the market in which the needle or pointer travels across a small rack, or a pawl bears against a toothed wheel. As the pointer travels in the normal manner towards the maximum reading the pawl or ratchet engages step by step and thus the pointer cannot return to zero until it is released. You could construct some device of this nature, but it must be very light in order not to affect the reading. Probably the simplest scheme would be to mount a small thin wire bridge made from springy wire and supported between the pointer and the dial. The pointer could bear on this, and if the shape of the bridge is correctly chosen the pointer will not meet much resistance on its forward movements, but will be held against the tension of the return spring when the current drops. Alternatively a toothed wheel, removed from a clock or watch, could be soldered to the pivot and a small light ratchet mounted to hold this wheel against a return movement. A release will have to be mounted so that the ratchet may be withdrawn to re-set the pointer at zero.

Making an Air-core Coil

"I want to make a medium-wave type of coil for measuring purposes. According to my present calculations this coil must have an inductance of 200 microhenries, and I should be glad if you could tell me how many turns of wire and what gauge I want for a 2in. former. This is of ordinary ebonite tube having six raised ribs."—E. O. K. (Hammersmith).

YOU do not state the length of tube which is available, and we therefore assume that this factor is unimportant. To use a fairly handy gauge of wire we would suggest 28 d.s.c., and you would need approximately 65 turns of this wire, wound with adjacent turns touching, to obtain a coil of 200 microhenries. The total winding space would be approxmately 1.15ins.

An Ultra Short-wave Circuit

"I attach a sketch of a set I have roughly designed for use on a band from 3 to 5 metres. Can you please state whether this will work before I build it up? You will see that it is a superhet and that most of the parts are of well-known make."—I. C. T. (Gloucester).

WE do not think you will meet with much success with this circuit. Firstly, the intermediate frequency is badly chosen. Use 465 k/c transformers in place of the 110 components you show. Secondly, the pentagrid will be found rather ineffective on such a low wave-band, and you will certainly obtain better results with a hexode-triode. The layout is extremely critical, and you would find the coils slightly on the large side, as it will be necessary to take into account the actual wiring, and the size of the coil formers which you mention should be reduced to 1in. The other components are quite suitable, and the circuit should be quite effective.

A Signal Generator

"I wish to build a testing unit in order to enable me to service all types of receiver. What is the best type of unit for my use. I might mention that I have a good range of metres, including your Multi-meter, which has always given me great satisfaction."—T. W. B. (Birmingham).

THE signal generator will probably complete your range of test apparatus and will be found of great utility in ganging receivers, adjusting superhets, etc. A good commercial unit may be obtained from various firms, or you may construct a useful unit yourself from the details which were given in PRACTICAL WIRELESS dated July 14th and 28th, 1934.

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

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Unless otherwise stated, all items are clearance, second-hand, or surplus lines, and radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

NEW RECEIVERS, COMPONENTS, ACCESSORIES, etc.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C.4 (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the following Manufacturers' Unused Goods at a Fraction of the Original Cost: all goods guaranteed perfect; carriage paid over 5/-; under 5/- postage 6d. extra; I.F.S. and abroad, carriage extra; orders under 5/- cannot be sent C.O.D.; please send 1½d. stamp for large new illustrated catalogue, also August bargain supplement.

SPECIAL Bargains for callers at our Clapham Branch where Summer Sale is now taking place.

WORLD Famous Continental Valve Manufacturer; mains types, 4/6 each, H.L., L., power; high and low magnification, screen grid; variable Mu screen grid; 1, 3, and 4 watt A.C. output, directly heated pentodes; V.H.P., D.D.T. Diode Tetrodes, 250 volt 60 m.a. full wave rectifiers; A.C., D.C. types, 20 volts, 0.18 amp. filaments; screen grid; variable Mu screen grid; H., H.L., power and pentodes.

THE following Types, 5/6 each: 350v. 120 m.a. full wave rectifiers, 500v., 120 m.a., full wave rectifiers, 2½ watt indirectly heated pentodes.

2-VOLT H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable mu screened grid, 5- or 4-pin pentodes.

THE following American Types, 4/6; 250, 210, 245, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 281. All other types, 6/6.

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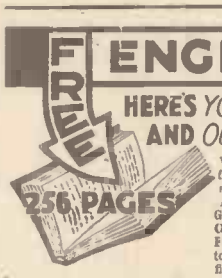

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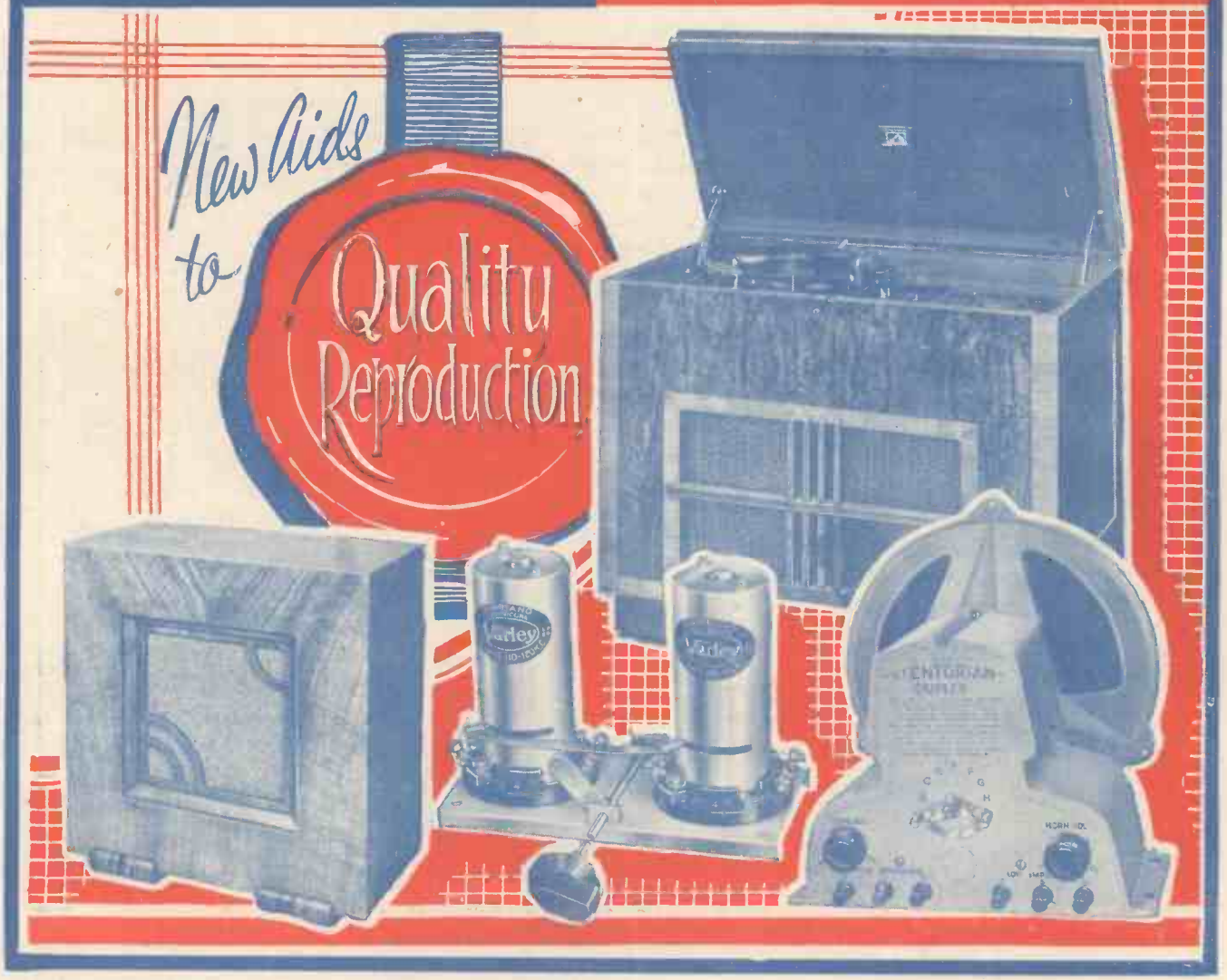
September 14th, 1935.

AND AMATEUR TELEVISION



NONSENSE ABOUT RAYS. By F. J. Camm.

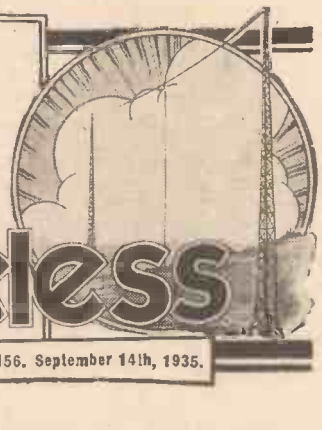
See Page 745

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VI. No. 156. September 14th, 1935.



ROUND *the* WORLD *of* WIRELESS

Progress of Russian Radio

ACCORDING to the latest published statistics relating to the year 1934, the Soviet Authorities have operated sixty-six transmitters for a period of 140,000 broadcasting hours. The number of listeners is estimated at 20,000,000, and the programmes were transmitted in sixty-two different languages and dialects!

Radio Lille Testing

THE new French State transmitter, Radio Nord, recently completed at Camphin, near Lille, is carrying out experimental broadcasts in the early morning and at the conclusion of the day's programme. The wavelength is 247.9 metres.

Trouble Foreseen on 1,875 Metres

IT is reported that Radio Romania, the 150-kilowatt National transmitter installed at Brasov, will be ready to start its initial tests next Easter. Although it had been hoped to find a new channel for this high-power station, it will be compelled, apparently, to share the wavelength already used by Kootwijk.

Radio Normandie to Move

THE popular Fécamp broadcasting station is to be transferred as soon as possible to Louvetot, situated between the towns of Caudebec and Yvetot, roughly twenty miles from the present position of the station. It is hoped to cover a larger area as the new installation will include a modern single pylon anti-fading aerial. Engineers also anticipate that the broadcasts will suffer less from morse interference by coastal vessels. The same wavelength will be retained.

Belgian Time Signals

LITTLE by little most Continental stations are taking their time signals from observatories, and relying less on the verbal announcements put out by the studios. Brussels No. 1 and 2 broadcast an official signal simultaneously at B.S.T. 12.00, 13.00, and 19.00; it consists of a long dash followed by the regulation six dot seconds.

Another French Station Moves

IN view of the reconstruction of the Bordeaux Lafayette transmitter, the Ministry of Posts and Telegraphs has decreed that the private Bordeaux Sud-Ouest station, working on 222.6 metres, shall be removed beyond the city limits—it is to be transferred to Cenon.

Alterations in French Programmes

IN future, British listeners will not find much entertainment in the broadcasts from the Paris Eiffel Tower, as it is proposed to use it mainly for the transmission of talks to French schools. Entertaining programmes will be featured by Radio-Paris, Ecole Superieure, and the private stations installed in or near the capital.

Radio Asmara?

THE recent establishment of a radio telephony service on short waves between the Italian colony of Eritrea and Rome will, it is reported, pave the way for the installation of a broadcasting station at the capital, Asmara. By the medium of short waves, it will be possible to relay the Italian programmes and re-transmit them for the benefit of Italians resident in the colony. Asmara lies at some forty miles west-south-west of the port of Massowah, on the Red Sea.

On Other Pages

Play in Four Languages

IT is reported from Prague that an author in Brno has written a play entitled *Witnesses*, which the capital station will shortly broadcast in German, Czech, English, and Dutch.

New Czech Station

THE Czech Authorities propose to erect a station on the summit of Mount Jeschken, overlooking the town of Liberec (pre-war Reichemberg). It is to be used for the broadcast of special programmes to the German-speaking population of pre-war Bohemia.

The World's Longest Aerial

DISSATISFIED with the results obtained on ordinary aerials, a resident of Bushkill (Penn.), U.S.A., uses a telephone cable some six miles long which connects his house to a neighbouring farm. If the story is to be believed, he can now listen to many of the world's broadcasts.

Proposed North Wales Station

THE B.B.C announces that it has acquired a site near Beaumaris for the erection of a new 5-kilowatt relay transmitter to radiate the West Regional programmes. It will operate on 373.1 metres (804 kc/s). For the supply of local entertainments in addition to the existing premises at Cardiff, new studios are to be installed at Bangor (North Wales).

Radio Station in Straits Settlements

SINGAPORE is to possess a medium-wave transmitter operated by the Municipal Authorities; one of its aims will be to relay and rebroadcast the Daventry Empire programme. The station is to be built by the General Electric Company Ltd., and Standard Telephones and Cables Ltd.

Why Not Regional Interval Signals?

SO far, in Great Britain the only interval signal adopted is the sound of Bow Bells, heard in the London National and Regional programmes. Could not the West Regional, Midland, Scottish, and Northern be given a distinctive signature? It is a matter which might be considered by the B.B.C. engineers.

Another Invisible Ray

THE Ministry of Transport is testing out a new traffic control worked by an invisible ultra-red ray. When a walker, desirous of crossing the street, passes in the beam, the red light is switched on in his favour.

ROUND the WORLD of WIRELESS (Continued)

Purnell Attwood Trio

THE newly-formed Purnell Attwood Trio will broadcast for the first time on September 14th. The violinist is Frederick Lunnon, a member of the Wessex Quartet, which is broadcasting on September 17th; Purnell Attwood ('cellist) is a member of the same quartet, and the pianist is Edgar Glasspool, brother of Wrayburn Glasspool, whose examples of atonal compositions were performed last year at the Bath Musical Festival.

Promenade Concerts

IN the B.B.C. promenade concert on September 12th, in addition to a new suite by Arthur Bliss, Rachmaninov's magnificent Pianoforte Concerto No. 2 will be played by Solomon, and the suite "Háry János," by Kodaly, will be heard. The Beethoven programme the following evening will consist of the Leonora Overture No. 1, the second Pianoforte Concerto played by Eileen Joyce, and the third ("Eroica") Symphony. The famous "On hearing the first Cuckoo in Spring" and "Summer Night on the River," perhaps the most exquisitely descriptive pieces that Delius wrote, will be heard in the Saturday concert of September 14th. On the same evening, Isolde Menges will play the solo part in Max Bruch's Violin Concerto No. 1, and Maggie Teyte and Peter Dawson will sing works by Tchaikovsky and Handel respectively.

Revue Broadcast from Minehead

"CABARET FOLLIES," presented by Sidney Ilott, will be relayed for Western listeners from the Queen's Hall, Minehead, on September 16th. This show, which is on revue lines, is produced by the proprietor; the relay will be taken in the last week of the show at Minehead, for the season there ends on September 21st, and after that "Cabaret Follies" goes on tour.

B.B.C. Midland Orchestra

HFOSTER CLARK will conduct the B.B.C. Midland Orchestra on September 18th, and the Symphony Concert on September 20th, when they will include Haydn's Military Symphony and Borodin's Unfinished Suite. The orchestra give an operatic programme on September 19th, and the guest-conductor will be Clarence Raybould. Emily Broughton, soprano, will sing two arias with the orchestra, and the suites from "Der Rosenkavalier" and Rimsky-Korsakov's "Pan Voyevoda" will be broadcast.

Places Revisited

IN order that he may describe on the microphone a locality or town, it is always best that the speaker should be either a native or have long associations with the place in question. With this in view, the B.B.C. Talks Branch has hit on the idea of persuading persons well known for their descriptive or writing powers to revisit towns and localities with which they are connected, or where they have spent some time. Early memories of, and present changes in, these favoured places will be described to listeners. This series of talks is being called "Places Revisited." Among the speakers are A. G. Macdonell, author of "England, their England"; James Agate, drama critic; James Bone, literary editor of the *Manchester Guardian*; and Robert Lynd, essayist and literary editor of the *News Chronicle*. The first talk in the series is on September 29th.

Organ Music for Midland Listeners

FOR the first time from the Midland Studio, D. G. Cunningham, City Organist of Birmingham, presents a gramophone recital of organ music on September 16th; he has, of course, broadcast a great many organ recitals.

"Koanga"

DELIUS'S opera, "Koanga," preceded by an explanatory introduction, will be relayed to National listeners from Covent Garden Opera House on September 23rd. Frederick Delius (1863-1934), one of the most remarkable composers of his time, came of German parents who had settled in England. He was destined for a mercantile career, but his dislike for business was so great that he ran away at the age of twenty, and established himself as an orange planter in Florida, where he devoted his leisure to the study of music. In 1896 he wrote his first opera, "Koanga," the libretto of which was taken from "The Grandissimes," a novel by C. F. Keary and G. W. Cable. It deals largely with negro life, and shows the influence of the tropical luxuriance of Florida on Delius's work.

INTERESTING and TOPICAL PARAGRAPHS

RADIO ON THE RIVER

A Marconiphone receiver, Model 257, in use outdoors under ideal conditions.

The Two Bostons

ON September 17th a relay will be given from Boston, Lincolnshire, the first to be arranged from North Lincolnshire since the county was incorporated in the Northern broadcasting area. An exchange of greetings has been arranged between the Lincolnshire Boston and Boston, Massachusetts, where the three hundredth anniversary of the famous Common is being celebrated.

Light Entertainment from Blackpool

A CONCERT Party programme will be provided on September 18th by Tom Vernon's "Royal Follies," relayed from the Central Pier, and Ernest Binns' "Arcadian Follies," relayed from the South Pier, Blackpool. Many popular entertainers will come to the microphone.

A Good "Turn" from Newcastle

SEPTEMBER 19th will bring to the microphone those two outsize comedians Hurly and Burly. These popular entertainers specialise in bright, snappy tunes and the mimicking of various musical instruments. Hurly is the comedy man on the concert platform, whilst Burly is both pianist and vocalist of the combination. Their turn will be broadcast from the Newcastle studios.

SOLVE THIS!

PROBLEM No. 156.

Cummings built a superhet employing a PP5/400 valve in the output stage and 41MPG, MVS/Pen., and 41MLF valves in the preceding stages with a 460 BU rectifier. He carefully worked out all the necessary resistance values so that the voltage on the anode of the first valve would not exceed 200 volts. He was surprised to find that the 1 mfd. condenser, having a voltage rating of 250 volts D.C., which he used for decoupling the first anode circuit kept puncturing. Why was this? Three books will be awarded for the first three correct solutions opened. Envelopes must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Envelopes must be marked Problem No. 156 in the bottom left-hand corner and must be posted to reach here not later than the first post Monday, September 16th, 1935.

Solution to Problem No. 155.

The plunger of the two-point switch was in contact with the metal chassis through the switch supporting bracket, and therefore the long-wave section of the coil to which the plunger was connected was shorted on both settings of the wave switch. Jordan should have insulated the supporting bracket from the metal chassis.

The following readers successfully solved Problem No. 154, and books are accordingly being forwarded to them. A. G. Haken, Rossendale, Hyde Street, Winchester; W. H. Wells, 39, Cortis Avenue, Worthing, Sussex; J. Payne, 10, Cowper Road, Hanwell, W.7.

Q-U-A-L-I-T-Y:
New Aids to Ideal Reproduction

The Many Improvements which Have Been Made in Components and Loudspeakers in Order to Make Possible Better Reproduction are Here Described

This neat assembly is a two-gang Varley "Variband" intermediate-frequency transformer unit. It can be adjusted to pass a band width up to 14 kc/s.

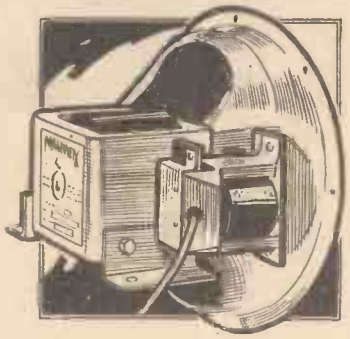
EVER since broadcasting began the principal requirement of the listener has been good quality (call it "high-fidelity" if you like) reproduction. And, although for more than ten years past we have been trying to make ourselves believe that we were able to obtain good reproduction, we are to-day only just on the verge of getting it. It is not intended by this to convey the idea that there has been little progress in this direction—everyone knows that improvements in both transmission and reception have been very real—but that our *standards* have gradually been raised until to-day our only comparator is reality. Whereas we used to judge the quality of reproduction by comparison with the old horn-type gramophone, with the telephone, or with other sets we may have heard, we now compare the reproduction with nothing other than the original production—the programme before transmission. Thus, our present-day standards are as high as they possibly could be, and it might take as long to satisfy them as it has taken us to progress from the throaty or nasal sounds which satisfied us in 1922 to the reproduction as we now know it. But the fact that our comparison is with the original shows that we have made wonderful headway.

Artificial Bass Not Wanted

When the moving-coil loud-speaker was popularised a few years ago we felt that the sonorous bass which it gave us was marvellous and considerably better than the shriller reproduction of the horn-type speaker. It was not long, however, before it was realised that this bass was not real, but consisting principally of resonances, box effects, and so on. The pendulum then began to swing in the opposite direction, and the listener wanted more "brilliance" combined with real—not faked—bass. Loudspeaker manufacturers, valve manufacturers, and set manufacturers came to the rescue by devising special speaker cones, baffles which did not permit resonance, and valves which gave an output which was better able to operate the moving coil properly.

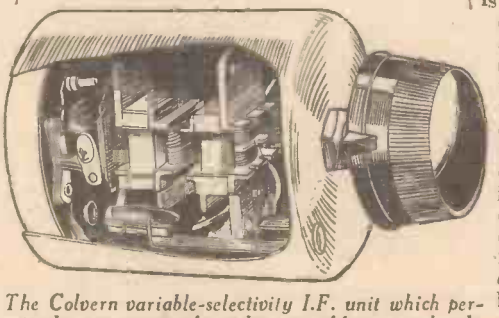
Better Baffles

By the beginning of 1935 a fair stage of development had been reached, but the craze for smaller and smaller sets made it difficult for manufacturers to provide a sufficient baffle effect to permit of real bass when the speaker was contained in the same cabinet as the receiver. The constructor was at an advantage here, for he could house his set in any size of cabinet he desired, and by so doing he could obtain splendid low-note reproduction. For 1936, receiver manufacturers have overcome



The Magnavox "Thirty-three" speaker unit which is capable of providing extremely good reproduction.

many of their old difficulties, due to the fact that their customers do not mind having a larger receiver, and, in fact, they generally prefer a set of the console type. (*We have always expressed the opinion that sets should not require to stand on a table, but that they should be complete pieces of furniture in themselves.*—ED.). This is just one reason why we shall have better quality in 1936, but there are many more.



The Colvern variable-selectivity I.F. unit which permits the acceptance of a wide range of frequency bands.

This shows the front of the new W/B "Duplex" speaker. The high-note tweeter may be seen projecting from the centre of the cone.

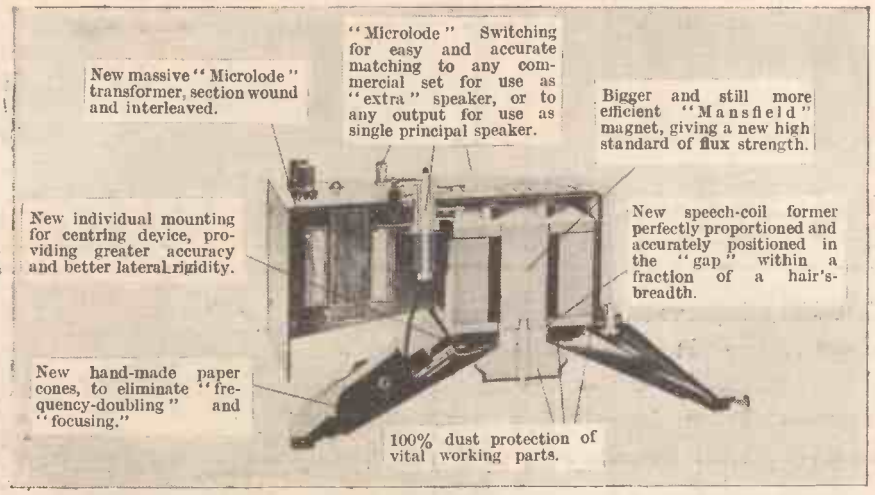
Variable Selectivity

During the past few months there have been many new developments, all of which are bound to have the effect of ensuring better reproduction. One of importance is the introduction of tuning components, by means of which the degree of selectivity, and hence the band width covered, can be varied according to requirements. Variable selectivity was long overdue, for the widespread use of superheterodyne circuits, which were able to give the high degree of selectivity demanded by broadcasting conditions, had made it necessary to include various tone-compensating devices. These were effective up to a point, but were "preventatives" rather than "cures," and as such could not be deemed entirely satisfactory. By using variable-selectivity I.F. transformers it is possible to succeed without employing too many corrective devices, and at the same time to have as much selectivity as necessary when distant reception is required.

Alternative Systems

Different methods of providing variable selectivity have been adopted by makers of commercial receivers, but it is not everyone who can afford to buy a new receiver to obtain this undoubted advantage. This is where the constructor scores, for by the expenditure of a few shillings only he can add a variable-selectivity unit to his present set. One of the best known of these units is the Varley "Variband" I.F. unit, which comprises two intermediate-frequency transformers in which the coupling between each pair of windings can be controlled from a knob on the panel. The idea is that the position of the ferrous core is altered so that the band width can be varied progressively from about 2 to 14 kc/s—from a band which provides extreme selectivity with a certain loss of high notes, to one which adequately covers

(*Continued overleaf*)



A view showing a section through the popular W/B "Stentorian" speaker unit. It incorporates the "Microlode" feature which ensures accurate matching with the output stage.

the B.B.C. transmissions, but which provides only moderate selectivity. Wearite and Colvern have also introduced variable-selectivity I.F.s, these being single units in which coupling is varied by altering the position of one of the windings, the general result being the same as that provided by the Varley model.

Better Valves

Valves for providing better quality have not been introduced as entirely new models, but characteristics have gradually been improved, so that efficiency has been increased to provide a better undistorted output for a more modest current consumption. There is, however, one new valve by Hivac which is claimed to give as great a degree of amplification as an ordinary pentode, but without the usual disadvantages of the latter. This valve is known as the "Harries," and in general construction is similar to a pentode without the suppressor grid. The main point is that the anode is set at a certain critical distance from the screening grid; this apparently simple modification is claimed to produce an almost uniform mutual conductance over a wide range of input volts, and thus the valve gives the same degree of quality output as a triode and the amplification of a pentode.

A New Speaker Idea

There have been several advances in loudspeaker design, one of the most important of which is exemplified by the W/B "Stentorian Duplex." W/B speakers have always been well known for the quality reproduction which they provide, but this new model is really "something different," for it includes the proven "Stentorian" moving-coil unit as well as a small "tweeter" horn which is mounted concentric with the cone. The horn is a small bakelite moulding, which is operated by a separate speech coil actuating a curved aluminium diaphragm. There are separate matching transformers for both the horn and the normal cone, as well as separate volume controls for each, so that they can be exactly "balanced." As might be expected, the horn deals specifically with the very high frequencies, the cone handling the medium and low frequencies. The resulting reproduction is extremely good, and the speaker is more than usually sensitive, so that it can be fed by any modern receiver.

Exponential Cones

Another speaker modification is introduced by the makers of the "Wharfedale" units, the particular model being that known as the "Bronze." This has a moving-coil unit and an exponentially-curved cone, the object of which is to give

A new Celestion speaker, the "Standard 8" chassis.

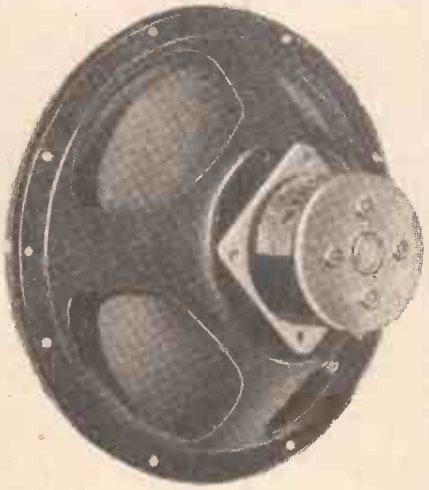
uniform response over a very wide range of frequencies. The cone obviates the usual "peak" in the middle frequencies, besides preventing focusing of the high frequencies. Another speaker with similar characteristics is the Magnavox "Thirty-three," and this lives up to the reputation which Magnavox have held for so long.

An entirely different method of ensuring good response over a wide frequency range is applied to the Sonochorde "Piezo-coil" speaker, which combines a high-grade moving-coil movement with a piezo electric-crystal "tweeter." This is similar to the combination unit which was available last year, but it is nevertheless deserving of mention in this article.

There are some new Rola speakers which represent a definite improvement on previous models. For one thing, the makers have devised a means of preventing the entry of dust into the air gap; a flexible cover is used in the coil suspension, this being a much neater arrangement than that of simply covering the whole unit in a black muslin bag. Another Rola innovation is an extension speaker of the "wide-range" type housed in a walnut cabinet lined with Celotex to prevent resonances.

Other Systems

Two new speakers are now available by Hartley-Turner, one of which incorporates a "re-entrant" cone, the object of which is to prevent any "peak" in the middle register. The special cone has the appearance of an ordinary cone with a smaller one mounted inside out in the centre. The other speaker by this firm is a twin-diaphragm unit which is claimed to give good response up to 12,000 cycles. Yet another new product of this firm is a new type of box baffle, which they call the "True-bass boffle." This is obtainable



The new universal extension speaker by Rola. It is obtainable in two types—high-resistance and low-resistance—for use with any type of receiver.

in various sizes and comprises a stout box inside which are mounted spaced sheets of non-resonant material having circular holes of various sizes, these being so arranged that all trace of bass resonance, or box resonance, is obviated.

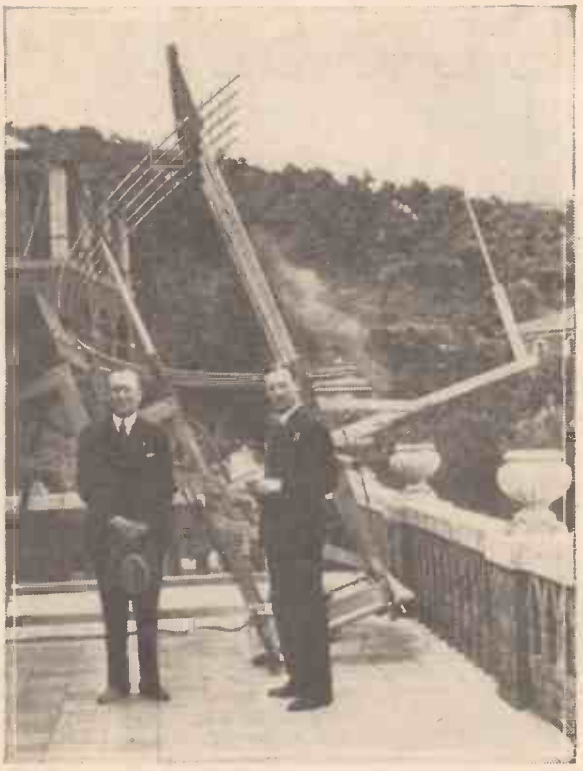
Other speaker manufacturers have made various improvements with the object of ensuring a wider frequency response. For example, some new Celestion speakers are fitted with a combined matching and volume control; Sound Sales have devised a large diameter cone spider which ensures parallel movement of the coil over the magnet, and practically every manufacturer has made some modification to ensure a wider and better frequency response.

Yes! 1936 will certainly be a quality year.

Nonsense About Rays

Imaginary Rays which are Never Produced. Propaganda Canards without Scientific Foundation

By F. J. CAMM



The Marchese Marconi with a micro-wave transmitter showing a reflector for the aerial.

WE have heard a good deal about rays during the past few weeks in connection with the threatened war between Italy and Abyssinia. It is not for me to discuss the political merits or demerits of either side, but I feel it high time to expose the utter nonsense written by non-technical writers in the daily papers about mysterious rays which do not exist. **Not so long ago, several individuals claiming expert knowledge undertook, by means of ultra-short-wave wireless apparatus, to mesmerise certain people! It is significant that for the purpose of this test they had to transport the victims in an aeroplane wherein the tests were carried out!!** At the conclusion of the experiments they informed newspaper reporters that it had been "entirely successful" because the patients had shown distinct signs of drowsiness.

Now it is a fact that anyone unaccustomed to the rhythmic drone of an aeroplane engine will become drowsy, and I understand it is a fact that pilots of commercial airplanes frequently have to awaken their passengers when they reach the end of their destination. So it is a fair conclusion that the ultra-short-wave mesmerism had nothing whatever to do with the drowsiness. **It is also fair comment to remark that the experiment would have been more convincing had it been carried out on terra firma!** A few years before that we heard a good deal about the death ray—*always a safe thing to talk about, since you cannot experiment with it without being guilty of murder!*

A Challenge!

It is with some astonishment, therefore, that I learn that the name of the Marchese Marconi was seriously coupled with a claim by the Italians that he had discovered a new ray which would put aircraft entirely out of action. I am sure that Marconi does not agree with this statement, which is insulting to the intelligence of the merest schoolboy. **With the greatest of deference to the Marchese I respectfully submit that no one has discovered such a ray, and that it is outside the bounds of possibility for him or anyone else to do so. If he disagrees with me on this point, I hereby issue a challenge for him to demonstrate to the satisfaction of any responsible body that he could stop the mechanism of an aeroplane situated only three feet from his apparatus, let alone** an aeroplane travelling at 100 m.p.h. at an altitude of at least 5,000ft. I have no doubt that, were this challenge accepted, the test would result in failure. The nonsensical claim (I am sure that Marconi himself must be annoyed about it) that a device situated on the earth can put an aeroplane 10,000 ft. above the earth out of action is too transparently absurd to be believed by responsible technicians.

Automatic Screening

The electrical pressure generated in the magneto of an aeroplane is of a minimum order of 20,000 volts, and even ignoring the dissipation factor, **there is not enough power in the world, even though every power unit were coupled together, to project a ray which would have the slightest effect upon the aeroplane. This ray would have about as much effect on aircraft as a speck of dust colliding with a battleship.** After the announcement of this "new" and "wonderful" ray apparatus, I notice that one newspaper took it sufficiently seriously to publish an interview with another "technician," in which the latter stated that it would be a simple matter to circumvent the ray by screening the engine. This again is an absurd and erroneous conclusion, for even though we admit the possibilities of the ray, **all aircraft is screened and is not in need of additional screening.** The fabric coverings of the fuselage and the wings are doped with a fluid in itself containing aluminium powder, thus enshrouding the complete aeroplane with a thin but effective metallic screen. The engine is covered with an aluminium cowl which effectively screens the magneto. It is not a matter of opinion but a matter of fact that no ray could affect modern aircraft.

These facts need to be placed on record. We can perhaps understand a nation's motives in wishing to frighten her prospective quarry in much the same way as some of the Propaganda Departments, during the war, inflamed public spirit by announcing that the Germans were converting corpses on the battlefield into butter. All's fair in war, even canards of this sort.

Whilst, therefore, the Italians themselves do not, I am sure, believe in their wonderful ray, I cannot think that the most unintelligent Abyssinian is intimidated thereby. It is one thing to control a mechanism by a ray, quite another to project a ray. Even though it were possible, aircraft would soon be equipped with similar apparatus to put the ground apparatus out of action.

I am not referring to the well-known and proved use of rays in connection with selenium cells and photo-electric cells. This use of invisible rays is beyond all doubt; such apparatus can be used unfailingly for burglar alarms, for counting purposes, for switching arrangements and so on. My remarks particularly refer to the claims made by the unscientific to project rays into the empyrean and to perform miracles with them. Notwithstanding all the talk during the past ten years about these rays, nothing has been done even mildly approaching qualified success. We are accustomed to these wild claims when they emanate from America, but then Americans are like that and no notice is or need be taken of them.

Let us hope that we shall hear no more of death rays, rays for disabling aircraft, and mesmeric rays, which merely raise the hopes of the ignorant and annoy those who deal in scientific facts.

[*Just as we go to press we learn that Marconi has officially denied that he has produced any anti-aircraft ray device.*]

OUR SERVICE DATA SHEETS

A NEW READER SERVICE!

On the facing page is given the First of Our Series of Service Data Sheets. This article, which should be cut out and kept for reference, explains how to use them.

AS announced in the Radiolympia number of PRACTICAL AND AMATEUR WIRELESS, we shall, in future, publish a Service Data Sheet with every one of our receivers, and in the interests of readers who have constructed our 1934-1935 sets, we have decided to cover the most popular designs published during the past twelve months as well. It is not claimed, of course, that a beginner will be able to locate any and every defect by merely taking the measurements suggested on the Service Sheet, as testing modern wireless sets is a somewhat complicated procedure, which, can only be mastered by studying the underlying theory of wireless, but with the aid of these sheets constructors will be able to check the voltages and currents at vital points in the set, and thereby decide whether the components are functioning satisfactorily.

Voltage Tests

It will be noted that voltage measurements occupy first place on our sheet, and it is suggested that these be taken first. In fact, it is advisable to take these measurements on a new receiver, even though no defect is suspected. In the receiver dealt with this week, the £5 Superhet, the voltages may be measured before placing the valves in their respective sockets, as there are no anode and screen decoupling resistances used. It is emphasised, however, that it is advisable, especially in the case of mains-operated receivers, to take voltage measurements with all valves in circuit, as the removal of one valve may seriously affect the voltages applied to the other valves. In universal and D.C. receivers the valve heaters are wired in series, and therefore the valves will not light after one valve has been removed. The beginner is, therefore, advised not to remove valves when taking measurements, for although in the case of most battery sets no damage is likely to occur, serious damage may be caused to a mains-operated set. Again, in the case of the battery set, a cheap meter may prove quite satisfactory, but for mains-receiver tests a reliable meter having a high "ohms per volt" constant (preferably 250 or higher) must be employed if reliable readings are to be obtained. The necessity for using a meter having a high "ohms per volt" value for mains-receiver measurements arises because there are numerous dropping resistances in the average mains receiver and, therefore, if the current taken by the meter is excessive the voltage dropped across these resistances will be high, and the voltage reading will be decidedly lower than the actual voltage present after the meter has been disconnected from the point being tested. This argument also holds in the case of battery-operated receivers, of course, if there are anode or decoupling resistances in the circuit under test; for example, a high resistance meter is necessary if accurate measurement of the voltage on the anode of a detector valve having a decoupling resistance in its anode circuit is desired.

Current Measurements

Current measurements are, in many cases, more helpful than voltage measurements, as the condition of a valve can often be detected by this means. Valves are sometimes found to be inefficient, even though their filaments or heaters are intact; this is particularly the case after they have been in use over a thousand hours. The total consumption of a receiver can be measured by connecting a milliammeter in the H.T.— lead. In a battery set this can be done by removing the H.T.— plug from the battery socket and then connecting the milliammeter between the H.T.— socket and the H.T.— lead. If the receiver is inclined to be unstable, however, it will be advisable to connect a 1-mfd. condenser across the meter, otherwise a true reading will not be obtained, as the resistance of the meter will produce low-frequency instability. In mains receivers it is sometimes found difficult to find the H.T.— line, and therefore it is suggested that the meter be connected in the H.T.+ line. The current consumption of each valve may be measured by connecting the milliammeter in each anode circuit in turn, care being taken to switch off before disconnecting the anode lead. In cases where the anode pin is inaccessible, a split adapter may be used. The meter should be connected to the adapter, and the valve under test removed from its holder, the adapter plug then being inserted in the valve-holder, and the valve placed in the adapter socket.

A Wearite tester in the form of a frequency meter. This instrument is particularly useful for station location, ganging, and other purposes.

Resistance Measurements

It is sometimes found that receivers will not function satisfactorily even though all voltage and current readings are normal. When this is the case the H.F. coils or L.F. transformers should be suspected. These components may be tested for continuity by means of a milliammeter and a grid-bias battery, and if Ohms Law is applied an accurate resistance measurement may be made. The coil or transformer under test should be disconnected from other components, and one end of the winding should be connected to one terminal of the milliammeter. The other terminal of the meter should then be connected to one of the battery sockets, and one of the other sockets of the battery to the other end of the winding to be tested. Unless the resistance is approximately known, a low voltage (e.g. 1½ volt) should be used for the preliminary test in order to avoid the possibility of damaging the meter. If a reading is obtained, it will indicate that the winding is not broken, and, as mentioned above, the exact resistance may be calculated from Ohms Law, which states that resistance (in ohms) is equal to voltage divided by current (in amps.).

Summary

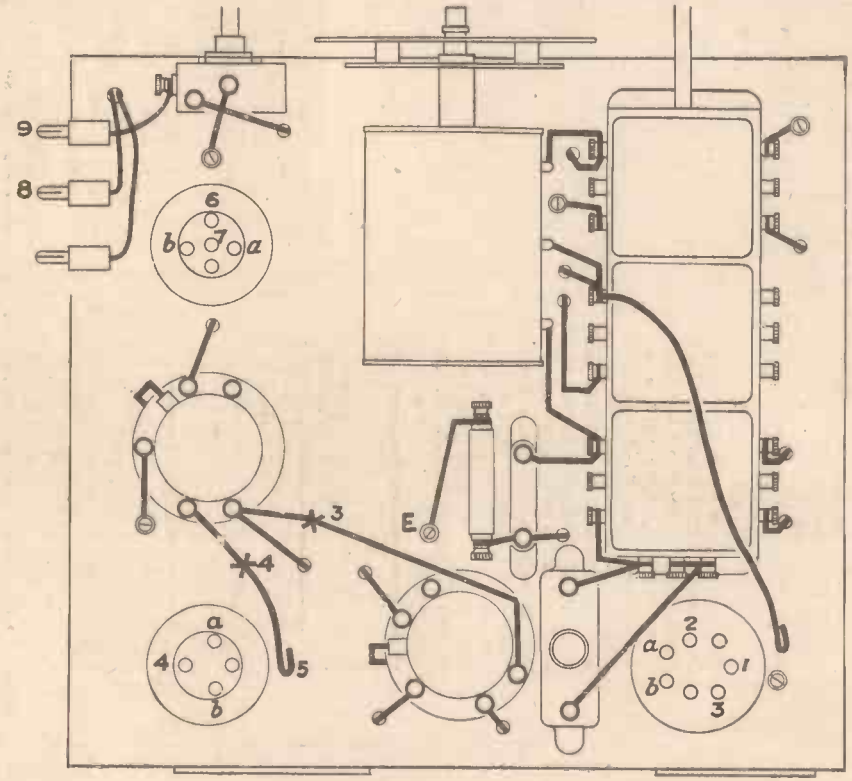
High anode voltages in battery receivers indicate that the actual battery voltage is too high, or that the anode dropping resistances have too low a value. Low anode voltages indicate that the H.T. battery is run down, or that the anode resistances have too high a value. In mains-operated sets, however, it is not so easy to decide the cause of abnormal voltage values. High voltage may again be due to a low resistance value in circuit, or to an excessive smoothed voltage being delivered from the mains unit. High smoothed voltage may, in turn, be due to one of several causes, however, viz., high supply voltage, high reservoir condenser value, low valve current consumption (due to high value grid bias resistance or the use of a low emission valve). Low anode voltage readings may be due to the use of a high anode resistance or to a low smoothed voltage from the mains unit, which, in turn, may be due to a low supply voltage, a defective rectifying valve, low value reservoir condenser, or high valve current consumption. High valve current consumption may be due to the use of a low value bias resistance, a defective bias bypass condenser, or a low value anode resistance. High total current consumption with consequent low voltages may also be due to a shorted or defective smoothing condenser in the mains unit, or a shorted bypass condenser in the receiver. In a battery-operated set high current consumption is generally due to the use of a run-down G.B. battery. Low current consumption, on the other hand, is due to the use of a low emission valve or excessive G.B. voltage. From this summary it will be noted that current and voltage readings are in many cases inter-related, especially in mains-operated receivers.

Two important warnings are given in connection with all meter measurements. The measuring instrument, whether a milliammeter or a voltmeter, must be kept well away from the magnet of the speaker, otherwise the magnet may attract the meter needle, causing extraordinarily inaccurate readings to be registered.

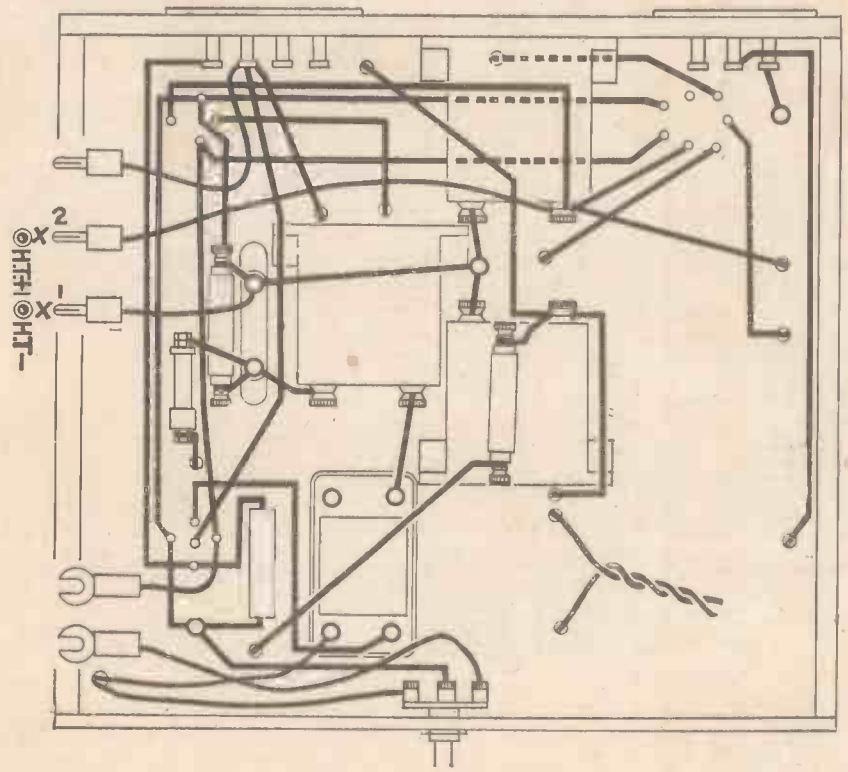
When taking measurements in high potential circuits, care should be taken to keep the fingers away from the meter prods. Apart from the fact that an unpleasant shock might be obtained, the meter or receiver support might be dropped momentarily, thereby causing serious damage to the apparatus.

SERVICE DATA SHEET No. 1

FOR THE £5 3-valve Battery Superhet



Top of Chassis Wiring Diagram



Underneath Chassis Wiring Diagram

Approximate Voltage Readings

Voltmeter—to E
„ + to 1 = 72 volts.
„ + to 2 = 72 volts.
„ + to 3 = 120 volts.
„ + to 4 = 72 volts.
„ + to 5 = 120 volts.
„ + to 6 = 115 volts.
„ + to 7 = 120 volts.
„ + to E
„ —to 8 = 9 volts
„ —to 9 = 9 volts.
Voltmeter across A and B = 2 volts.

Approximate Resistance Readings

Coils 1 and 2.
Ohmmeter across terminals 4 and 6 = 8 ohms.
„ „ „ 1 and 3 (long wave) = 19 ohms.
„ „ „ 1 and 3 (med. wave) = 3 ohms.

Coil 3.
Ohmmeter across terminals 4 and 6 = 8 ohms.
„ „ „ 1 and 3 (long wave) = 27 ohms.
„ „ „ 1 and 3 (med. wave) = 7 ohms.

I.F. Transformers.
Ohmmeter across terminals 1 and 2 = 43 ohms.
„ „ „ 6 and 7 = 26 ohms.

L.F. Transformer.
Ohmmeter across terminals 1 and 3 = 400 ohms.
„ „ „ 1 and 4 = 1,500 ohms.

Approximate Current Readings

Milliammeter connected at X1 = 20 m.a.
„ „ „ X2 = 2 m.a.
„ „ „ X3 = 1 m.a.
„ „ „ X4 = 2½ m.a.

Drop between maximum and minimum setting of volume control = 5 m.a.

A PAGE OF PRACTICAL HINTS

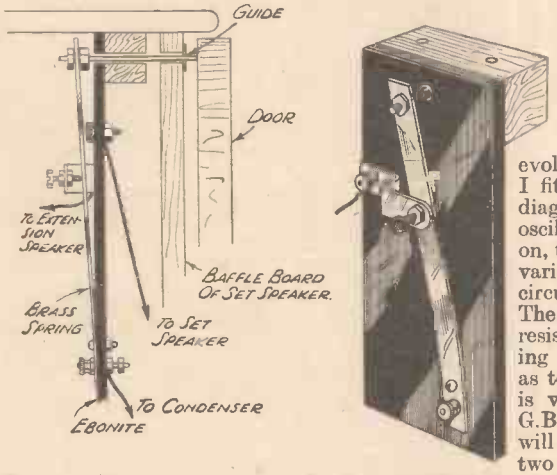
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Automatic Switching for Extension Speaker

MY set is housed in a cabinet of a type which was popular a few years ago and which is apparently once more returning to favour; in other words, it has doors which hide the controls when desired. In particular, two double doors close over the speaker, which is in the lower part of the cabinet, and I have utilised these doors to operate an extension speaker switch, as shown in the sketch. A piece of ebonite is attached vertically to the roof of the lower portion of the cabinet behind the speaker baffle, and carries a spring of flat brass about ¼in. wide and 4in. long. The spring is connected to the condenser of a choke-condenser circuit and normally makes contact with a small terminal passing through the ebonite and connected to the set speaker. A light brass rod is loosely



Details of an automatic switching arrangement for an extension speaker operated by the door of a radio cabinet.

attached to the top of this spring and is brought out through to the front of the cabinet, where it projects about ¼in. When the door of the cabinet is shut it pushes this rod, the spring thus breaking the contact to the set speaker and making one with a small bracket (one end of an old crystal detector holder bent at right angles) behind it. This bracket is connected to the extension speaker, and thus the closing of the door switches from the set to the extension speaker. It would be easier to attach a switch of this sort directly to the back of the baffle board, but in the position shown the outer end of the brass rod is hidden by a beading when the doors are opened. Two points only require attention. The brass rod should have plenty of clearance, and should be provided with a guide—a hole in a small piece of metal or bakelite—at the front. The rear contact should be adjustable, and may consist of a short piece of tapped rod held by two nuts.

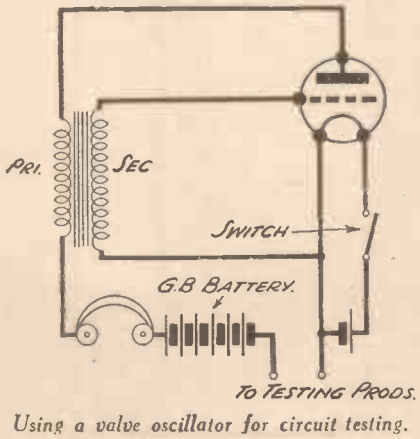
If it is desired that the circuit shall definitely not be broken, the main spring may be fitted with two subsidiary springs, one on each side, and so arranged that contact is made with the extension speaker before that with the set speaker is broken, but the action of shutting the door is so quick that I do not think this is necessary.—H. H. MACEY (Stoke-on-Trent).

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

Circuit Testing with a Valve Oscillator

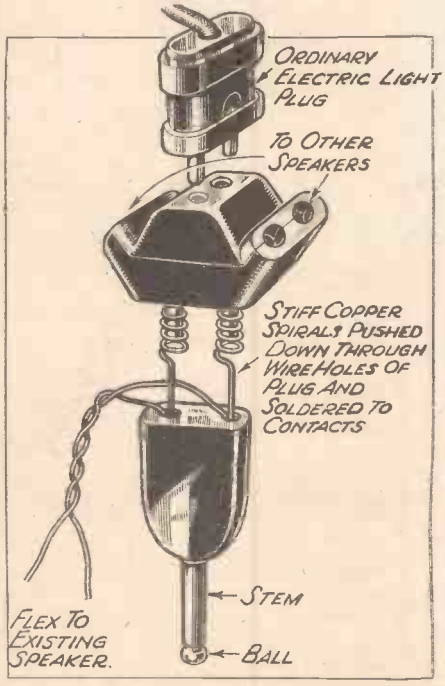
REALISING the disadvantages of using headphones and a battery for testing circuits, I sought a better method and evolved the following arrangement. I fitted up a circuit, shown in the diagram, consisting of a one-valve oscillator. When the L.T. is switched on, the note heard in the headphones varies with the resistance of the circuit between the testing prods. The higher the note, the higher the resistance. Thus, as well as showing continuity, it also gives an idea as to the resistance in the circuit. It is very sensitive, as with a 9-volt G.B. battery as "high tension" it will oscillate with resistance up to two megohms between the testing prods. Also, it is impossible to confuse high resistances with condensers, as it does not oscillate with condensers in circuit, unless they leak. The few components required can easily be mounted on a small baseboard, or in a cigar box, so that the unit is easily portable.—R. B. MUTCH (Liverpool).



Using a valve oscillator for circuit testing.

Connecting an Additional Speaker

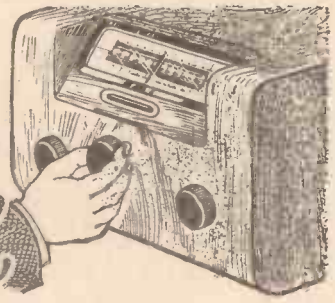
HERE is a dodge for connecting more than one speaker to a set that is fitted with a plug and jack. Two spirals are made from stiff copper wire with straight ends long enough to go through the bakelite contact cover to the connectors, to which they are soldered. The spirals should be a tight fit on the pins of the three-way plug to which the other speaker or speakers are connected.



Method of connecting additional speakers by using a three-way lighting plug.

The spirals are coiled so that the adjacent turns touch, but the three-way plug is quite easily removed when desired. The accompanying diagram explains the arrangement quite clearly.—J. W. B. EVANS (Conway).

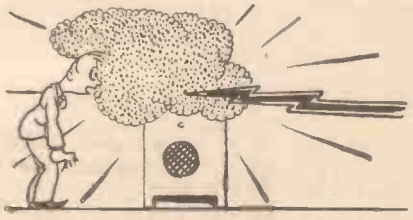
On Your Wavelength



By Thermion

Wanted—a Ray

WHILST all this talk of marvellous rays is in the air, will someone kindly come to my rescue and invent a ray which will silence noisy typewriters, my neighbour's wireless set when it is broadblasting, and that lowest form of life, crooning? After all, if an aeroplane can be brought hurtling from the skies as a result of a ray which is a figment of the usual lurid foreign imagination, it seems an easier proposition for me to be able to twiddle a knob and tune my neighbour's set to a programme I feel he ought to receive. The trouble about broadcasting is that you cannot answer back—you have to like it or lump it, and in the latter case we switch over to the

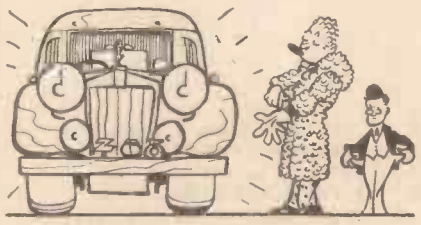


Thermion wants a ray. . . .

Continent for a further basinful of jazz. Everybody's doing it, aided and abetted by the gramophone companies. This ray business wants developing, so that the announcers and programme directors can be made aware of the reactions of the listeners to the broadcast fare. In the future, I doubt not, we shall cook our eggs and Sunday joint, and even shave by ray. We shall poke our daily newspaper into a slot and a ray will transfer its reading matter to our brains (if any). It will be the period of incubation, the curing of disease by ray—hooray! This ray business is getting me, you see.

Prosperity is Round the Crooner

EXCUSE my feeble joke, but I have just been reading of the fabulous sums paid to the Bing Crosbys, some of whom earn as much as £5,000 a year for boop-a-doop and hutch-a-cha-cha, whilst your Thermion, owing to editorial shrewdness earns a few pence per week (*This is gross libel; you have always been overpaid.*—Ed.). No wonder labour troubles exist when skilled mechanics and skilled contributors tread the thorny paths of penury, whilst cachinnating crooners are well paid for doing little except to annoy intelligent people. Why was I not born a crooner? In spite of the jewels of wisdom which fall



A crooner £5,000 per year; only a few pence for my jewels of wisdom!

like dewdrops from my pen upon the page beneath, I have never been able to persuade your shrewd and shrew-like Editor of my real worth. And still I write, and still the wonder grows, that one small head could hold one half it knows. Alas, the poor negro with untutored mind—and all that. I can well imagine why everyone now wants to become a crooner.

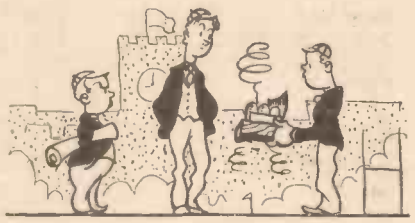
While two of my correspondents suggest that crooners are really wise people, appreciating that meritorious work goes unrecognised and commands very low pay, they point out the case of a poet who recently died practically penniless and forgotten by the world. Personally, I am of the opinion that anyone who continues to turn out work which the world does not want is foolish. It is egotistical in the extreme for a poet to say: "Here is my work. Why is it not recognised?" It does not occur to them that a lot of it is not worthy of recognition and is quite rightly forgotten. A wise man would have changed his tactics and supplied the public with the sort of stuff which it will recognise, so perhaps jazz craniacs, crooners, and the like are shrewd business people who know how to commercialise tripe and wax exceeding fat upon it.

The Schoolboys Again

MY deeds upon my head! I cry Pax. Hundreds of schoolboys have flailed me with their pens and a plentiful supply of blots, that I should dare to suggest they are incapable of design. I take it all back, and invite my schoolboy friends to let me have details of circuits they have designed. Therein lies the proof or otherwise of their arguments. For every circuit which shows originality I will award a special prize containing my autograph, and if that is not worth winning, what is? And this also applies to schoolgirl designers.

Pylons and Crackles

LOTS of the crackling problem is due to the Grid Scheme—that ill-considered system for which, I am sure, England will pay in time of war. Not only will a few aircraft be able to paralyse the country in time of war, but the miles of overhead cables and the thousands of pylons, with their fine tracery of ironwork, provide a set-back to the development of aviation. Pylons are a positive menace to pilots, and I am wondering whether some device could not be arranged which would warn pilots in time of fog that they are approaching one of these ugly erections. Something on the principle of the electronde should suit



Those schoolboy designers have flailed me!

capacity between the cables and the device in the aeroplane giving forth a shrill note.

"Car Radio at Olympia"

I AM taken to task by my friend Dyer, of the *Wireless Trader* with regard to my paragraph under the above heading which appeared in my notes in the issue dated August 31st. I referred to the "regulations" regarding the use of car-radio receivers, whereas I should have referred to the "proposed regulations." The point is that the restrictions to which I referred have not yet come into force; nevertheless it is a fact that several manufacturers are designing their receivers in such a manner that they will comply with the draft regulations referred to if and when they actually come into force. But whether or not the regulations ever become legal, I am quite sure that there is a bright future for car radio.

(*Continued overleaf*)

(Continued from previous page)

What of Micro-Waves?

NO less a person than Professor E. V. Appleton has lately declared that there is no future for long-distance transmission by means of micro-waves. This distinguished physicist, who is chairman of the British National Committee for Radio-telegraphy, has announced that recent discoveries show that there is a layer of intensely-hot gases in the upper atmosphere, the temperature of which is estimated at 1,000 degrees Centigrade. From the published results of researches it appears that micro-waves will not be reflected back from this upper atmosphere in the same manner as are normal medium and short waves, the result being that their range must be very limited. This news is, in itself, not new to the wireless experimenter who has found in practice that even ultra-short waves are only really effective for transmission over "optical" distances. Nevertheless, it might be that the exception will prove the rule, and on quite a few occasions effective transmissions have been carried out on wavelengths below 10 metres, and over distances up to 200 miles or so.

Six Hundred Miles on Ultra-shorts

INCIDENTALLY, I have just learned that an American amateur claims to have received four different 5-metre transmissions over a distance of approximately 600 miles. With regard to two of these transmissions this amateur has had verification of reception. It would appear that this reception cannot be placed under the heading of "freak," since four entirely different stations were received. The set, by the way, was a home-constructed super-regenerative arrangement.

The report states that the reception was subject to rapid fading, which seems to indicate that it was the reflected ray that was being utilised. If this were the case the experience would be very much at variance with the finding of Professor Appleton. In any case, it is evident that we have still a good deal to learn about the transmission and reception of the very high frequencies.

Another Use for Short Waves

I AM told that a new use for portable wireless transmitters is shortly to be tried in the New York Stock Exchange. It seems that the engineering staff of that organisation is hoping to provide miniature transmitters by means of which the various quotations can be sent to a receiver connected to a telephone some 20ft. away. From that point they are to be sent direct to the despatch department in a room fifteen stories above. It is obvious that only the simplest type of transmitter will be required, and it is believed that a licence will be unnecessary in view of the very limited range of the apparatus.

Jazz craniacs.

Notes from the Test Bench

Superhet Tests

THIS week the first of our service data sheets is published, and we have no doubt that these will fill a long-felt want amongst home-constructors. By carefully measuring the voltages and currents at various points in the circuit most of the faults which occur in home-constructed receivers may be traced. It is found, however, that the superhet presents more difficulties than the straight type of set, and satisfactory results cannot always be obtained even though all voltage, current, and resistance values are in order. This is due to the fact that the average superhet has seven tuned stages, all of which require careful trimming if optimum results are to be obtained. The detailed trimming instructions which we publish for our three-valve series of superhets enabled the majority of readers to accurately adjust these receivers. In cases where constructors have built receivers from blueprints, without having trimming instructions, it often happens that great difficulty is experienced in obtaining the correct setting for the intermediate-frequency transformer trimmers and the oscillator tuning condenser trimmer.

Using Test Oscillators

IN such cases an oscillator is very useful; in fact, this instrument is practically an essential to those whose work entails the testing of modern receivers. The correct method of using an oscillator for adjusting a superhet is as follows: Adjust the oscillator tuning control to the correct setting for the intermediate frequency used in the receiver, and then connect one of the output leads to the input terminal of the primary winding of the first I.F. transformer, and the other lead to the receiver earth line. The receiver and oscillator are then switched on and the I.F. transformer trimmers adjusted until maximum signal strength is obtained in the speaker. After correct adjustment of the I.F. transformers has been obtained the output leads of the oscillator should be connected to the aerial and earth terminals of the set, and the gang condenser trimmers adjusted until maximum signal strength is again obtained. It is emphasised, however, that some oscillators are not fitted with a blocking condenser, and therefore it will be necessary to connect a fixed condenser between the oscillator lead and the primary terminal of the I.F. transformer when checking the intermediate frequency, otherwise an H.T. short-circuit to earth may occur.

From the Sublime . . .

WE have had various freak arrangements in the way of novel receivers, but one which, to my mind "takes the cake" is American. In a recent issue of an American contemporary details are given for the construction of a "Bluebeard 4-Tube Set." The cabinet is made in the form of a grotesque face with moulded nose, futuristic ears, a beard to hide the loud-speaker, and eyes which light up when the set is switched on. Actually the two eyes are the tuning and volume-control knobs respectively, and miniature neon tubes are mounted in the knobs. To make the face still more terrifying there are eyelashes drawn round the eyes, and these serve as scales for the control knobs. It is stated by the designers that the receiver is "designed especially for the den or children's room." I am afraid it would scare many young children to such an extent that they would never want to hear wireless reception again.

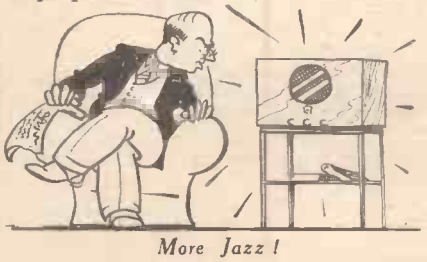
It Pays to Advertise!

PYE RADIO LTD., the well-known radio manufacturers, are prominently featuring this season the rather neat slogan, "Ask for Pye—it sounds better." A visitor who called at their Stand at Radiolympia said that he had bought a Pye set because the Pye van, bearing this slogan, passed his house every day. Perhaps it would not be out of place to repeat in this instance a rhyme quoted recently by Sir Stephen Killick, Lord Mayor of London:—

The codfish lays ten thousand eggs,
The homely hen but one
But the codfish never cackles
To tell us what she's done,
And so we scorn the codfish
While the homely hen we prize
Which demonstrates to you and me
That it pays to advertise.

"Friday the Thirteenth"

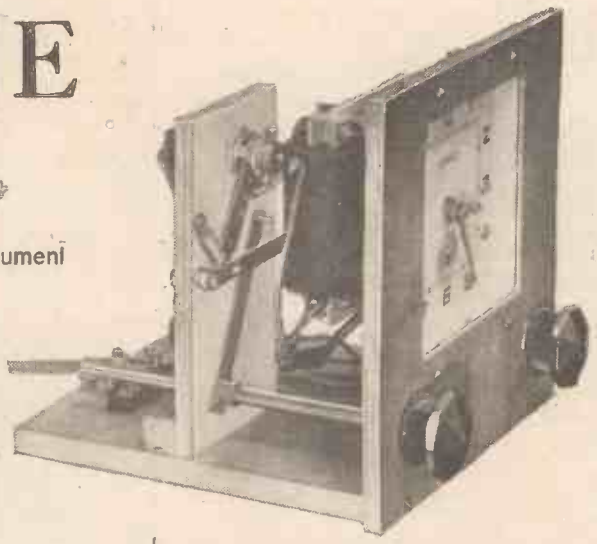
LANCE SIEVEKING has finished his adaptation of the film "Friday the Thirteenth," and the result will be presented in the National programme on September 11th and heard by Regional listeners on September 13th. The basic idea of the play is that all the characters participate in one single dramatic experience—an accident to a London omnibus. The play demonstrates in what way the accident affects and diverts the life story of each of the people in the bus.



More Jazz!

A NEW TIME SWITCH

Details of Construction of an Efficient Electrically-operated Instrument are Given in this Article



MANY designs have been published for a switching arrangement (usually incorporating a clock) which will switch a radio set on and/or off at any predetermined time, but unfortunately they all appear to suffer from the disability that they are not safe for permanent use on a mains set.

These disabilities arise through various causes—for instance, in many of them the contact points are exposed, in other words, metal parts connected directly to the mains can easily be touched by the uninitiated with consequent serious shock—again, the majority of these devices use dragging contacts, that is to say, the make and break action is slow rather than "snap," a feature which is particularly essential in any switch breaking a mains circuit.

Dragging contacts used on mains will inevitably produce excessive arcing (or sparking) with consequent dirty contacts, and in a short time the actual points of contact will become so oxidised that no connection is made, even in the on position. It will be clear from these two points that a simple clock-switch is useless on a mains receiver, however suitable it may be for a battery-operated set. Again, there is usually the trouble of winding and regulating the clock, this latter operation being of paramount importance.

Those readers who have "controlled" A.C. mains will no doubt have at least one electric clock, and will appreciate the accurate and reliable readings given by these timepieces, and if one could be made to operate a switch controlling the receiver one could depend on the set being switched on at the time originally intended, and not at an inopportune moment due to the inaccuracies of the spring-type movement.

Even if the mains are not definitely controlled, the frequency, providing it is 50 cycles, will be sufficiently accurate to require only slight adjustment at intervals of a few days.

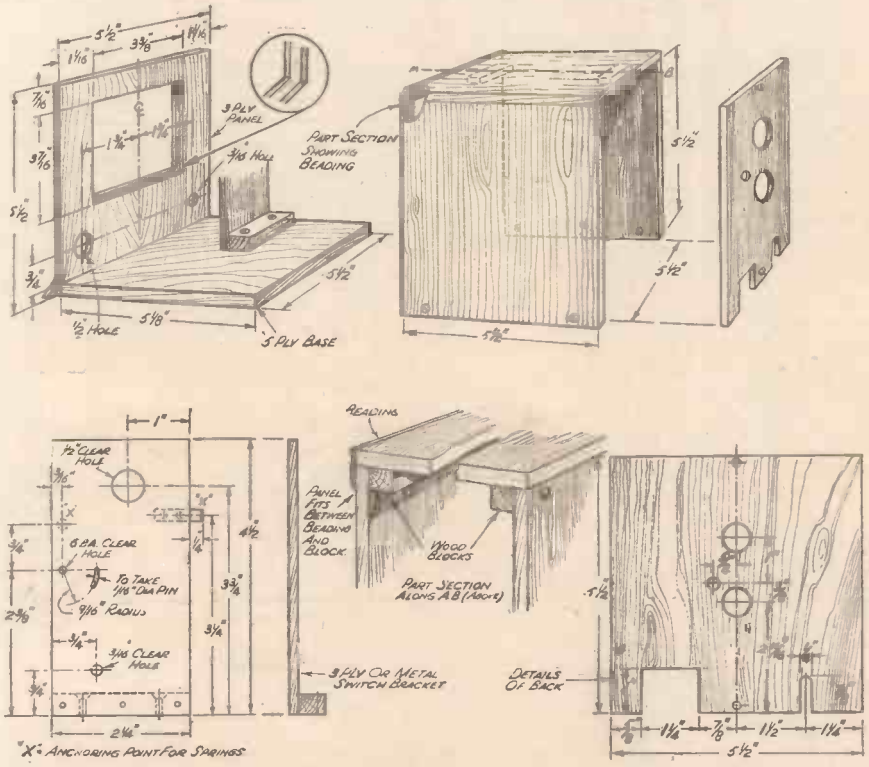


Fig. 1.—Details of construction for the wooden cabinet for the time switch described in the text.

An Electric Movement

Bearing these facts in mind, it was decided to design a clock switch which would have the advantage of (1) Electric movement; (2) Snap-action switching suitable for mains; (3) Pre-setting for each time required, i.e., it must not automatically switch on at regular intervals of 12 or 24 hours, and (4) Compactness and neatness.

The switch eventually produced possessed all these advantages, and although it was not possible to produce it at an extremely low price, with the minimum of labour, nevertheless the practical man should experience no difficulty in producing an exact copy of the original at reasonable cost with only a few simple tools.

With regard to constructional details, the clock-switch is based on a Ferranti alarm clock, obtainable at any good jeweller's. The movement is first removed from the bakelite case, a brief examination will disclose the operations necessary to achieve this, and the alarm mechanism removed. To do this it will be necessary to drill the two rivets clamping the "buzzer" strips to the top bracket, the bracket being left in position. The panel and bracket for the switch mechanism are next prepared from stout three-ply wood, the panel preferably having a veneer to match the cabinet. The base-board is cut from five-ply, the panel being securely fixed to this. Full details of the wood parts are given in Fig. 1. It is imperative that the dimensions given for the bracket should be followed as closely as possible, otherwise the various mechanical parts will not fit. The clock fits into the

(Continued overleaf)

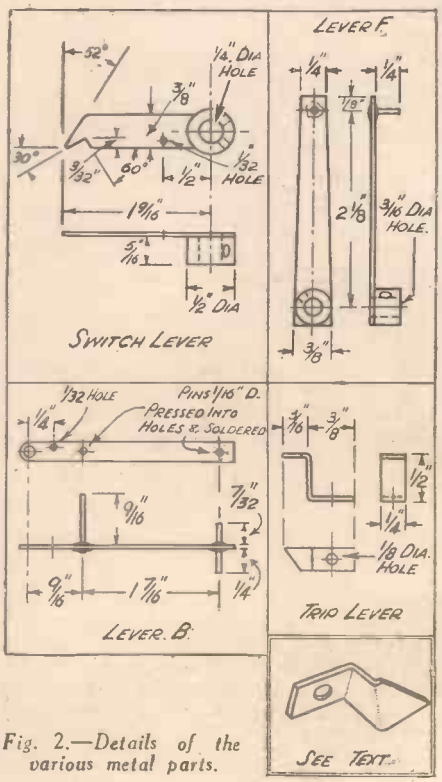


Fig. 2.—Details of the various metal parts.

(*Continued from previous page*)

recess in the panel, four long 6 BA screws serving to hold it in position.

Dimensions for the principal metal parts are given in Fig. 2, the actual choice of material resting with the constructor, but brass seems to be the most suitable. Particular care should be taken with the switch-lever A which should be of hard brass. It will be noted that the end is slightly rounded. As far as the original model was concerned, this was quite

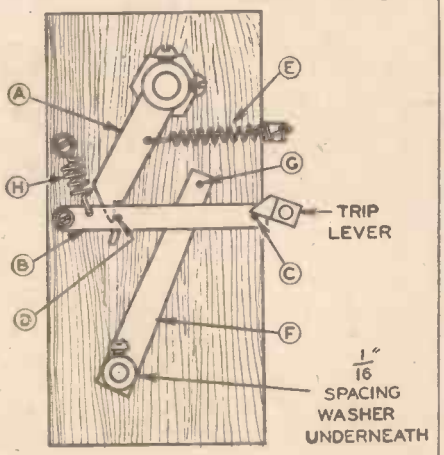


Fig. 3.—Showing the mechanism in the "set" position.

satisfactory, but it was noted that after some considerable use the mechanism tended to operate somewhat early, due to the rounded end having a tendency to push down the pin D in lever B, thus releasing the switch prematurely (see Fig. 3).

The mechanism could be adjusted to allow for this, but if extremely accurate timing is essential it would be advisable to trim the end only, and substitute a square pin for the round one D in lever B.

Details of Operating Mechanism

A detailed drawing of the mechanism is given in Fig. 3, the switch being in the "set" position. The trip lever, in its travel, presses down the pin C and consequently the lever B, until the pin D releases the switch lever. The tensioned spring E then pulls the switch-lever to the opposite side, thus changing the switch contacts.

To re-set the mechanism, the knob, and consequently the lever F, is turned in an anti-clockwise direction. The pin G engages with the switch lever and causes the ratchet end to pass over the pin D. Once it is by, the spring H pulls lever B in an upward direction, thereby setting the switch. The knob can then be released—incidentally in building it must be remembered that the switch-lever may have to take the lever F in its travel, and the latter should not work stiffly—otherwise it may prevent the switch from functioning correctly.

To prevent undue pull on the pin D and the lever B the pin is extended and runs in a curved slot cut in the wood, or, if preferred, a similar slot cut in a small metal plate can be provided, the plate being secured to the bracket. As another alternative, the bracket itself could be made from sheet brass in preference to ply wood.

If it is desired to release the "set" mechanism by hand it is sufficient to rotate the knob in a clockwise direction. The lever F then engages with pin C, pressing down lever B and thus releasing the switch lever. So much for the method of working.

The trip lever is soldered to the original alarm hand, and here a little patience is necessary. The cam is secured by a set-screw which fits into a recess in the spindle, and, as a result, no adjustment can be made from this point.

Timing Adjustments

First tin the end of the cam (after removal from the clock) and also the trip lever. Set the alarm hand for 10 o'clock and the hands to about an hour and a half less, *i.e.*, 8.30 o'clock. Replace the cam and hold the trip lever in place, just touching the pin C, lever B being set. A brief touch with a hot iron serves to secure the two parts together, and the working can be tried out.

It will doubtless be necessary to file the trip lever slightly to obtain correct timing; if too much metal is taken off it is a simple matter to re-sweat the lever in a slightly more advanced position.

It should be noted that if the alarm adjustment knob is turned in an anti-clockwise direction (viewed from the back) the trip lever is liable to catch against the pin C. Actually this should not happen, the knob should unscrew when turned in this direction, but to obviate the risk of strain the lever could be shaped as shown in the inset to Fig. 2, lever B will then bend slightly as the trip lever passes.

Some little difficulty was experienced in obtaining a suitable plug and socket for the output, as these parts are almost invariably manufactured to pass the current *into* the apparatus, whereas in this case the current comes *from* the apparatus. For maximum safety the pins must be on the output lead, the socket being part of the clock switch, and the only suitable component was found to be the Bulgin unit illustrated, the centre screw of the socket part being removed and a longer one, going through the baseboard, substituted.

As an alternative to this arrangement, the output lead could be fixed permanently to the clock switch, two terminal points being fitted on the baseboard, and the lead clamped in a similar manner to the input lead.

The alarm and time-adjustment knobs and the starting knob remain to be fitted. As far as the first and last are concerned the simplest method of extension is to break the moulded part by gently tapping with a hammer, and solder a length of brass rod to the threaded part. There are numerous methods of fitting a small knob to the end of the extension piece, the time knob being treated in a similar manner, if preferred. It would probably be easier in the long run to make this direct from one piece of brass rod, however, a small hole being drilled about ⅜in. deep, and a fine saw-cut then being made of a similar depth, the remarks concerning the knob still applying.

Electrical Details

With regard to the electrical connections, the clock is always in circuit, but the output to the socket is dependent upon the switches. Presume that the mechanism is set and the mains output is off. Then immediately the switch is released by the action of the clock the mains will be switched on—alternatively supposing that it is required to switch off at a given time, the mechanism is set and the panel switch moved to the position where current is switched on. The timed-release action then switches it off.

Briefly then, the inside switch puts the current on or off, the choice of these actions being dependent upon the setting of the panel switch. With the mechanism released the panel switch may be used for on/off purposes.

As to the wiring, all joints must be

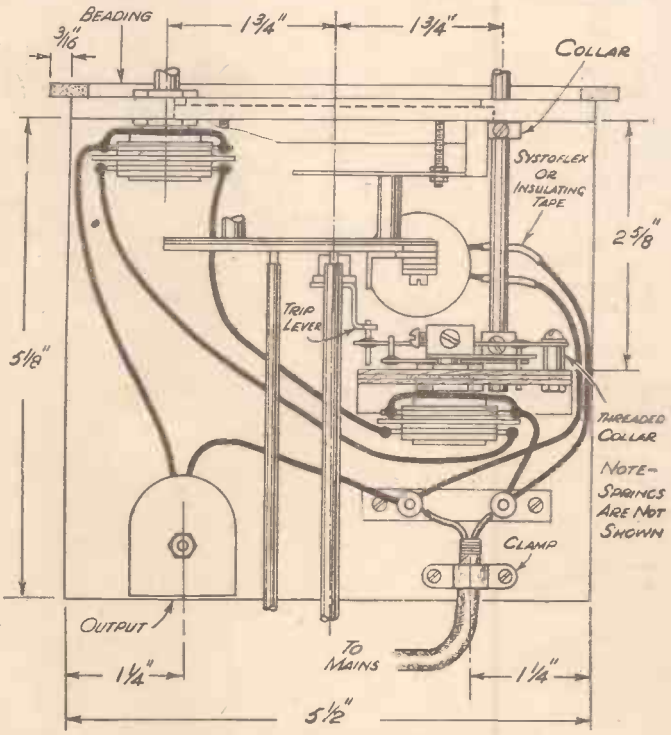


Fig. 4.—Wiring diagram giving some of the chief dimensions of the unit.

soundly made, and Fig. 4 gives the wiring details, and all grub screws and nuts securely tightened, as the slight jerk on release tends to loosen, in particular, the inside switch.

The Cabinet

The cabinet is extremely simple to construct, and details are given in Fig. 1. The sides and top unit fit over the panel and baseboard, the back being removable on its own.

The bottom piece of beading is fixed to the panel, the remaining three pieces forming part of the sides and top unit.

In conclusion, providing that the dimensions and details are closely followed little difficulty should be experienced in making a similar model, which will serve other purposes besides controlling the radio receiver. The switches are rated to carry 2 amperes at 240 volts, which is equivalent to 480 watts, making the unit suitable, amongst other things, for switching off a reasonably-sized window display.

SHORT WAVE SECTION

The Simplest Short-waver

This Section is Generally Devoted to the Interests of the Established Short-wave Amateur, but This Week the Space is Being Given Over to Those Who Have Not Yet Taken an Active Interest in Short-wave Reception But are Intending to do So.

IT has often been pointed out in these pages that a short-wave set is the simplest possible type which the constructor can build, but the sceptics often ask: "But how simple is it really?" That is a question which we propose to answer, not by lengthy argument, but by showing how a reasonably efficient set of this kind can be built at a cost of only a few shillings. We shall not claim that the set described is super-sensitive, nor that it is as good as one built around special factory-produced parts, but we do say that it cannot fail to work, and we will show how proper components can be fitted after the constructor has satisfied himself that short waves are really worth his while.

Standard Components

The circuit diagram of the single-valver of which full details are to be given is shown in Fig. 1, and a wiring plan is given in Fig. 2 for the benefit of those who are not yet quite confident of their ability to read a theoretical diagram. In the first place it is necessary to explain why the .0005-mfd. variable tuning condenser is connected in series with a .0003 mfd. fixed condenser, since this is unusual. The reason is that a tuning condenser for short waves should have a maximum capacity of not more than about .0002 mfd. and the lowest possible minimum capacity. This condition is approximately satisfied by connecting the two condensers in series. Condensers of the required value can be bought very cheaply, but most constructors will have a .0005-mfd. component somewhere in the junk box along with, no doubt, a few fixed condensers of various capacities. And as this initial set is not intended to cost more than a few shillings we think that the idea suggested will meet with approval. At a later date a standard short-wave condenser of either .00016 mfd. or .002 mfd. can be bought.

Making the Coil

The coil, it will be seen, consists of 15 turns of wire—in three sections of 3, 7 and 5 turns each—wound on a length of 2in. diameter cardboard tube. Ordinary postal tube is suitable for use as the former and this should for preference be given a liberal coating of shellac varnish before use. The 3-turn winding is for aerial coupling, the 7-turn winding is for tuning the grid circuit, and the 5-turn winding

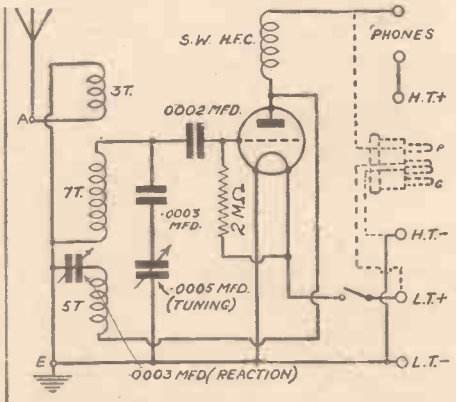


Fig. 1.—The circuit of the simple short-waver described. Broken lines show the connections for using the set as an adapter.

is for reaction. The grid coil is wound with 20-gauge enamelled wire, the turns being equally spaced by the diameter of the wire used, but the other two windings have side-by-side turns of about 26-gauge enamelled wire. Actually, it is not essential that these exact gauges be employed, but they are probably most suitable. All the turns are wound in the same direction, and the ends of the windings are anchored by passing the wire through pairs of small holes made in the tube with a drill or a pricker. As to the connections, these are as shown, and care is needed only to see that the coil leads are connected in the order shown; that is, the leads from any winding must not be reversed.

The coil can be attached to the small baseboard either by fitting a small angle bracket to the former, or by making the latter a push fit over a wooden disc or large cork screwed to the baseboard. The reaction condenser may be any ordinary component having a capacity of .0003 mfd., but it is better to use one of the air-spaced variety if this is to hand. The grid condenser and leak are standard components which nearly every constructor will have in the junk box, but even if they are to be bought new they will not cost more than two shillings. A valve-holder of normal baseboard-mounting type is indicated, but if a new one is to be bought it will be better to obtain a short-wave one such as the Clix, Eddystone, or B.T.S. Any on-off switch will serve perfectly well.

The H.F. Choke

The next item is the H.F. choke, and this can be made very easily by winding 150 turns of 36-gauge enamelled wire on a

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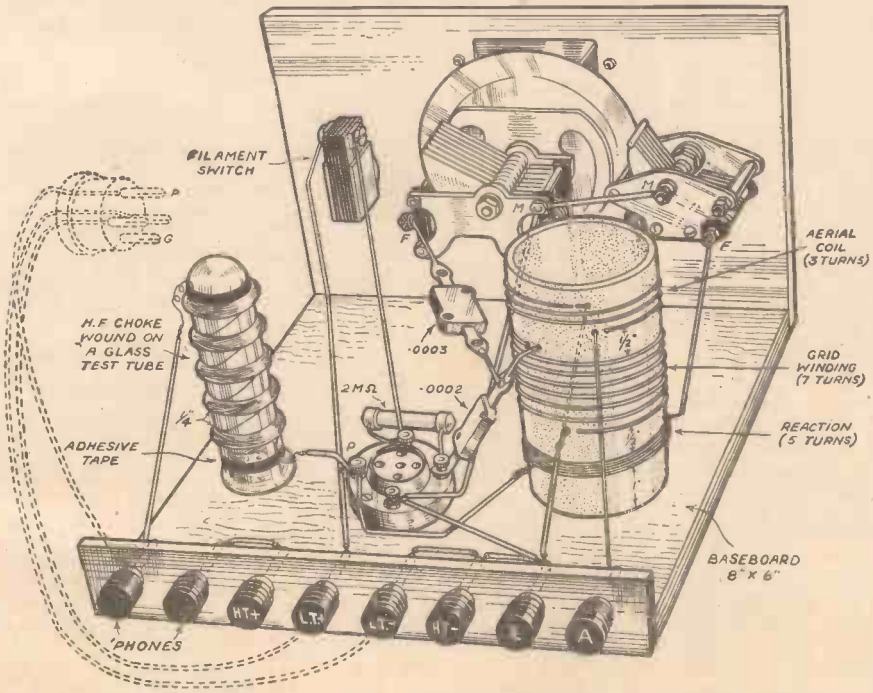


Fig. 2.—This is the pictorial wiring diagram of the circuit shown in theoretical form in Fig. 1.

SHORT-WAVE SECTION

(*Continued from previous page*)

¾in.-diameter test tube (obtainable from a chemist's for a penny or so). The turns are continuous (electrically), but are wound in five sections of 30 turns each. No special care is called for here, for you simply wind 30 turns in a pile about ¼in. wide, leave a gap of ¼in., wind 30 more turns, and so on. As will be seen, the two ends of the winding are held in position by winding a strip of adhesive tape or insulating tape round the tube. On completion, this simple choke can be fixed to the baseboard by means of a cork which fits the open end. When desired, an Eddystone type 948 choke can be bought to replace the simple home-made one.

Eight terminals are fitted to the rear edge of the baseboard and are mounted on a strip of ebonite 1½in. wide. In connecting up see that all the leads are as short as possible, and cut those from the coil and choke so that they are just long enough to reach to the appropriate terminals.

Wavelength Covered

The finished receiver will tune from about 20 to 40 metres, and will therefore cover the wavelengths used by many amateurs (working on about 40 metres) as well as by a number of short-wave broadcasting stations working on wavelengths in the region of 31 metres. Probably the transmissions which will be received most easily are those of Rome on 25.4 metres, Zeesen (Germany) on 25.49 metres, Huizen (Holland) on 25.57 metres, and Radio Nations (Switzerland) on 31.26 metres, but there are many American stations which are well within range when conditions are favourable.

The method of operation is the same as that in the case of a Det.-L.F. receiver designed for medium- and long-wave reception, except that greater delicacy of operation is necessary. This means that the tuning condenser—which must have a reasonably good slow-motion drive—must be controlled slowly, and that the reaction condenser must be employed more frequently so as to keep the set just on the verge of oscillation; this is indicated by a faint "breathing" sound in the 'phones.

For Loud-speaker Reception

Should it be desired to operate a loud-speaker the set can be used as an adapter by fitting an old valve base or an adapter plug to the two L.T. terminals and to one of the 'phone terminals, as shown in broken lines in Figs. 1 and 2; a convenient length of four-strand is suitable for connection. The detector valve of the broadcast receiver is then removed and the plug inserted in its place. It might be added that the most suitable valve for use in the short-wave set is a type H.L. or L., but in any case the detector valve from the broadcast receiver can be used satisfactorily.

Leaves from a Short-wave Log

Growing Interest in Short Waves

WHEN Radiolympia this year celebrated its tenth anniversary it furnished a clear demonstration that makers of wireless receivers have now recognised the wider field of exploration offered by the addition of short-wave bands to their sets. Listening to broadcasts on the medium and long wavelengths has become so matter-of-fact that it has been a wise move on the part of British makers to realise that to-day pleasurable entertainment in radio is to be found on the higher frequencies. Readers of PRACTICAL AND AMATEUR WIRELESS need little reminding of the fact that, in view of the considerable strides made during the past two or three years in transmission on wavelengths below 100 metres, we have always advocated that the amateur should turn his attention to this direction. In the meantime many countries have established regular radio services destined to listeners in other continents, and consequently the number of transmissions available to the listener is growing rapidly from week to week. If the would-be purchaser or constructor of a wireless receiver selects a circuit which permits him to tune in channels in the long, medium, and short wavebands he may rest assured that at no time during the day or night will he be at a loss to find entertaining radio entertainments from some quarter or other of the earth. Moreover, in many instances when, owing to atmospheric conditions, broadcasts from distant medium-wave stations are difficult to receive, there is frequently a relay to be found on a much lower channel; this advantage alone should prove a decided asset, as prevailing electrical disturbances seldom affect adversely transmissions on widely separated frequencies. Experience shows that when listening conditions are poor on the higher band it is often excellent on short wavelengths and vice versa.

Altered Time Schedules

Rome (I2RO) on 25.42 m. (11,801 kc/s) appears to have taken over the majority of broadcasts usually carried out for North and South America on 31.13 m. (9,637 kc/s). It is expected that the former channel will be held during the summer months, and that the transmitter will revert to the higher wavelength towards the autumn. France has made some slight alterations in its programme times and the service is being gradually extended. In future, daily broadcasts in English for a period of ten minutes, comprising each a short news bulletin, are to be transmitted by Radio Colonial (FYA) at B.S.T. 01.20 for the U.S.A. and at 11.00 for New Zealand. Similar broadcasts in French are given at B.S.T. 01.10 for Canadian listeners and for French residents in the Near East at B.S.T. 16.50. The Paris Overseas station also transmits a special programme in Spanish at B.S.T. 04,03.00 destined to South America.

VK3LR, Lyndhurst (Victoria) has increased its power to 1 kW. and should now prove a better signal. It works on 31.32 m. (9,580 kc/s) daily. One peculiarity about the final announcement lies in the fact that you are bid "Good-night wherever you may be." The usual times of transmission are B.S.T. 09.15-13.30 on weekdays and from 04.00-13.30 on Sundays.

East Indian Stations

Lately the Netherlands East Indian stations have been showing more activity than usual. PLV, Bandoeng (Java) on 31.86 m. (9,415 kc/s) is used more regularly than hitherto for special broadcasts. You may pick them up almost daily at B.S.T. 14.30. Other Bandoeng stations which also broadcast gramophone records are PLP, 3 kW., on 27.27 m. (11,000 kc/s), and PMN on 29.24 m. (10,260 kc/s). They are to be heard on Sundays between B.S.T. 09.30-11.30 and again from 14.45-16.00.

VPD, Suva (Fiji) a 3 kW station run by Amalgamated Wireless (Australasia), Ltd., is testing almost daily with Sydney with a view to a relay of the Sydney and Melbourne radio programmes and news bulletins. The station is on the air between B.S.T. 06.30-07.30 and sometimes between 08.00-09.00. The channel is 13,075 kc/s (22.94 m.). Suva is 1,800 miles east of Brisbane and about 1,200 miles north of New Zealand.

Following the examples of European countries Japan is putting out a special daily short-wave programme in English through JVH, Tokio-Nasaki, on 20.55 m. (14,600 kc/s); it is usually heard between B.S.T. 01.30-02.30. As there would appear to be some difficulty in using this channel for the United States another wavelength is brought into operation simultaneously and there is a possibility that the station may develop more than 20 kW. in the aerial in future. JVH was recently heard working with GBL, Rugby (20.47 m.) between B.S.T. 08.30-11.00.

Reykjavik

The Radiotelephone service having now been officially opened between Iceland and England, it will be interesting to pick up the channels used by the Reykjavik transmitter, as they are also to be utilised for the interchange of radio programmes between Iceland, Denmark, and other countries. The wavelengths adopted are: 24.52 m. (12,235 kc/s) and 33.11 m. (9,060 kc/s), but 21.48 m. (13,965 kc/s) has also been added to the network. The respective call-letters of the station are TFJ, TFK and TFL. The writer has also logged a relay of the Reykjavik long-wave programme on the first two channels.

Finally, two Colombian transmitters have adopted new channels; they are HJ5ABE, Cali, now on 20.83 m. (14,120 kc/s) instead of 42.86 m. (7,000 kc/s) and HJ5ABC, Pereira, on 48.9 m. (6,135 kc/s).

Random Jottings

By JACE

B.B.C. Television Service

WE understand that as authority has been given for the placing of orders for high-definition television equipment for the London Station, the B.B.C. has decided to discontinue the present experimental thirty-line transmissions as from September 15th.

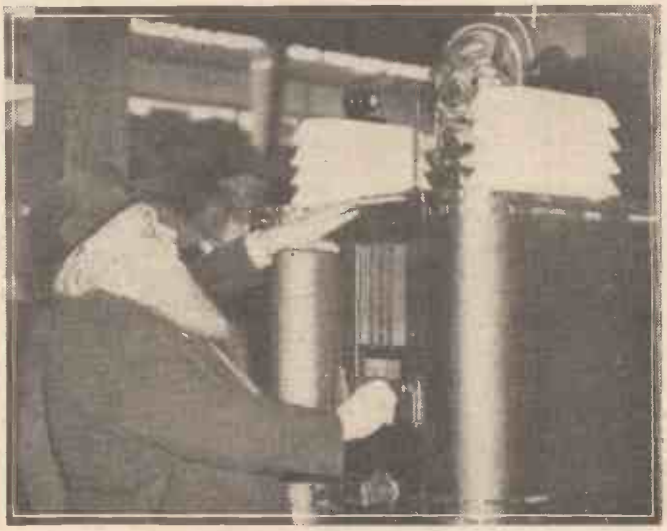
A Novel Broadcast Programme

ON September 10th, in the Regional programme, Ernest Longstaffe will stage a charming musical fantasy, the scene of which is set in Broadcasting House. When the busy day is over and the musical instruments that have been in use all day (and most of the night) are put away in their cases, silence settles over "Band Room No. 5." Instruments as well as artists are at rest, but, in the case of the former, not for long. At 2 a.m., with a rustle and a creak, the piano comes to life and is transmogrified into a silvery-haired old gentleman. The trumpet becomes a soldier, the violin a young girl, the saxophone an American, and the drum a policeman. They have a life of their own, these apparently inanimate creatures of wood, and silver, and catgut, and brass, and they decide to amuse themselves until their new day of servitude begins in a cabaret in which each instrument takes part. The cast will include Alma Vane, John Rorke, and Billy Mason as, respectively, the violin, the piano, and the saxophone. The instruments will be played by members of the B.B.C. Variety Orchestra, namely, Bernard Reillie, Arthur Sandford, Harry Carter, Sticks Gibling, and A. J. Lewis.

Ten Miles of Paper

A FAMILIAR sight in Fleet Street is a horse cart with six rolls of paper and a notice on each roll announcing: "Five miles of paper for your daily paper."

At Radiolympia this year one firm claims to have given enough printed material to consume two of the rolls as used by newspapers. The firm in question was Messrs. Mullards, who ordered enough printed material, describing their valves and receivers, to allow every visitor to Radiolympia to take one of each kind away.



Professor Otakar Steinberger, of Prague, the well-known telepathy student, investigating the Marconiphone Telepatho Box, which answered questions, at Radiolympia.

Royal Air Force Vacancies for Boys

THE Air Ministry announces that vacancies will occur this month for over 300 Boy Entrants, Royal Air Force. Entry is open to boys who were between fifteen and three-quarters and seventeen and a quarter on August 1st, 1935, and who have attended a secondary, junior technical, or central school up to the age of fifteen and a half, or have attained an equivalent educational standard. Accepted boys will be given twelve to sixteen months training as wireless operators, armourers, and photographers. This method of entry is the normal system of recruitment for the foregoing trades, and is independent of the special entry of young men over the age of seventeen for training in the same trades which has been authorised in consequence of the expansion of the Royal Air Force. The number of vacancies is, of course, increased as the result of the expansion.

Intending applicants should write at once for details of the scheme and application forms to the Air Ministry (Boy Entrants Dept.), Adastral House, Kingsway, London, W.C.2. Candidates will be required to obtain nominations from a recognised authority, which must reach the Air Ministry by September 15th, to be in time for the next entry.

This novel stand, in the form of an old English inn, was used by the Marconiphone Company as their office at the recent Radio Exhibition at Olympia.

St. Giles Fair at Oxford

THE mobile recording unit of the B.B.C. is to be used to pick up characteristic features of St. Giles Fair at Oxford on September 10th; and these will be linked so as to form a sound picture to the broadcast in the evening. The producers will be J. H. Fletcher, from the Recorded Programmes at Broadcasting House, and David Gretton, who has just become Outside Broadcast assistant at Birmingham, where he was formerly an announcer. The Fair is notable for several reasons. It is one of the oldest in the country—indeed, the millenary of the Saxon saint, Frideswide, with whom it was originally connected, falls to be celebrated this year; it is the largest held in a public thoroughfare, the booths and shows lining both sides of St. Giles for a long distance; and it is, from the point of view of showmen, gypsies, and stall-keepers, the climax of a series of small local "feasts" which are celebrated in Oxfordshire villages. The association of the Fair with St. Giles came about through the fact that the Abbot of Godstow owned the Manor of Walton—where in the Middle Ages the fair was held in open fields—and was also the patron of St. Giles Church.

Two New Broadcasting Stations for Hyderabad

ACCORDING to a recent announcement the Government of the Nizam of Hyderabad has decided to place an order with the Marconi Company for the supply to the State of Hyderabad of two broadcasting stations of the most modern type.

One of these stations, which has a power of 3-5 kilowatts, and capable of being increased in power to 6-10 kilowatts, will be installed at Hyderabad, and the second, a station of 500 watts, will be installed at Aurangabad.

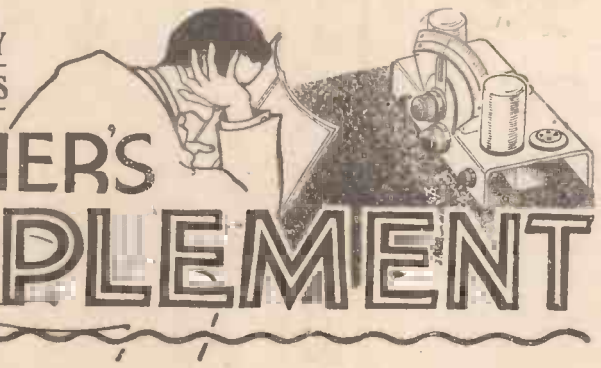
High-precision drives and all the latest refinements of modern broadcasting technique are being incorporated in the equipment, which will thus provide the Hyderabad State with one of the most up-to-date broadcasting services.

Broadcasting in the Hyderabad State on a small scale was introduced some two years ago on the personal initiative of Syed Mahboob Ali, the success of whose private broadcasting service at Hyderabad has led to these developments. Mr. Mahboob Ali, Director, Wireless Department of the Nizam's Government, who is at present in London, is touring the world in order to examine the principal broadcasting organisations and the potentialities of television with a view to developing the Nizam's State Broadcasting Service on thoroughly up-to-date lines.

This scheme will include a widespread development of broadcasting to the villages in the Hyderabad State, upon the lines suggested by Colonel Hardinge, a member of the Executive Committee of the Indian Village Welfare Association, during his visit to Hyderabad last November. Hyderabad State covers an area of 82,000 square miles, with a population of over fifteen millions.

THE SUPERIORITY OF MODERN VALVES

BEGINNER'S SUPPLEMENT



The Chief Features of the Latest Multi-electrode Valves and Why They are Superior to Those of a Few Seasons Ago are Discussed in this Article.

ABOUT two seasons ago a new crop of interesting valve types were introduced which were instrumental in making possible many changes from the circuits which had become rather of a stereotyped nature. High-frequency pentodes, double-diode-triodes and other multiple valves, were soon followed by improved frequency changers—the pentagrid or heptode, and the octode—and it became well within the scope of the amateur of average ability to produce a workable superhet with a reasonable number of valves.

Since that time there has been little of startling character in the way of entirely fresh developments, but although current catalogues may not contain details of many new sorts of valves, there has been considerable improvements in detail, and several newly designed valves which make stage efficiency in the sets embodying them even higher than before. There are many readers who still pin their faith to the straight circuit having one or more radio-frequency stages, and even some builders of superhets recognise the advantage of employing one radio frequency pre-amplifying stage.

An Important Feature

R.F. amplifiers and I.F. amplifiers, too, are to-day almost invariably screened pentodes of the variable-mu type. High maximum sensitivity, stable operation, and their amenability to gain-control, exercised either manually or by A.V.C., are their great merits. These valves have, of course, been available for two seasons, but the latest types have one very important feature, namely, that they are so designed that the screen can be connected to the normal anode voltage. Previously, the screen voltage recommended was about one half of the anode voltage, and thus necessitated the use of either a potentiometer arrangement or, at least, a voltage-dropping resistance with, in addition, a by-pass condenser. These items, representing an expenditure of some shillings, are avoided in the new valves, which are also claimed to have better characteristics so that increased efficiency is secured as well as circuit simplification and reduced cost.

Next in order come frequency changers. The heptode and octode are still with us, and at present are first favourites. Little material change is to be noted in them, although it is claimed that modifications are incorporated which render them more suitable for short-wave working. A new form of frequency changer is, however, likely to cause great interest. This is the triode-hexode, which may be considered as combining the advantages of electron coupling enjoyed by the pentagrid and octode, with the use of a separate triode oscillator unit in the same bulb as in the triode-pentode which, however, requires external coupling between the oscillator and mixer.

The hexode portion of the triode-hexode consists of a cathode, control grid and three other grids, of which 2 and 4 are earthed suppressors and grid 3 what may be termed the "mixer grid," connected to the grid of the oscillator section. It will thus be seen that the heterodyne frequency modulates the hexode anode current *after* the application of the incoming signal and not before, as in the octode or pentagrid. Owing to the "mixer grid" being two grids away from the cathode, a larger heterodyne voltage than usual is necessary, and the use of the separate but self-contained triode section makes possible the generation of such a voltage. The oscillator, by the way, uses a short section of the lower part of the common cathode in this valve. Fig. 1 is a diagrammatic representation of the triode-hexode.

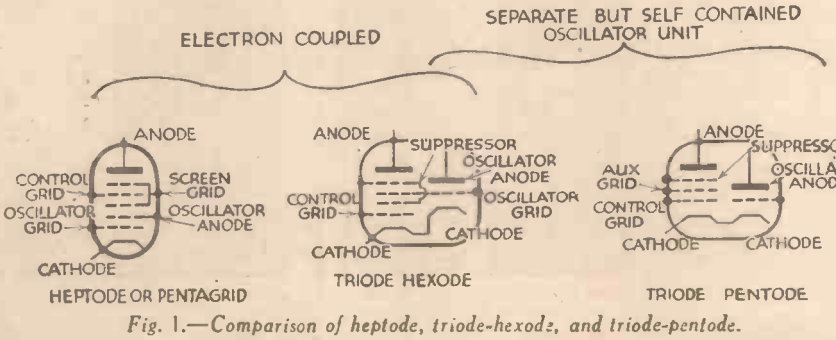


Fig. 1.—Comparison of heptode, triode-hexode, and triode-pentode.

Speech Detectors

Coming now to speech detectors, diodes are, of course, still prime favourites.

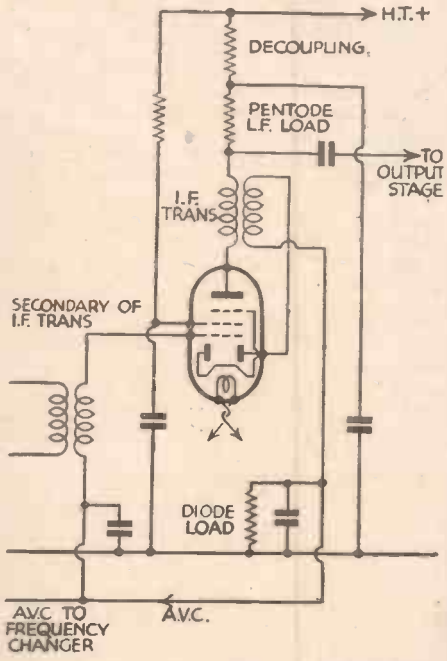


Fig. 2.—Diagram including a duo-diode H.F. pentode as a four stage (reflexed) valve.

The original duo-diode-triode combination, while still popular, is more often supplanted by plain duo-diodes, and valves of this type are, for the first time, now available in battery ranges. One reason why duo-diodes are achieving more general use is the introduction of what are variously termed "high slope" or "high sensitivity" output pentodes in the mains ranges. Previously, a mains pentode required a peak signal of between 15 and 20 volts R.M.S. to load it fully, and in sets of more or less conventional design this meant either the use of an amplifying detector (triode or pentode), or some form of L.F. amplification between the diode detector and the output valve. This amplification could be conveniently supplied by the triode portion of a duo-diode-triode.

The new sensitivity output pentodes, however, can be fully loaded by an input signal of under 4.0 volts R.M.S., a value obtained easily from the output of a diode detector. Thus, no other L.F. stage is necessary, and the diode detector, immediately followed by a high slope output pentode, is quite good modern practice. In this connection, it should be noted that with an output valve so sensitive, a gramophone pick-up may be connected directly to the grid of the pentode which is, of course, another great advantage.

The advent of the high slope output pentode at once suggested a further multi-purpose valve, namely, a duo-diode-pentode combination which, as its name indicates, provides one diode for speech

(*Continued on opposite page*)

BEGINNER'S SUPPLEMENT

(*Continued from previous page*)

detection, another as A.V.C. valve, and an output valve all in one envelope. Many sets employing this type of valve have been designed.

Another form of duo-diode-pentode has recently appeared, but it should really be termed a pentode-duo-diode for, in this case, the pentode portion is of the H.F. pentode type and is intended primarily for use as radio-frequency or intermediate frequency amplifier. The two diode elements are for use as speech detector and A.V.C. respectively. The order of operation can, however, be reversed if desired, and the valve employed as diode detector and A.V.C. valve followed by a stage of L.F. amplification, in which case the output of the pentode portion must be led to the grid of the final output valve. This valve can be used in reflex circuits, for it will perform no fewer than four separate functions—I.F. amplifier, reflexed L.F. amplifier, detector, and A.V.C. valve. A theoretical circuit of such an arrangement is shown in Fig. 2.

Valve makers have been paying still more attention to Class "B" and to Q.P.P., and new triodes, specially designed for use as drivers for Class "B," and additional types of double pentodes for Q.P.P. have recently made their appearance. A good many commercial sets employing these two methods have been produced and give very satisfactory volume and quality. It seems strange that, generally speaking, amateurs have not taken very kindly to these useful forms of power amplification. Initial expense, a rather different technique and, possibly, some misunderstanding of the real uses and the correct method of controlling such stages may contribute. But the added first cost is more than saved in battery economy if Class "B" and Q.P.P. are properly used, and quality is capable of being extraordinarily good if it is only realised that maximum output *is* maximum, and maximum *occasional* output, i.e., on really loud passages of music, and should not be employed to raise the whole volume level of the performance to the order of a watt or so. Anyhow, these forms of output are well worth further consideration.

Investigating a few more general points, it must be noted that the most important is that there is practically no difference either in characteristics or in actual performance between A.C. mains valves and those intended for use in A.C./D.C. sets. This means that in future a single design, with only a slight alteration to the heater and rectifier circuits, and the omission of the mains transformer in the universal version, will suffice for A.C. and A.C./D.C. sets. The sole exception will be the case of the high fidelity receiver using a triode of large output in the last stage. Such will be available for A.C. mains only. At least one firm, however, are making a universal triode output valve of about 2 to 2½ watts output, and two of these in push-pull should form a very useful output arrangement for a universal "quality" receiver.

Finally, it has been definitely established that modern valves operate very successfully on short waves, as is shown by the introduction this year of a considerable number of commercial short-wave and all-wave sets, with ranges down to below 20 metres. This is, naturally, excellent news for the amateur experimenter.

Designing Your Own Wireless Set

The Design of the L.F. Amplifier for a Battery Set is Dealt with This Week.

By FRANK PRESTON

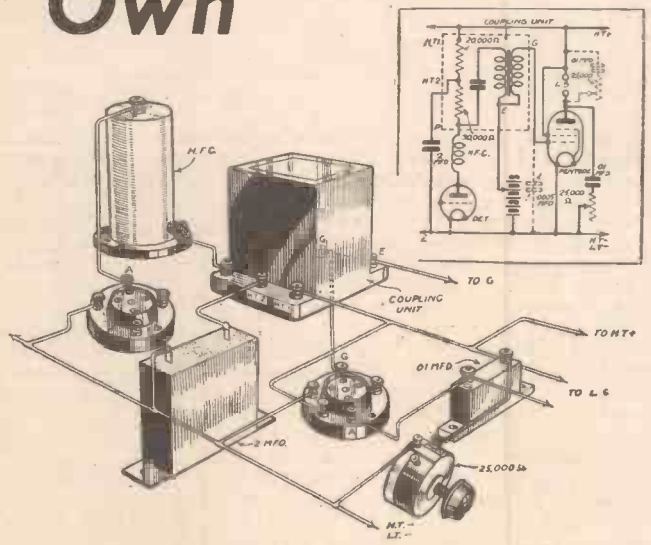


Fig. 1.—The circuit for a pentode output valve. Three different forms of tone correction are shown.

WE have now discussed in fair detail the design of the H.F. and detector stages of the receiver and have arrived at the low-frequency amplifier. It is generally considered that this part of the set is so straightforward that it is impossible to go wrong. When dealing with the simplest type of amplifier using only a single valve there may be a good deal of truth in this, but when quality reproduction is an important factor, and when a fairly high output is required, the argument certainly does not hold good.

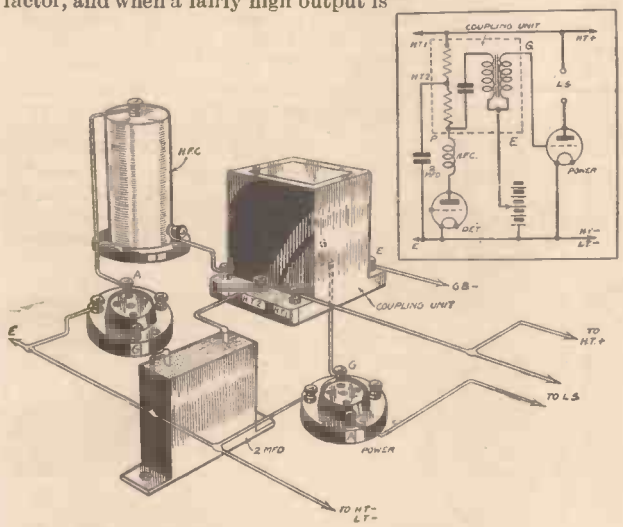


Fig. 2.—The simplest form of L.F. stage—using a small-power valve. Tone correction is unnecessary.

The Output Required

In the first place we will assume that the receiver being considered is battery-operated, that an undistorted output of about 500 milliwatts is required, and that economy of running is considered as important. We are then almost compelled to use a high-efficiency pentode, such as the Cossor 220 H.P.T., and this must be fed by means of a good low-frequency transformer or parallel-feed unit providing a step-up ratio of not less than 5 to 1. The latter is generally to be preferred, and we have the circuit shown in Fig. 1; the coupling unit illustrated is not of any particular make, but the connections apply to all the better-known units on the market. It will be seen that the tapped resistance included in the unit is employed for both coupling and decoupling, a 2-mfd. fixed condenser being joined between the tapping on the resistance and earth. This arrangement is very satisfactory for use in conjunction with almost any general-purpose or L-type valve having an impedance up to about 15,000 ohms. If power-grid detection were being used, however, it would be better to feed an ordinary transformer by means of a power-grid choke, as explained two weeks ago.

Tone Control

It is well known that all pentode valves have a tendency to give prominence to the higher notes, and for this reason it is usual to include some form of tone control. The usual arrangement is to connect a .01 mfd. fixed resistance in series with a 25,000-ohm variable resistance between the speaker terminals, as shown in broken lines. The same effect is obtained by connecting these components between the anode of the valve and the earth line (shown in full lines) and this has the advantage that the resistance is isolated from the high-tension supply—a definite improvement when the set is operated from an eliminator. An entirely different system is to control the tone in the grid circuit of the valve by connecting a .0005-mfd. variable or pre-set condenser between the secondary terminals of the L.F. transformer, as is also shown in broken lines. The result of this method is practically the same as that given by the others, but not usually quite so good, since the others have a tendency to equalise the anode load at various frequencies.

The Effect of H.T. Voltage Variation

In the circuit shown grid bias is obtained from a battery, and for 120 volts H.T. a voltage of approximately 4.5 is required. Incidentally, it should be made quite clear that the 500-milliwatts output, at which the 220 H.P.T. is rated, is obtained only when the H.T. voltage is 150 and the G.B. voltage 4.5, 150 volts also being applied to the screening grid. Thus, if any of these figures are changed the output will be affected; increasing the G.B. voltage or reducing the H.T. (principally that to the screening grid) has the effect of reducing the output. Most set-users employ a 120-volt H.T. battery, and when that is done with the valve in question the available output may be taken as approximately 400 milliwatts.

The anode-current plus screen-current consumption of the valve mentioned, and working with 120 volts H.T., is about 7.5 milliamps., but when it is proposed to use a super-capacity battery, an H.T. accumulator,

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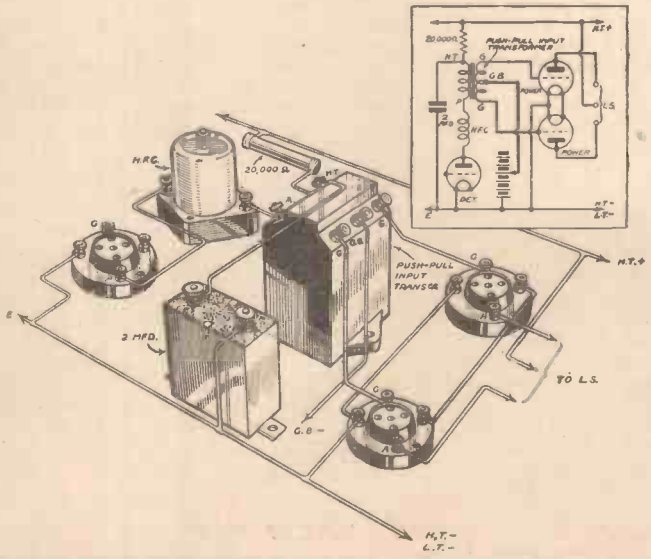


Fig. 3.—A push-pull circuit employing a pair of power triodes. Direct transformer coupling is used since most push-pull input transformers are designed to carry a fairly high primary current.

(Continued from previous page)

or an eliminator there will be a greater current available, in which case an output up to about 1,000 milliwatts may be obtained by using a valve such as the 230 P.T. (Cossor), or Pen. 220A (Mazda) in the same circuit. The total H.T. consumption of these valves is about 15 and 18 milliamps respectively.

Up to 300 Milliwatts

When a smaller output than 500 milliwatts is required a triode valve is to be preferred, when up to some 300 milliwatts can be obtained for a current consumption of about 12 milliamps by using a valve such as the Mullard PM202 or the Mazda P220A. Still smaller outputs are to be obtained (up to about 150 milliwatts) for a current consumption of as little as 5 milliamps by using a high-amplification small triode such as the Mullard P.M.2A, the Mazda P220, or the Hivac P220, in each case using the circuit shown in Fig. 2. To-day, however, it is rare that the listener is content with an output of anything less than 250 milliwatts, so that the valves last mentioned are generally more suitable for use in the first stage of a two-stage L.F. amplifier, or in the driver stage of a Class B amplifier.

The advantage of using a single triode L.F. amplifier is that it gives better quality reproduction without the use of a tone control, and without the need for such great care in making accurate adjustments of G.B. and H.T. voltages.

High Quality With Push-pull

We can now consider the position when an output in excess of, say, 300 milliwatts is required, and when quality of reproduction is the first requirement. The pentode will for the moment be ruled out because it does not provide *quite* the same degree of fidelity as is given by triodes. We might use a single super-power valve in a circuit like that shown in Fig. 2, or we may employ a push-pull stage. The latter is always to be preferred because it tends to balance out any distortion which might possibly appear when using one valve by itself, but it is more costly with regard to the components required. On the other hand, the H.T. current consumption can generally be taken as being less than that of a single super-power valve providing the same output. One reason for this is that a push-pull stage does not merely give twice the output of one of the valves used, as is generally thought and to be expected, but almost two and a half times the output. For example, the Cossor 220 P.A. (a high-amplification triode) is rated to give a maximum of 180 milliwatts undistorted output, but two of these valves in push-pull can be made to provide about 450 milliwatts. In the same way, a pair of Mazda P220A.s, each rated at 350 milliwatts, will give very nearly 1,000 milliwatts in a push-pull stage, arranged as shown in Fig. 3.

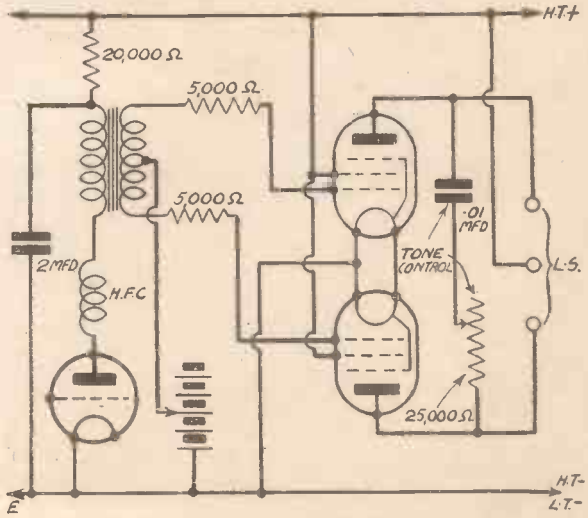


Fig. 4.—A circuit similar to that shown in Fig. 3, but using two pentode valves in push-pull. "Stopper" resistors are included in the pentode grid circuits to prevent parasitic oscillation.

The Economics of the Question

When using any of the valves mentioned—or others of similar types—in push-pull it is necessary that the H.T. current available for operating them should be between 20 and 30 milliamps, which nearly always means that an H.T. accumulator or a mains unit must be used to operate the set. At the same time an excellent high-quality output can be obtained for a moderate current consumption by using two pentodes of the high-amplification type in push-pull, as shown in Fig. 4. Tone control is still required, the condenser and variable resistance being connected as shown, but due to the special benefits of push-pull the quality obtained is generally as good as that from two triodes—at least when using modern valves. As an example of what can be obtained from an amplifier like that shown in Fig. 4 we might assume the use of a pair of Cossor 220 H.P.T. valves, fed from H.T. supply of 120 volts. The maximum undistorted output of each of these is, say, 400 milliwatts, so that the total output may be taken as about 1,000 milliwatts. The combined anode and screening-grid current of the valves is approximately 15 milliamps, or very slightly more than the consumption of a single pentode capable of providing the same output, whilst the results are definitely superior. From this it will be appreciated that the extra cost of components is easily justified.

Automatic Grid Bias

In all of the circuits so far given it has been assumed that grid bias was to be obtained from a battery, but it is actually far better to get it automatically, for then the bias is always kept at the right figure for the state of the H.T. supply unit. In other words, as the H.T. battery runs down the G.B. voltage is reduced in proportion. This matter need not be explained in detail here for it was fully explained in the article entitled "The Experimenters Explain," which appeared in the issues of PRACTICAL AND AMATEUR WIRELESS dated June 1st and June 8th, 1935. What we do need to consider is the application of automatic bias in the circuits previously discussed. The connections suitable for all the circuits described are given in Fig. 5. It will be seen that a fixed resistance, shunted by a 25-mfd. electrolytic condenser, is joined in series between the H.T.—lead and the L.T.—connection of the set. The value of the resistance must be such that it will provide a voltage drop equivalent to the required bias, and this value can easily be found by the application of the well-known formula: Resistance (ohms) equals voltage required divided by the current (m.a.) and multiplied by 1,000. In this case it must be remembered that the current passing through the resistance is not only that of the output valve(s), but that taken by all the valves in the set. Thus, if the output valve takes 10 m.a. and the other valves take 8 m.a. between them, the required bias voltage being 4.5 volts, the resistance value is 4.5/18 times 1,000, or 250 ohms. Generally speaking, automatic bias is not satisfactory when variable-mu amplification is used in the H.F. stage. The reason for this was explained in the article referred to above.

Component Arrangement

We have so far touched only briefly on the various types of output circuit, but we have at least dealt with those arrangements which are most popular and which are most widely used. In later articles, however, we will show how other circuits can be devised for special purposes, using those already considered as basic designs.

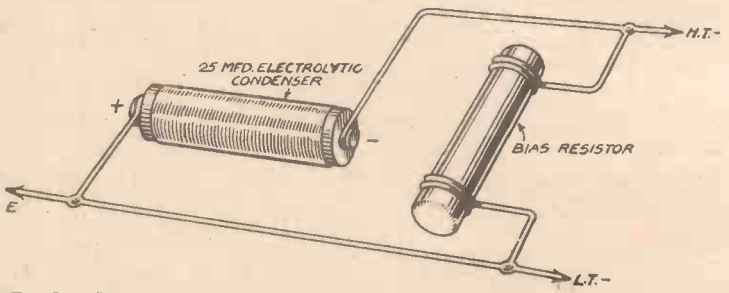


Fig. 5.—Showing the simple connections for obtaining automatic grid bias in any of the circuits described.

J. B. Airplane Dial

STATION selection has to be carried out on practically every receiver by means of a moving pointer, and it is obvious that this operation is made simpler where a very large scale is provided, and small movements of the pointer are more easily observed. There have been many different types of scale and pointer produced for the home-constructor, and the latest Jackson Bros. product, which is illustrated below, has many advantages over the usual dial. As may be seen, the scale is completely circular, whilst the pointer is double-ended. The scale is 3¼ins. in diameter and the total length of the pointer is 2¾ins. The drive to the pointer is transmitted from a slow-motion device of the usual type through the medium of two sprocket wheels and a length of chain, and is positively free from backlash or slackness. The scale is marked in two ranges, from 200 to 550, and from 800 to 2,000 metres, and thus one has to use the appropriate end of the pointer when tuning. A double lamp-holder is fitted at the rear and the height of the entire unit is adjustable through the mounting bracket, which is slotted and permits of a vertical movement of half an inch. At its lowest setting the condenser spindle would be 1¾ins. from the baseboard, and the dial could thus be employed with practically any modern baseboard-mounting type of condenser. The dial was tested on a single condenser of the old pattern with a heavy loosely-fitting moving section, but even when this was at right angles the dial could be set to a very fine adjustment without the weight of the vanes having any effect whatever, and on a modern four-gang condenser, which has rather a stiff movement, there was not the slightest difficulty in turning the condenser. A glass window is provided with the dial, and the escutcheon may be obtained in chromium, oxidised silver, or bronze. The price is 5s. 9d.

The new J.B. Airplane dial.

High Voltage T.M.C. Condensers

A NEW range of T.M.C. condensers is now available and these are of the high-voltage type, rendering them suitable for television apparatus or high-power amplifiers, etc. An 8 mfd. unit with a D.C. test voltage of 2,000 and designed for 750 volt working is available at 27s. 6d., and there are five values suitable for 1,000 volt working. These are obtainable in .1, .25, .5, 1, and 2 mfd. capacities and cost from 4s. 6d. to 11s., according to capacity. A similar range is obtainable for 1,500-volt working, and these have been tested on 4,500 volts and cost up to 26s. according to capacity.

IMPRESSIONS ON THE WAX

By T. ONEARM

Murder on the Wax

AN impression of the play "Ten Minute Alibi," which had such a long and successful run at the Phœnix Theatre, London, has been recorded by "His Master's Voice" on *H.M.V. C*2771. This record is sure to evoke great interest, as it contains the whole essence of the play and is an ideal disc for amusing guests at a party. It is full of thrills, every sound from the lifting of a telephone to the fall of the body being faithfully reproduced.

Brilliant Orchestral Recording

STOKOWSKI and the Philadelphia Orchestra playing "Scheherazade," the famous Oriental work composed by Rimsky-Korsakov, has now been recorded for "His Master's Voice" in its entirety on *H.M.V. DB*2522-7. Every collector will want to hear this superb set of records, as Stokowski has really excelled himself in his treatment of Rimsky-Korsakov's great work.

Users of "His Master's Voice" Auto-radiograms will be glad to know that a specially coupled edition of these records is available so that it is possible to listen to the whole work with only one break.

John McCormack, the famous Irish-born tenor, contributes this month to the "His Master's Voice" Catalogue with two beautiful songs entitled "Baby Aroon" and "When the Children say their Prayers," on *H.M.V. DA*1425. John McCormack's voice has never been heard to better advantage than in these two songs. Something gentle and wistful about his singing makes still more attractive these already delightful pieces.

The Boy Who Sang Before the Queen

MASTER JAMES PHELAN, the boy chorister who was the soloist at the Jubilee Service in Hyde Park, and who had the honour of singing before H.M. the Queen at the Old English Fair held in the precincts of Westminster Abbey, has just recorded for "His Master's Voice" "Ave Maria" (Schubert) on *H.M.V. C*2766. This is one of the finest boy soprano records that has been made for some time, for James Phelan's enunciation and the pure tone of his voice are delightful to hear.

Peter Dawson Sings a Song from "Sweet Music"

"GOOD Green Acres of Home" is the title of an inspiring song from the film "Sweet Music," sung by Peter Dawson on *H.M.V. B*8353. On the other side is "The Strong go on." Both songs are sung in that wonderful rolling baritone voice which everyone knows and loves so much.

All the hits from the films "Roberta" and "Sweet Adeline" have been recorded by the New Mayfair Orchestra on *H.M.V. C*2772. A few of the well-known tunes to be found on this record are: "Lovely to look at," "Let's Begin," "I won't Dance," "Why was I born," and "Lonely feet."

Dance Records

THIS month's dance music contains a greater number of hits than ever before. Jack Hylton and his Orchestra have made three snappy records which are going to be "best sellers." They are: "I won't dance" and "Lovely to look at," both from the film "Roberta," on *H.M.V. DB*200; "Love me for ever," from the film "On Wings of Song," and "South American Joe," the number which has become so popular lately, on *H.M.V. BD*203. The other record is "Footloose and Fancy Free" and "I'll never say 'Never again' again," on *H.M.V. BD*204. An especially good record is that of Eddie Duchin and his Orchestra playing "It's an old Southern Custom" and "According to the Moonlight," on *H.M.V. BD*199. Both these tunes are from the film "George White's Scandals of 1935."

Ray Noble, who is scoring such a brilliant success in America, has made a record for "His Master's Voice" of "Allah's Holiday" and a new arrangement of "El Relicario," the well-known paso-doble, on *H.M.V. BD*173.

This month's record for hot rhythm fans is "Gotta Go!" and "My! oh, My!" played by Eddie South and his Orchestra, on *H.M.V. BD*193. This record contains some very good violin and guitar effects and a snappily sung vocal refrain by Eddie South.

LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.

All letters must be accompanied by the name and address of the sender (not necessarily for publication).

An S.W. Log from Lincoln

SIR,—As I have been a reader of PRACTICAL AND AMATEUR WIRELESS since No. 1, and also a short-wave fan since 1927, I have been interested in reading the reports sent in by readers of short-wave amateur transmissions. As I have not seen a report from this district, I submit mine for Sunday, August 18th.

On 40 metres.—G6SR, G2SC, G2PX, G5BS, G6DH, G2MV, G5GI, G5GC, G6XQ, G6YU, G5TO, G2ZP, G6DL, G2LU, G5YY, G5LC, G2IP, G2IL, G5GR, G5GL, G6VF, G6UI, G6LS, G5PP, PAODX, PAOMQ.

On 20 metres.—W1AJZ, W3HFS, W2BCR, W2AYY, W3DQ, W3MD, W1AZZ, W9DIF, W1HTA, W1AJA, W1DNL, VE1FE, F8DR, and 8YB (Cuba). The set is a screen-grid detector and pentode output. The aerial is 66ft. (outdoors), and all stations were received on a moving-coil speaker.—A. E. ROBINSON (Lincoln).

Amateur Call Signs : Transmitting Circuits

SIR,—With reference to your correspondents R. Harvey and R. S. Houghton, whose letters are published in PRACTICAL AND AMATEUR WIRELESS for August 17th, I note their logs of amateurs heard on 40 metres, and would like to point out one or two errors. In Mr. Harvey's log there is one call sign G2AZC. This is not a genuine call sign, as English transmitters are only issued with two letters after the numeral. Three letters are issued to "artificial aerial" transmitters, who have no right to be "on the air." In Mr. Houghton's list there is FATIG. I think this more likely to be F8TIG. ORK3 is, as far as I am aware, not an official call sign. I append a log of DX stations I have heard recently.

On 20 and 40 metres, receiver o-v-pen.—PY1AW (Brazil), W1DUR, W8OKC, W3FJN, W1HQN, W1IAS, W1DZE, LU1EP (Argentine), CT3AB (Azores), VS1AG, W3HN, W3FJU, W1IDL, W4ADS, W4ACV, W9FTH, W3EZN, W8IWI, W1DBI, W8IMR, W8MYI, W2RPT, W9JL, W2DRR, W2GRG, W2HAY, VE4FA (Canada). All W's are American. All these stations have been heard during the last few days.

Referring to your correspondents who require transmitting circuits. I suggest that if they are interested in transmitting and transmitters they should join the Radio Society of Great Britain, who issue a magazine to their members monthly. This book is packed with hints and details concerning transmitting, etc. I disagree with the idea of publishing transmitting circuits in PRACTICAL AND AMATEUR WIRELESS, as this would probably encourage illegal transmitting, a thing the aforementioned society are doing their utmost to stamp out.—R. J. LEE (BRS1173) (Heathfield, Sussex).

A Good Amateur Log : Transmitting Data

SIR,—The following log of amateur transmitters working 'phones received on 40m. on Sunday, August 18th, between 11.15 and 13.15 B.S.T. may be of interest to other readers: G5KA, G6DL, G6XQ, G2LU, G2MV, G6SR, G5YY, G5YI, G2AV, G2FC, G2IX, G5BF, G6FU, G5FY, G2AX, G2IL, G2IP, GI5FZ (R4, QSA4); G5ML, G6WR, F8IA, PAOFB (R6-7, QSA5). From 20.15 onwards the following were logged: G6UI, G5CG, G5GS, G5WZ, G2QH (R9, QSA5); G5CY, G2AV, G5US, G6IY, G6KV, G2FC, F3GB, PAOFB, ON4OK. On Monday evening, August 19th, I logged, on 40m.: F8QR, F3DA, F3LK, F3DS, F3KQ, F8CF (Algeria), G6UI, G5PT, EA1AM, EA1BT, CT1LP. Others well heard here include: PAONFD, PAODK, ON4MJ, ON4AP, ON4RR, EA5LE, CT1AD, F8DM, F3LW, F8QL, F8OY, F8AG, OZ4Q, G6GO, G5PP, G5LC, G2RF, G5OV, G5HB, G6QZ. My set is a home-made det. and separate reactor, which arrangement gives very smooth reaction.

I notice in a recent issue of PRACTICAL AND AMATEUR WIRELESS that J. M. Davie suggests that readers keen on transmitting should join the R.S.G.B. In my case, living in the country, I would not be able to attend many meetings or meet many members. Also the T. and R. Bulletin does not cater for beginners. I think the readers concerned would much prefer to see a transmitting section in their PRACTICAL AND AMATEUR WIRELESS that would give them the necessary knowledge right from the beginning. When a subject is too large to be dealt with in an article, suitable books could be recommended.

I notice that your reader F. N. Bedwell lives at Stratford, about sixteen miles from here, and I would very much like to get in touch with him. I would mention, however, that I am only fifteen years old—but I have been a short-wave fan for three years.—J. T. PARKER (Broadway, Worcs.).

CUT THIS OUT EACH WEEK.

Do you know

—THAT a new principle in coil construction is likely to have remarkable influences on receiver design in the future.
—THAT valve design is also likely to change in view of certain principles which have recently been discovered.
—THAT the input fuse on a mains receiver should always be of lower rating than the mains fuse.
—THAT the value of an inductance varies with frequency.
—THAT an ordinary moving-coil meter cannot be used for measuring A.C. values.
—THAT the fumes from accumulators can cause serious corrosion on copper and other metals.
—THAT the above point should be borne in mind when designing a compact portable receiver.
—THAT the newly-introduced Midget valves are shortly to be made with valve pins on the base instead of the small contacts.

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

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

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

N. S. (Stoke-on-Trent). We regret that we have not published constructional details of a mains-operated H.F. unit suitable for addition to your receiver. Your suggestion will be given careful consideration.

F. M. (Wimbledon). The brilliancy of the glow will depend on the current which the battery is capable of supplying. The normal small dry H.T. batteries are only designed to supply a current of approximately 10 m.a. and therefore if a bulb requiring .1 amp. is connected across a battery of this type maximum brilliancy must not be expected. The drain from a grid-bias battery (unless a potentiometer is connected across it) is negligible, and therefore if the battery registers full voltage it may be considered satisfactory.

T. E. J. (Keighley). The price of the parts required for your receiver, including valves and speaker, is approximately £7. The kit is obtainable from Peto-Scott, Ltd.

H. W. L. (Arundel). The trouble you are experiencing indicates a coil defect. There is also a possibility that the valve is not up to standard or that the aerial is too long.

E. T. P. (Worcester). We regret that we have been unable to trace a short-wave club in your locality. We suggest that you communicate with The Radio Society of Gt. Britain, 53, Victoria St., London, S.W.1.

W. H. (Wembley). The transformer output required for feeding the H.T.8 is 175 to 200 volts at 200 m.a., if the rectifier is connected on the voltage doubler principle, or 375 volts at 90 m.a. if wired on the half-wave principle. Your transformer may be used if half-wave rectification is employed. If the valves require approximately 230 volts at 30 m.a. a 10,000 ohms 7-watt dissipating resistance should be connected across the output circuit of the rectifier.

K. W. K. (New Malden). The two sections of the pentagrid valve are coupled inside the valve by means of the common electron stream and therefore it is said that the valve is electron-coupled. Most other types of frequency changers have to be provided with external coupling coils.

A. C. (Rhyl). Your valve may be used as a half-waver, but the maximum output load must not exceed 60 m.a. The output voltage obtainable at this amperage will be slightly lower than the rated maximum output.

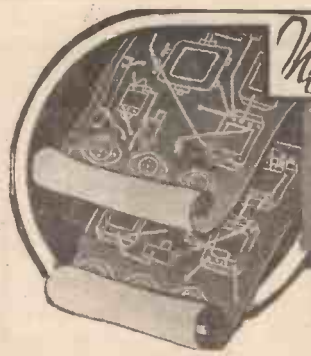
T. J. (Birkenhead). If the total current consumption of your receiver is approximately 20 m.a. and the mains voltage is between 220 and 250 volts, a 5,000 ohms resistance having a wattage rating of 2 watts or higher may be used.

R. G. C. (Shrewsbury). The Holiday Portable will probably meet with your requirements. The blueprint of this, A.W.393, may be obtained for 1s. 6d.

L. F. T. (Malta). We suggest that you use a stranded copper aerial wire approximately 40ft. long, placed as high as possible and as clear as possible from walls. It is permissible to use a separate aerial approximately 25ft. long for short-wave reception.

C. O. L. (Dublin). We suggest that you rotate the I.F. transformer screws until they are nearly full out (anti-clockwise), and the hexagonal nuts until nearly full in (clockwise). Adjust the C3 trimmer to a setting between a quarter and half a turn from the full in position (clockwise), and then adjust C1 and C2 trimmers until maximum volume is obtained.

W. P. (Nottingham). We regret that we have not published a receiver design incorporating the coil unit mentioned in your letter.



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

Where date of issue is omitted that particular number is out of print.

These blueprints are full-size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—"Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7½d., and "Wireless Magazine" at 1/3, post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS.

Blueprints, 1s. each	Date of Issue.	No. of B/print.
Long-Range Express Three	—	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	15.10.32	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Selectone Battery Three	14.1.33	PW10
Fury Four	—	PW11
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	4.3.33	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	—	PW22
Double Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.22	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	—	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	3.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	—	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47
Hall-Mark Cadet	23.3.35	PW48
Short-Wave Converter-Adapter	23.2.35	PW48A
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	11.5.35	PW50
Genet Midget Three	*June* '35	PM1
Cameo Midget Three	8.6.35	PW51
F. J. Camm's 2-valve Superhet	13.7.35	PW52

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	—	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.		
B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449
Two-valvers: Blueprints, 1s. each.		
Melody Ranger Two (D. Trans)	—	AW388
Full-volume Two (SG, Det, Pen).	17.6.33	AW392
Iron-core Two (D, Trans)	—	AW395
Iron-core Two (D, Q.P.P.)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
Family Two (D, Trans)	—	WM278
Three-valvers: Blueprints, 1s. each.		
8 Radiogram (D, RC, Trans)	—	AW343
P.T.P. Three (Pentode-Triode-Pentode)	*June* '35	WM389
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF Pen, D, Pen)	14.4.34	AW431
£5 5s. Three: De-Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.B Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378
Four-valvers: Blueprints, 1s. 6d. each.		
65/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D. RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four	*Mar.* '35	WM384
Five-valvers: Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (2SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379

Mains operated.

Two-valvers: Blueprints, 1s. each.		
Consoelectric Two (D. Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Three-valvers: Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D. Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	*Nov.* '34	WM374
Four-valvers: Blueprints, 1s. 6d. each.		
A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	—	AW380
A.C./D.C. Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C Quadradyne (2 SG, D, Trans) A.C.	—	WM379
All Metal Four (2 SG, D, Pen)	*July* '33	WM329
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.		
1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375
Mains Sets: Blueprints, 1s. 6d. each.		
1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super A.C.	—	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apl.* '35	WM385

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.		
General-purpose Portable (SG, D, RC, Trans)	—	AW351
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	—	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

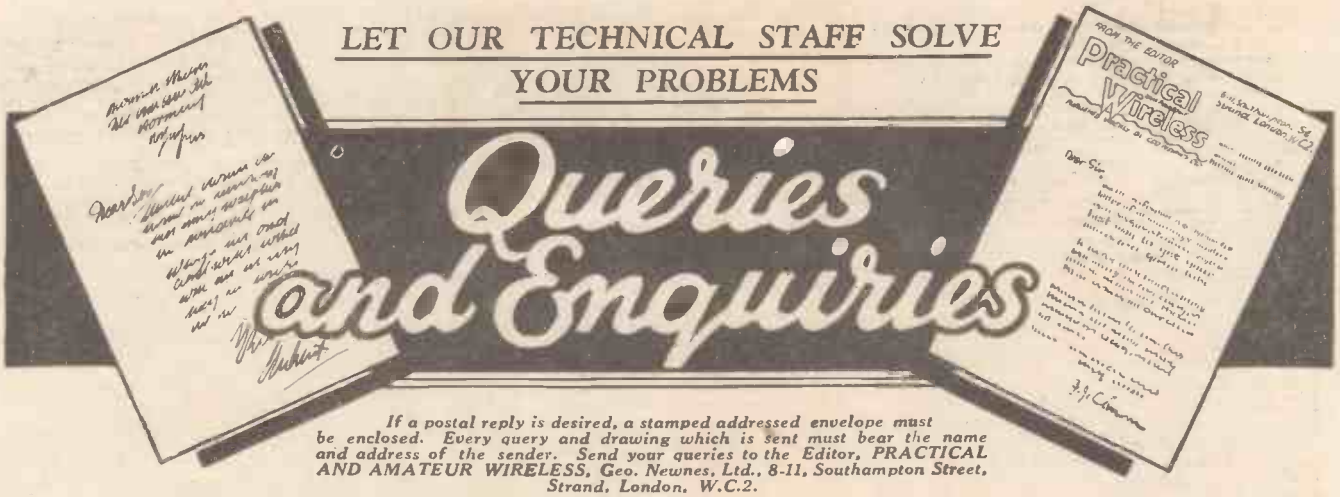
One-valvers: Blueprints, 1s. each.		
S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452
Two-valvers: Blueprints, 1s. each.		
Home-made Coil Two (D, Pen)	14.7.34	AW440
Three-valvers: Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenters' 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet, Converter	*Dec.* 1, '34	AW457
The Carrier Short-waver	*July* '35	WM390
Four-valvers: Blueprints, 1s. 6d. each.		
"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver	*Mar.* '35	WM383

Mains Operated.

Two-valvers: Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C/D.C.	*Aug.* '34	WM368
"W.M." Long-wave-Converter	*Jan.* '35	WM380
Three-valvers: Blueprints, 1s. each.		
Emigrator (SG, D, Pen), A.C.	—	WM352
Four-valvers: Blueprints, 1s. 6d. each.		
Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5, '35	AW462

MISCELLANEOUS.

Enthusiasts Power Amplifier (1/6)	*June* '36	WM387
Newstyle Short-wave Adaptor (1/-)	*June* '35	WM388



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

SPECIAL NOTE

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

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

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

L.F. Transformer Markings

"I have built a three-valve battery set and I wish to use an old transformer. I find, however, that the terminals of this component are not marked in the modern manner: the markings are IP, OP, IS, OS. Please tell me which of these correspond with the markings GB, G, HT, and P on my blueprint."—J. B. (Midhurst).

THE markings IP, OP, IS, and OS are abbreviations for Input Primary, Output Primary, Input Secondary, and Output Secondary. IP is equivalent to P, OP to HT, IS to GB and OS to G, but it may sometimes be found that best results will be obtained with the leads to terminals IS and OS reversed. If a whistle is experienced it is therefore suggested that this reversal be tried.

Speaker Matching

"I wish to substitute a pentode valve for my existing power valve in a battery operated three-valve receiver, but I find that the words 'For Power Output' are marked across the speaker transformer. As I am doubtful whether this speaker will work satisfactorily in conjunction with my new valve, I should like to have your advice on the matter."—W. W. N. (Bow, E.3.).

IF the pentode valve which you intend using is of the power type you will probably obtain quite satisfactory results from your existing speaker, but if the valve is an economy pentode (*e.g.*, 220 HPT, or Pen. 220) it will be necessary to use a tapped choke in the output circuit if best results are to be obtained. The end terminals of the tapped choke should be connected to the existing L.S. terminals, the centre terminal to one terminal of a 1 or 2 mfd. condenser, the other terminal of this condenser to one of the existing speaker leads, and the other speaker lead to H.T.– terminal. The Wearite type H.T.16 choke will be suitable.

Improving Sensitivity

"I have built a three-valve set with screen grid, detector, and pentode valves. I get good reception, but there are some stations which I cannot receive at good volume, and which I am keen to bring in. I should be pleased if you would let me know what modifications to make."—L. M. D. (Highgate).

IF the components in your existing H.F. stage are well screened, we think that the best procedure will be for you to add an extra H.F. valve. Constructional details of a reliable H.F. unit will be found in PRACTICAL WIRELESS No. 62. The volume of stations which are at present heard at moderate strength could also be increased by adding an L.F. stage. This should take the form of a resistance capacity coupled stage between the detector valve and the output stage, using a valve of the H.L. type. As the output valve is of the pentode type, it would be advisable to use a 500,000 ohms potentiometer as a grid leak for the H.L. valve in order that the input to this valve may be controlled.

Short-wave Adapter

"I have recently become very interested in short-wave reception and should like to know whether you have published details of a reliable short-wave adapter."—W. T. (Philadelphia).

CONSTRUCTIONAL details and the diagram of a reliable short-wave adapter-converter will be found in PRACTICAL AND AMATEUR WIRELESS, dated February 23rd, 1935. This may be used as an adapter in conjunction with a straight two or straight three receiver, or as a converter in conjunction with a set having one or more H.F. stages. It is suitable for battery or A.C. mains operation.

1936 Sonotone

"I have built the 1936 Sonotone but find that signals are very weak when the aerial lead is connected to the aerial terminal. When the aerial is transferred to the cap lead of the first H.F. pentode valve, however, reception is greatly improved and many stations can be picked up."—A. N. T. (Birmingham).

THE fact that signal strength increases when the aerial lead is transferred from the aerial terminal to the cap of the first valve indicates that there is a defect in the first H.F. stage. This may be due to incorrect wiring, of course, but if the wiring has been found correct the components connected to the first valve should be tested, especially the H.F. choke, first B.P.50 coil, and the first 210VPT valve.

Pick-up Connection

"I have a four-valve A.C. mains receiver which gives exceptionally good quality of reproduction on radio, but when I connect a pick-up between the grid and the cathode of the detector valve I cannot get faithful reproduction of gramophone records."—T. R. P. (Dundee).

AS you have connected the pick-up lead to the cathode of the detector valve, this valve is not biased, and therefore it cannot function very satisfactorily as an amplifier. The pick-up leads should be connected between the grid of the valve and the earth line of the set, and a bias resistance should be connected between the earth line and the valve cathode. The value of this resistance should be chosen in accordance with the valve manufacturer's instructions, and it is advisable to connect a condenser having a capacity of approximately 1 mfd. across it. Biasing will not be necessary for rectification, however, and therefore the grid should be joined between the grid and the cathode.

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

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Unless otherwise stated, all items are clearance, second-hand, or surplus lines, and radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

NEW RECEIVERS, COMPONENTS, ACCESSORIES, etc.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C.4 (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the following Manufacturers' Unused Goods at a Fraction of the Original Cost: all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad, carriage extra; orders under 5/- cannot be sent C.O.D.; please send 1½d. stamp for large new illustrated catalogue, also August bargain supplement.

SPECIAL Bargains for callers at our Clapham Branch where Summer Sale is now taking place.

WORLD Famous Continental Valve Manufacturer; mains types, 4/6 each, H.L., L., power; high and low magnification, screen grid; variable Mu screen grid; 1, 3, and 4 watt A.C. output, directly heated pentodes; V.H.P., D.D.T. Diode Tetrodes, 250 volt 60 m.a. full wave rectifiers; A.C. D.C. types, 20 volts, 0.18 amp. filaments; screen grid; variable Mu screen grid; H., H.L., power and pentodes.

THE following Types, 5/6 each; 350v. 120 m.a. full wave rectifiers, 500v., 120 m.a., full wave rectifiers, 2½ watt Indirectly heated pentodes.

2-VOLT H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable mu screened grid, 5- or 4-pin pentodes. H.F. Pen., V.M., H.F. Pen., 5/-.

THE following American Types, 4/6; 250, 210, 245, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 281. All other types, 6/6.

B.T.H. Moving Coil Speakers, matched pairs, 8in. 1,500 ohms. 7,500 ohms (1,500 speaker as choke 7,500 speaker in parallel with H.T. supply), with output transformer for pentode, 15/6 per pair; A.C. kit for pair, 12/6.

M.C. Multi-ratio output transformers, 2/6: 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6; 100 henry chokes, 2/6.

A LARGE Selection of Pedestal, table and radiogram cabinets at a fraction of original cost.

BLUE-SPOT 29P.M., P.M. Moving Coil multi-ratio transformers, 15/-; handles 4 watts. Sonochorde ditto. Ideal for Battery Sets.

ELIMINATOR kits, condensers, resistances and diagrams, 120v. 20 m.a., 20/-; Trickle charger, 8/- extra, 150v. 30 m.a. with 4v. 2-4amp. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps, with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a. with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

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(Continued at top of column three)

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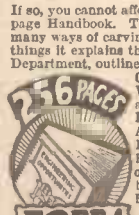

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(Continued from foot of column one)

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ROUND *the* WORLD *of* WIRELESS

Microphones at the Front

THE principal U.S.A. radio organisations, in the event of war between Italy and Abyssinia, propose to attempt a series of relays from the seat of conflict. If permission is obtained from the belligerents, running commentaries on engagements would be wirelessed through Addis Ababa, Paris, and London, for transmission to the U.S.A. An alternative route from the Italian lines would be *via* Asmara (Eritrea) and Rome, thence *via* Rugby or Zeesen direct to the American telephone network. Although practicable, it is a moot question whether such transmissions will be carried out.

British Adviser for Palestine Radio

FOR the establishment of the new Jerusalem broadcasting service, Mr. R. A. Rendall, West Regional Programme Director at the B.B.C. Bristol offices, has been lent to the Government of Palestine. The station is expected to start working in the course of the next few months.

The Sleeper Awakened

IN the United States a business concern has placed on the market an instrument which the inventors guarantee will cure snoring! It consists of a "mike," valve amplifier, and loud-speaker. By the medium of the microphone, the slightest snore is converted into a noise almost approximating the roar of an angry lion—and if that does not awaken the sleeper and possibly his neighbours, the case must be a desperate one.

Norway's Proposed "Ultra-short" Network

IN view of the mountainous character of the country, the laying of telephone landlines is an extensive matter. The authorities are now considering a scheme for linking up distant and lonely districts by means of 12-watt telephony transmitters working on 1.7 metres. Experiments will shortly be carried out by the Post Office engineers.

Medical Advice from Broadcasting Stations

IT is reported that the Italian Government has entrusted the shipping medical service to the E.I.A.R., and in future all inquiries of this nature, whether received by day or night, will be replied to, either by radio-telephony or telegraphy, through the Rome medium- or short-wave stations on any channel desired.

North Regional Interval Signal

THE B.B.C. is shortly adopting a distinctive interval signal for the broadcasts from the North Regional station. Listeners will hear a gramophone record consisting of a blend of the bells rung at York Minster, and snatches of the North Country melody, "The Oak and the Ash."

On Other Pages

More Police Radio

THROUGHOUT Great Britain steps are being taken for the linking up by radio of the individual police organisations. In addition to the station which is being erected in the Metropolitan Police area, a transmitter is also to be built at Heaton Park, Manchester. In the near future a wireless chain will be established from one end of the country to the other.

Radio Nice P.T.T. Calling

THE new French high-power transmitter at La Brague, near Nice, can now be heard testing in the early morning on 253.2 metres (1,185 kc/s). It is expected that it will be brought into regular operation next October, although so far no definite date for its official opening has been fixed. Radio Marseilles, another powerful station in the State Broadcasting Network, will be ready by December, 1935.

Goldfish to the Rescue

IN the past, owing to the growth of moss and weeds in the tanks supplying water for the cooling of large valves in broadcasting transmitters, stations, at times, have suffered breakdowns. To remedy this trouble goldfish are now kept in the tanks, and through their presence the water is kept free of such impurities.

Music Dramas for Midland Listeners

RUTLAND BOUGHTON'S music dramas were the subject of a Midland programme in the spring, when the composer himself conducted. A Midland Chamber Concert on September 22nd is to be devoted to other aspects of his work—the sonata for violin and piano, for which the theme is drawn from "Also Sprach Zarathustra," the variations for violin and pianoforte on a ground by Purcell, the two folk songs arranged for contralto, baritone, violin and pianoforte, and some of his songs, including two inspired by the Midland scene. Muriel Sotham will be the contralto, and Arthur Cranmer the baritone, Eda Kersey the violinist, and Leila Britton the pianist. Rutland Boughton is best known as the founder of the Glastonbury Festival, where some of his music dramas were given. Before that he was for seven years at the Birmingham Midland Institute teaching singing under Bantock. His home now is in Gloucestershire at Newent.

"Veronique"

IN the autumn of last year listeners heard André Messager's musical play, "Monsieur Beaucaire," and this autumn the same composer's even more famous light operetta, "Veronique," will be heard in the National programme on October 3rd, and will be repeated for Regional listeners the following evening. The play was first produced in 1904, and the older generation of playgoers will recall the successes scored by such famous artists as George Graves, Fred Emery, Maudie Darrell, Rosina Brandram, and Lulu Valli.. A slightly shortened and condensed version of the original libretto—by A. Van Loo and G. Duval—has been specially prepared for the microphone by Gordon McConnel.

ROUND the WORLD of WIRELESS (Continued)

"Happening Along"

THE fourth talk in the series "Happening Along" will be given by J. M. N. Jeffries for Western listeners on September 28th. On this occasion he takes Wales as the centre of his expedition, but, as in the earlier talks, he does not propose to tie himself down strictly to the locality.

Brass Band Festival

ON September 28th Northern listeners will hear an eye-witness account, by Ernest E. Milner, of the National Brass Band Festival at the Crystal Palace. This account is to be given from the bandsman's point of view, and will tell the story of the contest from the time that the various bands begin their rehearsals. Listeners will be provided with an interesting sidelight on the "backstage" preparations for a competition of this kind, and will hear how the bandsman travels to and from the Crystal Palace for the occasion.

"Yankee Doodle"

DURING the evening of September 25th "Yankee Doodle," which Martyn Webster presented in the spring, is to be revived, and it will be repeated in the "pool" programme the following afternoon. The original was notable as including the first complete broadcast performance of Gershwin's "American in Paris." The soloists are Marjorie Westbury, Geoffrey Dams, Oswald Rogers, and Jack Wilson (pianist); and Reginald Burston conducts the B.B.C. Midland Orchestra and Revue Orchestra. The numbers represent two strains in American music—that from the Plantations and that from Tin Pan Alley.

Russian Concert

A RUSSIAN concert, mainly consisting of works by contemporary composers, will be broadcast on September 19th. The Beethoven programme on September 20th consists of the overture "Coriolan," an aria from "Fidelio," sung by Laelia Finneberg, the violin concerto with Eda Kersey, who is well known to "Prom" audiences, as soloist, and the immortal Fifth Symphony. Dame Ethel Smyth's overture, "The Boatswain's Mate" is the first item on the programme on Saturday, September 21st. Haydn's Symphony No. 94 (the "Surprise") will also be given; and the other outstanding work which listeners will hear on this occasion is Rachmaninov's sparkling "Rhapsody on a Theme of Paganini," for pianoforte and orchestra. Moiseiwitsch will be the soloist.

"The Old Husking Bee"

IN presenting this novel broadcast in the National programme on October 2nd, Bill Campbell will introduce an innovation in radio entertainment. In this programme the Rocky Mountaineers, who have twice previously broadcast a backwoods entertainment from the Canadian Lumberjacks' Bunk House, will come down from the slopes of the mountains and take part with the homesteaders from the foothills in a barn dance in real Hill Billy style.

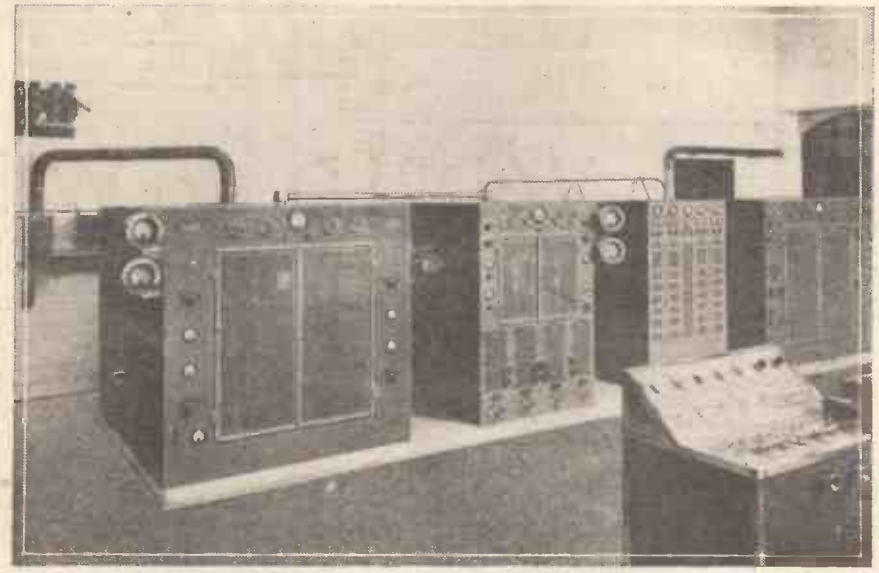
INTERESTING and TOPICAL PARAGRAPHS

High Power On Short Waves

IN order to improve the facilities for Italian vessels to keep in touch with their own country from all parts of the world, the Italian Ministry of Communications recently decided to increase the existing equipment at the wireless station at Coltano by the provision of a new Marconi type short-wave transmitter with a wave-range of 13-100 metres, and this has now been installed at Coltano for this service. The latest refinements of short-wave transmitting technique, particularly with regard to high quality of speech and constancy of the transmitted wave have been incorporated in this installation. The output of the transmitter to the aerial feeders is 56 kilowatts maximum on continuous-wave telegraphy and 35 kilowatts on telephony at 80 per cent. modulation; and it is, therefore, one of the most powerful of its kind in the world.

An important feature of the new installation at Coltano is the provision of four spot waves which can be selected practically instantaneously by means of a turntable mechanism which brings into circuit appropriate tuning inductances and condensers, so that a minimum of time is lost when conditions necessitate a change of wavelength. The illustration on this page shows the neat layout of the equipment.

A POWERFUL SHORT-WAVE TRANSMITTER



A Marconi high-power short-wave transmitter, for world-wide communication with ships at sea, installed at the Italian station at Coltano.

"Perseus and Andromeda"

THE next event in the Handel celebrations, which have played a big part in musical programme building this year, is the production by the B.B.C., on October 8th, of the first performance at any time of the opera "Perseus and Andromeda." The music of this opera, which will be heard by Regional listeners, is taken from the music written by Handel for the Pastiche "Jupiter in Argos," which, although intended for performance at the King's Theatre in May, 1739, was never given. The score has been arranged from an MS. in the possession of Mr. Newman Flower, the well-known Handel authority, and from a portion of Handel's autographed score in the Fitzwilliam Museum, Cambridge, with a new libretto written by Professor Albert G. Latham.

The Round Trip

ON September 25th, Northern listeners will hear a new type of radio play. It is called "The Round Trip," and has been written in collaboration with D. A. Stride, whose commentary on the Naval Review was heard recently, John Eccles, formerly Chief Officer in the Manchester Liners, now a marine surveyor, and Michael Reynolds, the author of "Famine in Lancashire" and "Peterloo." The play tells the story in sound of the voyage of the steamship *Montezuma* from the Manchester Docks to Alexandria and back.

SOLVE THIS!

PROBLEM No. 157.

Jackson had a powerful 5-valve super. on which he obtained excellent results. Owing to the large power available, and the fact that no H.F. volume control was fitted, he found it advisable to remove the aerial entirely for the reception of the local in order to avoid overloading. When in its most sensitive condition, he found that there was considerable noise due to some local electrical apparatus, and after some experiment found that by totally screening the receiver and the earth lead he could remove this interference, but when he removed the aerial for local reception, he could obtain no signals. The circuit had not been altered. Why was this? Three books will be awarded for the first three correct solutions opened. Envelopes must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 157 in the bottom left-hand corner, and must be posted to reach this office not later than the first post Monday, September 23rd, 1935.

Solution to Problem No. 156.

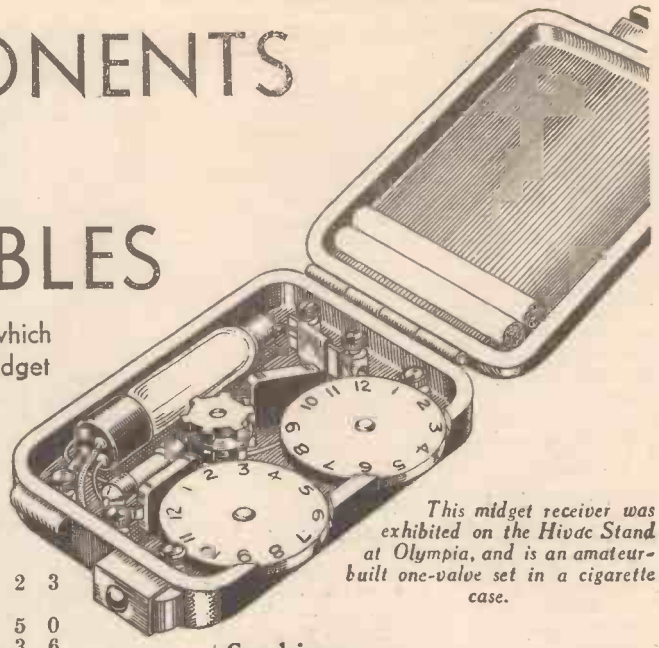
The smoothed output voltage from the 460 B.U. rectifier is approximately 500 volts, and therefore Cummings connected a high-value dropping resistance between the anode voltage supply point of the output valve and that of the three preceding valves. These three valves are of the indirectly-heated type, however, and therefore the voltage drop across the dropping resistance is practically zero during the heating-up period, and consequently the voltage across the first valve anode decoupling condenser is excessive for the first half-minute after switching on. Even though the output valve is of the directly-heated type, Cummings should have used an indirectly-heated rectifier or a delay switch.

The following three readers successfully solved Problem No. 155 and books are accordingly being forwarded to them:

W. Bone, 202, Uphall Road, Ilford, Essex.
J. D. H. Beckett, Heath Hey, Hooton-in-Wirrell, Cheshire.
D. L. Johnston, 64, Glisson Road, Cambridge.

MIDGET COMPONENTS *for* TINY PORTABLES

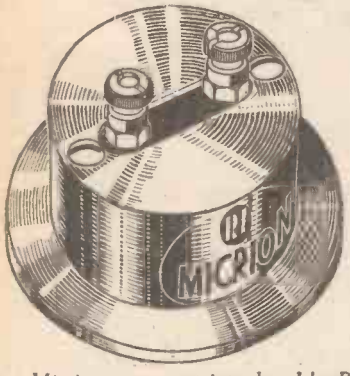
Details of Some of the Special Small Accessories which are now Available, and Particulars of Special Midget Receivers which have been Constructed



This midget receiver was exhibited on the Hivac Stand at Olympia, and is an amateur-built one-valve set in a cigarette case.

WITH the introduction of the Hivac Midget valves, a number of specially-made components have had to be introduced in order that full advantage could be taken of the minuteness of the valves and a receiver constructed which is in every respect a "Midget." For the benefit of our readers we give below a list of practically all the special small components which are now available to the home constructor in this connection, together with the prices. There are five valves available in the Hivac range, and these are as follow:—

	s.	d.
Type XSG—Screen grid ..	15	6
Type XL—Detector and L.F. amplifier	10	6
Type XD—Non-microphonic detector	12	6
Type XP—Power	12	6
Type XY—High efficiency output pentode	15	6



A new Micrion component introduced by Radio Instruments. This is an iron-cored H.F. choke, and is totally screened.

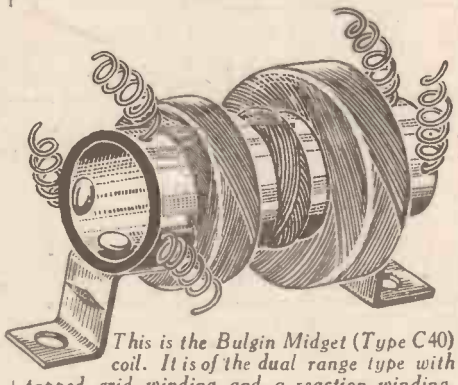
The following are the various components so far obtainable, and it will be seen that they are classified into groups, and the names of the manufacturers are given:—

Midget Coils:

British Television Supplies: Air-core coil 2 6
Bulgin: Air-core dual wave, type C40 .. .. 2 3
Formo: Iron-core coils from 5 0
Short-wave coils .. 3 6

Midget Variable Condensers:

Graham Farish: Litlos condenser (obtainable in log-mid line, differential or reaction) .. 2 0
Formo: Short-wave, .00016 .. 3 6



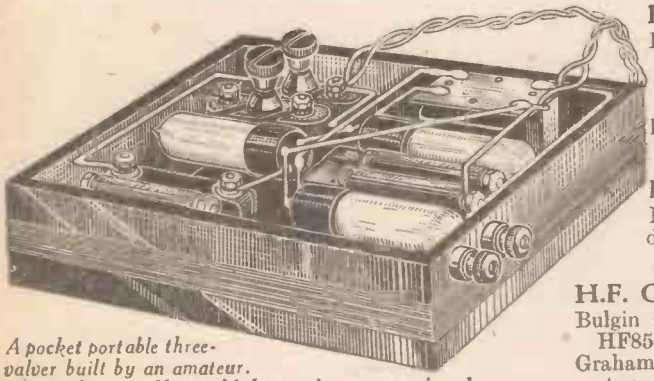
This is the Bulgin Midget (Type C40) coil. It is of the dual range type with tapped grid winding and a reaction winding.

Midget Fixed Condensers:

Bulgin: Tubular paper condensers, all capacities .. .. 10d. and 1s.
Graham Farish: Tubular condensers, .0001 to .25 .. from 1 0

Midget L.F. Transformers:

British Television Supplies .. 4 6
Bulgin: Type LF33 .. .. 4 0
Graham Farish: Max. parallel feed transformer 4 6



A pocket portable three-valver built by an amateur. Again the new Hivac Midget valves are employed, and the receiver gives a remarkable performance.

Resistances:

Bulgin: Non-inductive, 250 ohms to 5 megohms .. .. 6d.
Formo: One-watt resistances .. 10d.

Pre-set Condensers:

Formo: Formodensers (.0001 to .001 max.) .. 1 6

H.F. Chokes:

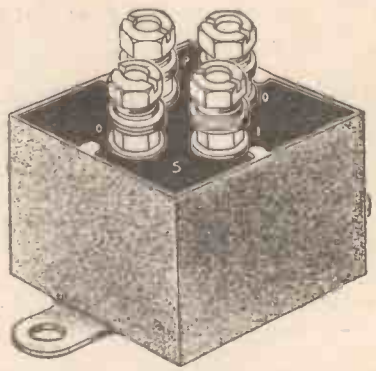
Bulgin: Midget, type HF85 .. .. .. 1 6
Graham Farish: Disc type 2 0
Radio Instruments .. 3 6

Sundries:

Miniature switches—Bulgin .. 4½d.
Socket strips: 2-way—Bulgin .. 4½d.
Socket strips: 2-way—Clix .. 4½d.
Valve-holders—Clix .. 10d. and 11d.
Grid leak—Graham Farish .. 11d.
Terminal mount—Graham Farish 6d.

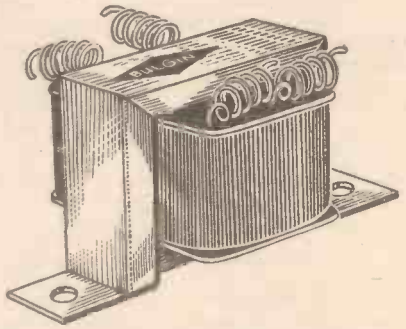
H.T. Batteries:

Drydex, Type X417 (1¼in. x 4⅝in. x 6 13/16in.), 70 volts + 1½ volts G.B. 7 9

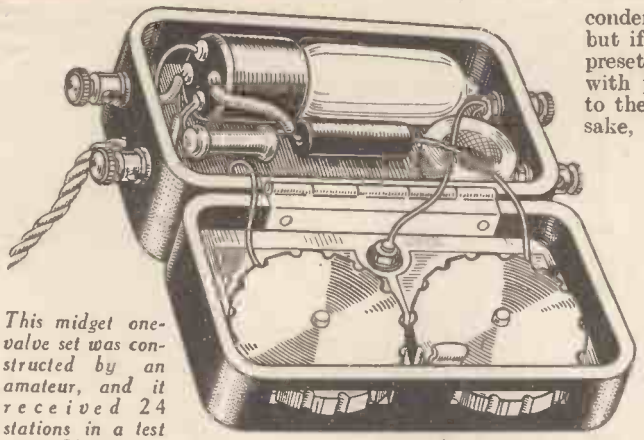


With the high primary inductance of 80 henries this midget L.F. transformer is very useful for a small receiver. It is a Sound Sales component and measures only 1¼in. x 1¼in. x 1⅛in.

Type X81 (1¾in. x 1in. x 5¾in.), 33 volts	3	9
Type X325 (1¾in. x 3½in. x 2in.), 45 volts	5	0



This is the Bulgin Type L.F.33 Transformer. This neat and efficient little component costs 4/-.



This midget one-valve set was constructed by an amateur, and it received 24 stations in a test at Olympia.

L.T. Accumulators :

Exide : Gel Cel 3 AH. Type PRA 3 (2¼in. x 1in. x 2¼in.) 7 0
Hercules : Type AX1-7 5 AH. (2⅝in. x 3¼in. x 1in.) 2 6
Hercules : Type AX2-10 10 AH. (2⅝in. x 3¼in. x 1in.) 4 6

Readers may also be interested in the following letter and illustrations on this page concerning a reader's receiver :—

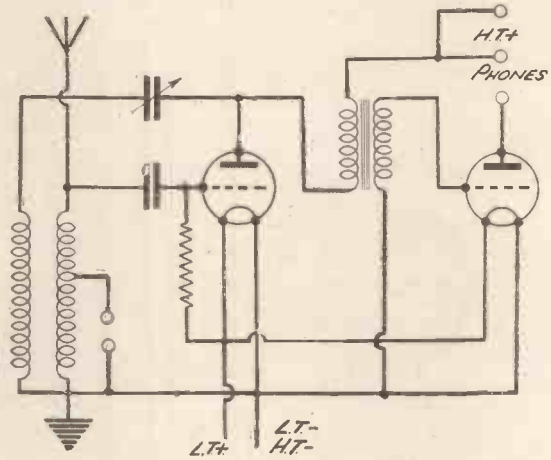
A good pair of headphones are essential for single-valve sets. This is a pair of light-weight phones made by National Radio Service. They cost 12/6 per pair.

SIR,—I enclose particulars and sketches of a midget receiver with which I have been experimenting. It is a two-valver, thus ensuring reception of two stations in most parts of the country, but it is built into a space of 2¼in. x 2¼in. x 3¼in., and will fit easily into a jacket pocket. In my receiver I used two Telsen reaction condensers of the circular type, but if these are not available preset condensers may be used with practically no alteration to the layout. For clearness sake, some of the connections have been omitted, but the circuit is the same as for the Cameo Midget Three without the second L.F. stage. The case is made of plywood, the coil is a Bulgin midget, and the toggle switch is for wave changing. No on-off switch has been used in order to save space, but it is a simple enough matter to disconnect or connect a crocodile clip to the L.T. accumulator. If a switch had been used there would always be the danger of the set being switched on accidentally when the receiver is placed in the pocket.

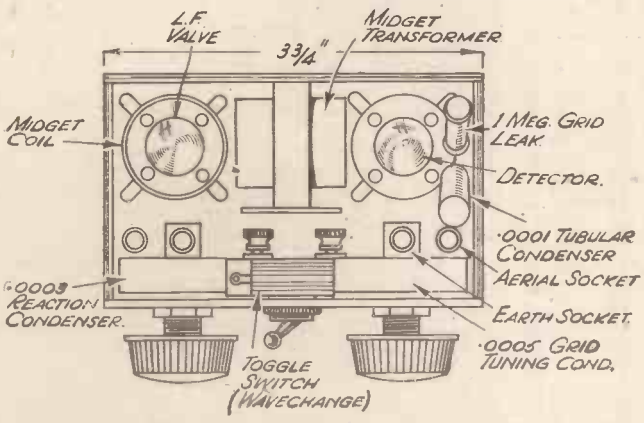
P.S.—Since writing the above details of my midget set I have made my own coil for it. It is wound on a 2in. length of paxolin former 1in. in diameter, with 38-gauge enamelled wire. The medium-wave coil has seventy turns wound side by side, the reaction 100 turns and the long-wave coil 220 (making a total of 290 for long waves) both of which are pile-wound to save space.

The set itself, with a 45-volt battery, small accumulator, two telephone earpieces, and 30ft. of thin flex for a throw-out aerial, will fit into a box camera canvas case nicely.

I was able to save space by cutting off terminals and making soldered connections and this made it possible for me to reduce the width of the base from 2¼ to 2in.—G. BONELLE (West Bromwich).



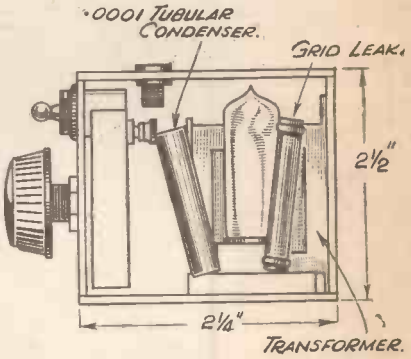
Theoretical circuit diagram of Mr. Bonelle's receiver.



The layout of the midget two-valve receiver described by Mr. G. Bonelle.

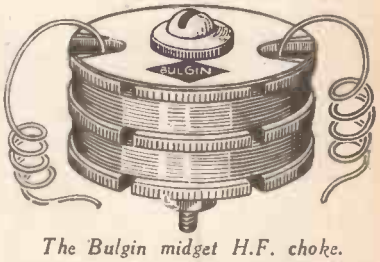
Other Midget Receivers

Those readers who were unable to visit the Radio Exhibition at Olympia will no doubt be interested also in the small receivers which are illustrated on these pages, and which show models actually constructed by amateurs and which were exhibited on the Hivac stand. These receivers are not merely novelties, built to a small scale just for interest, but are actual working sets, and as a demonstration of the efficiency of these models it may be mentioned that the set shown at the top of this page was tested outside the walls of Olympia and no less than twenty-four stations were clearly received on the head-phones.

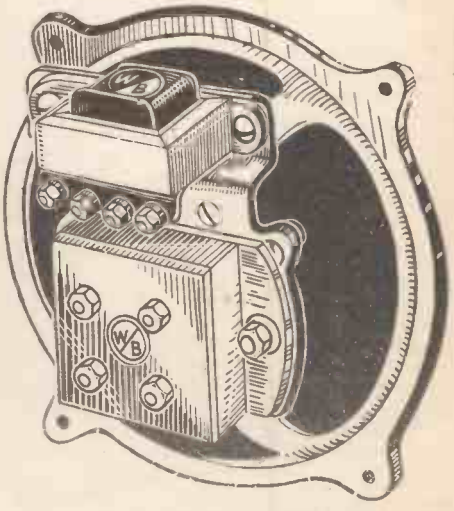


Side view of the midget receiver described on this page.

As a proof that it is not essential to restrict the design of this type of receiver to simple one-valve sets, there is a neat three-valve receiver shown on the previous page, and this is complete with a small frame aerial winding, and a receiver of this nature will enable a small loud-speaker to be operated quite satisfactorily in most parts of the country. Of course, a sensitive speaker should be used in order to make the most of the available signals, and in this connection the new Stentorian Midget can be highly recommended. This has an overall diameter of 5¼in. and is only 2¾in. deep. The cone has a diameter of 4in., and if a pentode valve is used in the output stage with sufficient H.T. a really good signal will be obtained.



The Bulgin midget H.F. choke.



A fine midget speaker in the W.B. range. This Stentorian costs 17/6 with three-ratio transformer.

Modernising Your Superhet

Advice and Circuit Details are Given for Improving a Superhet of the Type which was In Use Two or Three Years Ago.

By FRANK PRESTON

DURING the past few years the superhet type of receiver has grown almost out of recognition, and the improvements which have been effected are considerably greater than those which have taken place in connection with the "straight" set. Because of this, a superhet built, say, three years ago appears very old-fashioned by comparison with the modern receiver of similar type. In consequence, it is often desirable to modernise an old type of receiver, incorporating a few new components and introducing at least one new valve.

Most of the older sets to which reference is made were primarily designed to work with a frame aerial; they had a triode or double-grid valve as first detector, this being followed by a triode oscillator, the usual I.F. amplifier, triode second detector, and power output valves. By contrast, it is an almost invariable rule to-day to use a pentagrid, octode, or similar type of valve as combined first detector and oscillator, this being fed from a band-pass filter connected to a normal elevated aerial. The latter arrangement is considerably more efficient, not only because the range of reception is about trebled, but because it gives better quality, better selectivity, and more uniform response over the ranges of wavelengths covered.

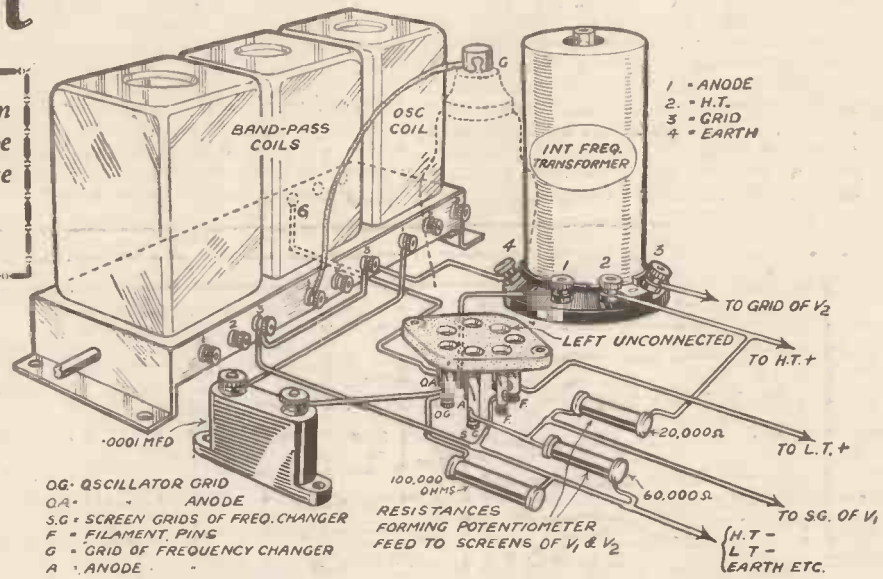


Fig. 3.—This illustration shows the connections to the pentagrid valveholder and corresponds with the frequency-changing circuit shown in Fig. 2.

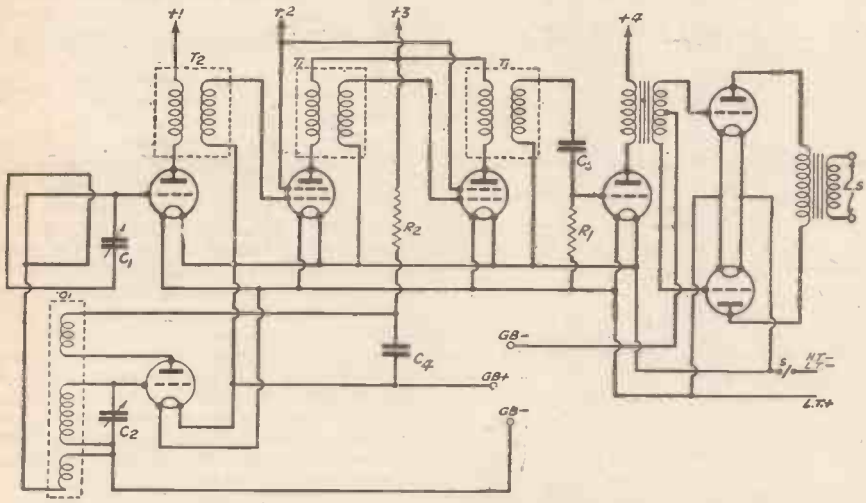


Fig. 1.—This diagram shows the connections used in an old-type superhet operating from a frame aerial.

Eliminating the Frame Aerial

Representative examples of the two types of circuit under consideration are given in Figs. 1 and 2, where the latter represents the modern arrangement. At first glance the two circuits appear to be entirely different, but on analysis it will be found that they vary little in principle. The chief difference is that the pentode portion of the pentagrid valve acts as first detector, the triode part of the same valve behaving as an oscillator. The band-pass circuit takes the place of the frame aerial, but the same oscillator coil is retained. Whereas in the first circuit "mixing" of the signal and oscillator frequencies takes place in the grid circuit of the first detector (this being provided for by connecting the frame aerial to a small coil connected in series with the grid winding of the oscillator coil), this function is performed inside the valve in the second circuit. Because of this, there is no need to wire the anode-circuit components in series, and each anode may be fed from different H.T. supply points.

Pentagrid Connections

Fig. 3 shows the valve-holder connections for the pentagrid valve. In this case it is assumed that the old oscillator coil is retained, and that a separate two-gang

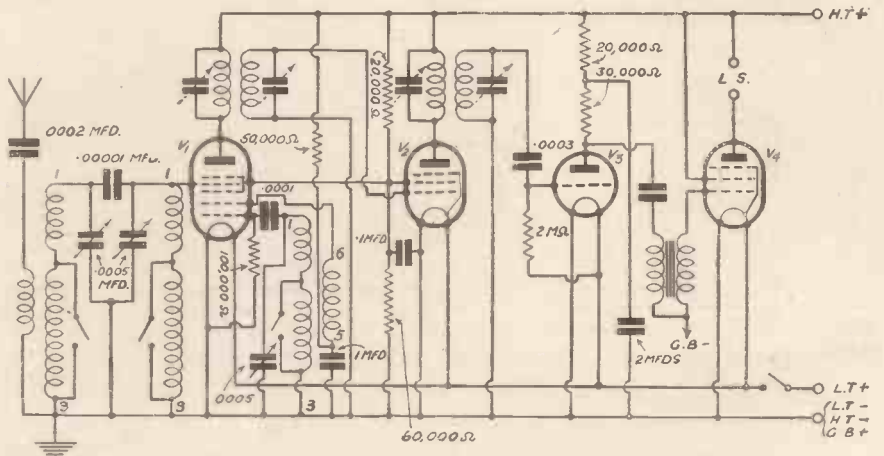


Fig. 2.—The modern counterpart of the circuit shown in Fig. 1. A pentagrid frequency changer is used and is followed by an H.F. pentode, I.F. amplifier, triode detector, and pentode output valve.

condenser is used for tuning the band-pass filter. This may not be an ideal method, and most constructors now prefer to have single-knob tuning, but it is the simplest arrangement when it is not desired to go to any greater expense than is absolutely necessary. If it were desired to use a three-gang condenser, however, this could be done by obtaining a complete set of three new coils. Alternatively, use could be made of a superhet tuning unit, including the three coils and the necessary condenser. It will be seen that the only components required in addition to the tuning circuits and valve are a .0001 mfd. grid condenser and a 100,000-ohm grid leak for the oscillator section of the pentagrid.

shown in Figs. 2 and 3 could be used equally well when modernising a later type of superhet of the kind designed for use with an external aerial and employing a band-pass circuit and oscillator coil tuned by means of a three-gang condenser: a popular circuit of the type now referred to is that used in the Premier Superhet described in the issues of PRACTICAL WIRELESS, dated September 23rd and 30th, 1933.

Improving the I.F. Amplifier

Most of the earlier superhets were provided with two intermediate-frequency valves, but when using modern valves it is nearly always found better to have only one I.F. stage, this making use of a high-frequency pentode. Thus, in modifying the old set it is a good plan to eliminate one stage, and to replace the S.G. valve by an H.F. pentode of the screened type. Fortunately, this does not involve any alteration of connections to the valveholder, provided that the new valve is of the fourpin type (a five-pin holder is required I.F. valveholder, connecting the secondary terminals of the second transformer to the second detector valve. The idea is shown in Fig. 5, where the components and connections to be removed are shown in broken lines.

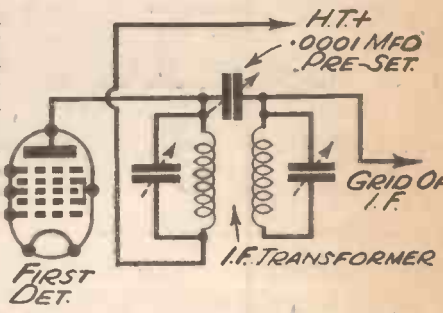


Fig. 6.—The frequency band covered by old type I.F. transformers can often be widened satisfactorily by adding a pre-set condenser as shown above.

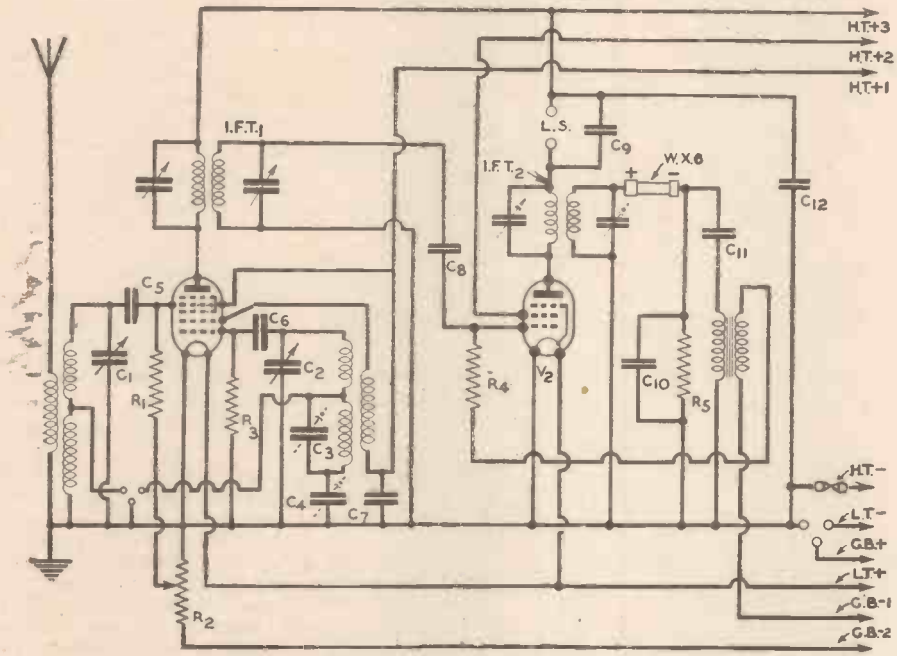


Fig. 4.—This is the circuit of Mr. F. J. Camm's two-valve superhet and represents the simplest possible form of modern superheterodyne receiver.

A Simpler Arrangement

If it were particularly desired to reduce the cost of parts to the greatest possible extent the band-pass circuit could be replaced by a single aerial-tuning coil, using a frequency-changing circuit similar to that employed in the PRACTICAL AND AMATEUR WIRELESS Two-valve Superhet, of which the full circuit is given in Fig. 4. By following this arrangement the original .0005-mfd. tuning condensers could be retained, simply changing the valve and fitting a coil in place of the frame aerial.

It will be evident that the connections in the case of an A.C. set, of course). All that is necessary, then, is to remove the third I.F. transformer and the second

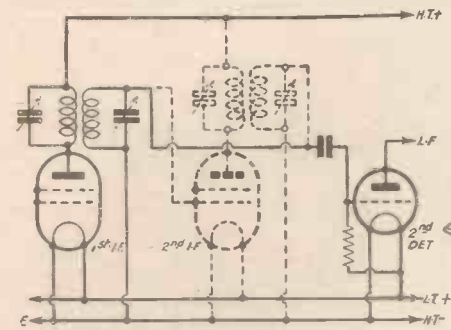


Fig. 5.—Showing how the second I.F. stage in an older type superhet is removed from the circuit when modernising. Broken lines show the connections and components removed.

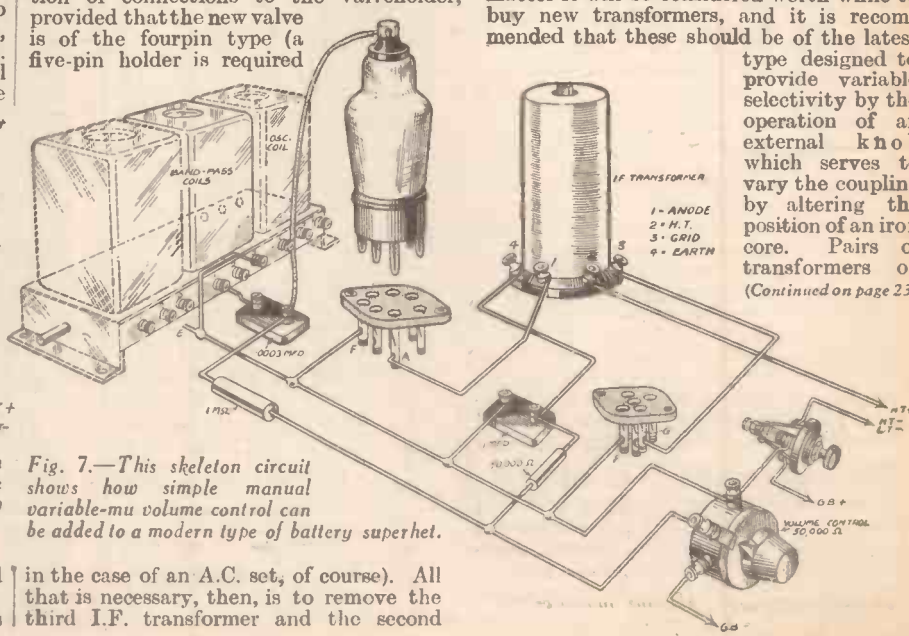


Fig. 7.—This skeleton circuit shows how simple manual variable-mu volume control can be added to a modern type of battery superhet.

Better Quality

After having made the alterations mentioned above it should be found that results are considerably better than before in every respect. It is possible that the quality of reproduction will still leave something to be desired, because the I.F. transformers employed will probably cover a rather narrow band width, with a result that there will be a certain loss of the high notes. This difficulty can be overcome by fitting new, modern transformers of the type in which the coupling between the two windings is variable (the Varley components used in the £5 Superhet are typical examples). In many instances, however, it will be found that a very real improvement can be effected by the simple process of adding small-capacity pre-set condensers to provide "top-capacity" coupling between the primary and secondary windings of the I.F. transformers. The condensers are simply connected between the grid and plate terminals, as shown in Fig. 6, and may have a maximum capacity of about .0003 mfd. They should be adjusted to about their midway positions in the first place, and then set finally so that the quality of reproduction is satisfactory without interference being introduced.

Where expense is not a very important matter it will be considered worth while to buy new transformers, and it is recommended that these should be of the latest type designed to provide variable selectivity by the operation of an external knob which serves to vary the coupling by altering the position of an iron core. Pairs of transformers of

(Continued on page 23)

A PAGE OF PRACTICAL HINTS

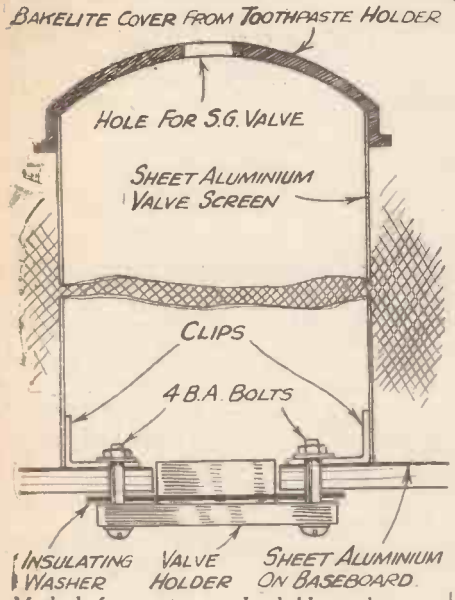
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Novel Valve-holder and Screen Fixing

WHILST rebuilding my set for the winter I decided to cover the baseboard with approximately .02in. aluminium sheet, adopt sub-baseboard wiring, and screen my screen-grid and detector valves. The thin aluminium sheet was soon cut by a 1in. centre-bit to accommodate the valve, as shown in the accompanying sketch. The valve-fixing bolts also clamp two screen-fixing clips to the earthed baseboard. The screens were made of the same gauge aluminium, bent circular, and fixed by shoemaker's brass eyelets so as to fit snugly inside the bakelite holder forming the lid. A hole was provided in the latter in the case of the screen for the screen-grid valve, whilst an insulating disc of bakelite was inserted between the valve-holder base and the baseboard, to avoid any inter-terminal leakage due to moisture in the wood.—W. A. HARRISON (Aintree).



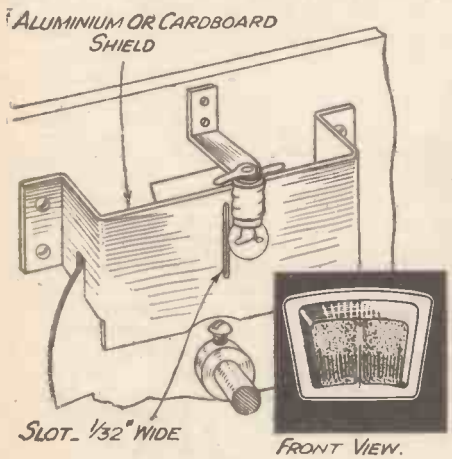
Method of mounting a valve-holder and screen.

THAT DODGE OF YOURS!!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

Light-line Indicator

ON the usual type of disc-drive dials the escutcheon window does not usually provide any adequate means of showing by means of a pointer the exact spot where a station is. The accompanying illlustrations show how a line of light can be thrown down the whole of the dial which shows through the window, thus allowing the operator to know the exact wavelength of the station. The slot allowing the light through should not be more than 1/32in. wide, as otherwise the light line will show over more than one reading. If a fretsaw blade can be procured thin enough it is best to cut a slot the same width as the divisions on the dial, thus bringing the exact marking in the centre of the light, as shown in the inset sketch.—S. C. HULL (Lordship Lane).



An easily-arranged light-line indicator for a tuning dial.

A Novel Loud-speaker Mounting

TO obtain the best results from an extension loud-speaker, it is, of course, essential that the unit should be mounted in a cabinet or on a suitable baffle of large area. It is often a matter of some difficulty to obtain a cabinet which will harmonise with existing furnishings, whilst a baffle board is altogether out of place in a tastefully-furnished room. The arrangement described herewith is most successful, both from the artistic and operating point of view. The loud-speaker is mounted on a framework of U-shape, which is then inserted in a bookcase in the space made vacant by removing a few books. As clearly shown by the sketches, the scheme is very easily carried out. The front of the framework is in the form of the usual grille, whilst the dimensions must be such that the front and sides are a close fit with the shelves above and below them. A small portion of the back of the bookcase must be cut away, immediately behind the loud-speaker, to permit free egress of sound waves, and for the same reason the bookcase must stand so that its back is about one inch away from the wall. The cut-away portion can easily be replaced if at any time it is desired to remove the speaker. It will be found that a case filled with books makes a most excellent baffle, whilst the arrangement has the great advantage of not interfering in any way with the furnishing scheme of the room. It goes without saying that if the bookcase is fitted with glass doors, the latter must be opened when the loud-speaker is in operation.

A novel method of mounting a loud-speaker, using a bookcase as a baffle.

If desired, of course, the receiver could be housed above the loud-speaker opening, and to camouflage the apparatus it could be mounted towards the back of the case and a cover consisting of a piece of ply, cut in the form of two doors, could be made to fit in front of it. This cover, or pair of doors, could be masked by sticking on the front the backs of some old books which are cut up for the purpose.—C. M. (Leeds).

Noise-free Aerial Systems

In This Article the Author Deals with the Problem of Providing an Aerial System which is Static-proof and Equally Efficient on all Wavelengths. By G. V. COLLE

THE increasing use of the short wavebands for broadcast transmissions, and as a fairly reliable means of entertainment for listeners, is now recognised by most receiver manufacturers as an accomplished fact.

Consequently, the latter end of the 1935 radio season marks the introduction of many short-wave units and all-wave sets, which is exactly as it should be. It is also clear from preliminary test reports that the receivers generally set a very high standard of performance, particularly as regards sensitivity.

What is not so clear is whether prospective users will be in a position to make full use of the available high overall amplification. Here, briefly, is the usual cycle of events. A listener buys an all-wave set, has it sent home and proceeds to connect the usual aerial, earth and mains leads. Results—probably excellent on medium and long waves. Turning over to short waves, a number of stations are picked up after a preliminary skirmish with the fine tuning control, and also the ignition noises from every car in the vicinity. A few evenings juggling with the controls, the same troubles recur and in consequence the receiver is tuned to the locals and a few medium-wave foreign stations ever afterwards.

The same tale is true of the short-wave unit (or receiver) except for the proviso that in this case the listener may have provided himself with the short-wave aerial system more suited to the wave ranges to be covered. In the latter instance it is possible that the better matching of the aerial system to the short-wave aerial coupling coil is providing increased signal strength, and therefore a higher signal-to-interference ratio.

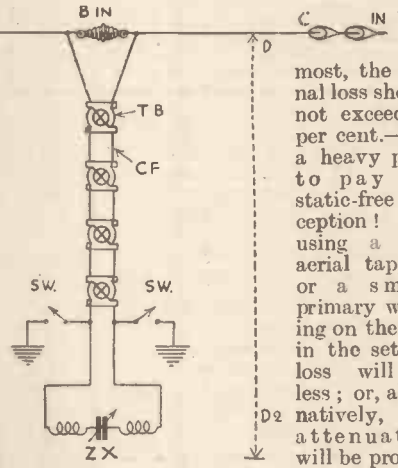
Reception under the latter conditions is certain to be more tolerable, although complete freedom from man-made static can only be achieved by paying close attention to the several vulnerable points of noise entry to the set, and providing a noise-proof aerial system.

We are concerned for the moment, however, with the real problem of providing an aerial system which is not only substantially electrically static proof, but equally efficient over ultra-short, short and both medium and long waves. In fact, the horizontal aerial section and the down lead together must perform equally well on all wavebands without necessitating mechanical or physical changes. Allowing for such modifications at the receiver end of the down lead, which is accessible, the requirements are nevertheless exacting.

Separate Aerial Systems

One obvious course is to erect two separate aerial systems, the first for medium and long waves only, and the second for all short-wave ranges. Without question the separation of the two aerials is technically the most happy solution. Each aerial can be arranged in a manner likely to provide maximum signal pick-up, and the down leads can be individually treated to afford the greatest relief to man-made static.

The down lead from the aerial for medium and long-wave reception can consist of a large diameter low-loss screened conductor or a small screened conductor acting as a transmission line with impedance matching devices at each end. Where the down lead length does not exceed, say, 50ft., the low-loss screened conductor is best, owing to the small signal attenuation and avoidance of complications. At the most, the signal loss should not exceed 20 per cent.—not a heavy price to pay for static-free reception! By using a low aerial tapping or a small primary winding on the coil in the set the loss will be less; or, alternatively, the attenuation will be proportionately lower if the down lead is less than 50ft. in length. Owners of commercially made receivers should note the latter point, because it is obviously impracticable to interfere with the "interior" to achieve technical perfection.



A single wire transfeeder system. TB are the transposition blocks, CF is the crossfeeder line, IN are insulators, and SW are switches.

Transmission Line Systems

Where the M.W. and L.W. horizontal aerial must be erected at some considerable distance from the receiver in order to avoid electrical static radiation, it becomes impracticable to employ a low-loss screened downlead, and here the transmission line system comes to our aid. There are several reliable makes on the market, and while each system possesses its own technical merits, yet fundamentally they all operate on the same principle. A step-down matching transformer is mounted on or near the horizontal aerial and another of the step-up type near, or on, the set.

The advantages of each system are numerous, not the least of which is that the screened small diameter transmission line (or downlead) can vary between, say, 50 and 400ft. in length, and additionally, is loss-free in that the lead can be buried, tacked to fences, walls, or run under floors or in walls. One word of warning to would-be users—whenever possible the outdoor cable should advisedly be purchased with insulation over the outer metal braid, as atmospheric conditions can play havoc with the usual exposed screening.

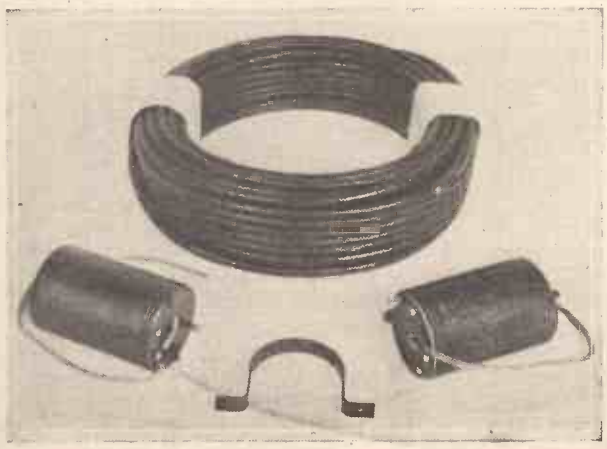
The Short-wave Aerial

With regard to the short-wave aerial, there seems to be no defined opinion among technicians as to the ideal arrangement. Certainly the writer was brought severely to task in the correspondence columns of this journal recently for daring to declare, in effect, that the well-known cross-over feeder principle was in itself not completely proof against man-made static. The opportunity now presents itself of clarifying the position.

This downlead consists of two "feeders" each attached to dipole horizontal aerials, end to end and insulated from each other. At regular intervals, the "feeder" downleads cross over on special insulated separators, while at the receiver the cables are normally joined to the ends of a coupling coil, either direct or *viâ* resistances, the latter devices being intended to make the complete aerial system aperiodic, to cover a band of wavelengths. Usually the dipoles have a natural wavelength response, according to their length, but this obviously only makes for maximum efficiency at one point.

If a centre earthed point is provided on the coupling coil, theoretically, all electrical static extraneous capacitative and inductive effects on the "feeders" are cancelled out and taken to earth. That this effect is *partially* achieved in practice has been proved, although it is contended that the improvement in the matching due to the downleads between aerial and set is equally responsible for the higher signal to interference ratio.

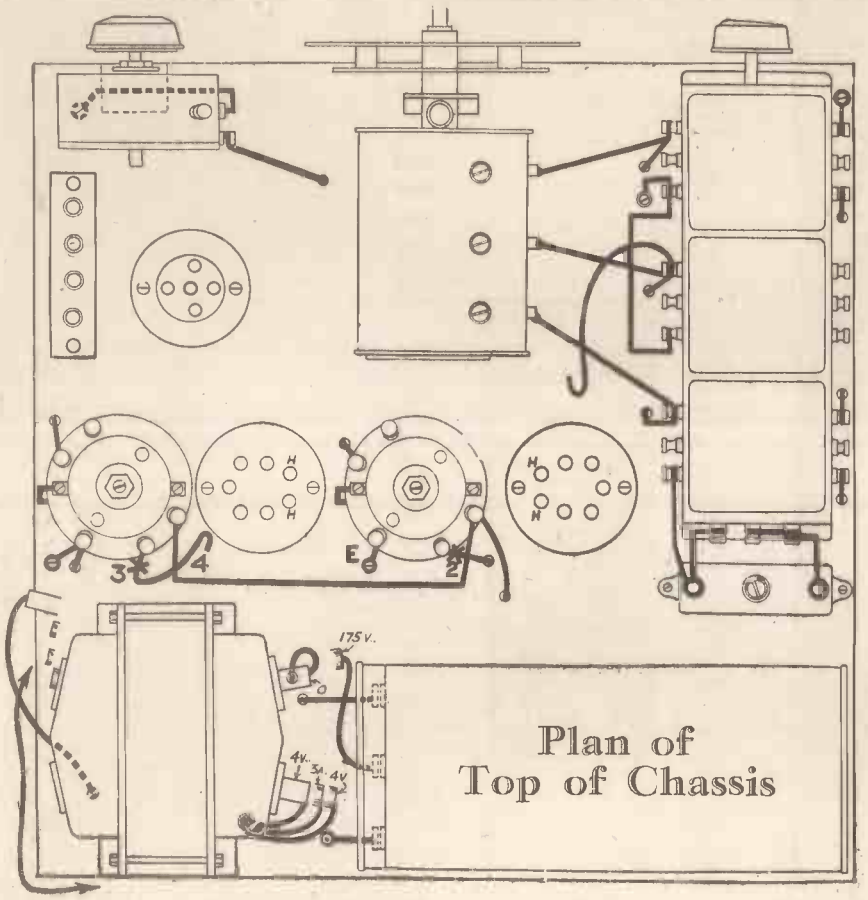
However, in the estimation of the writer, an even greater improvement in noise reduction can be effected by avoiding all possibilities of capacity coupling between the feeder coupling coil and the coil in the set. Stray capacity couplings will pass noise voltages, and these will nullify to some extent the advantages accruing from the special downlead. By simply interposing an electrostatic metal foil screen as a single open-circuited earthed turn between the windings, the desired effect may be obtained.



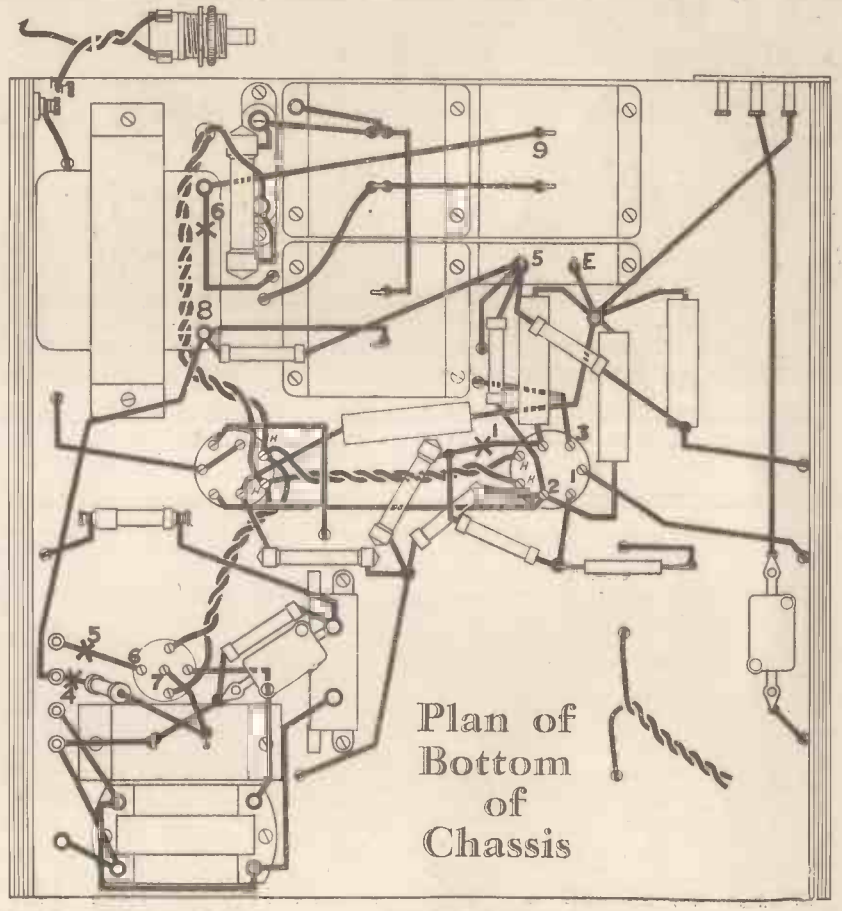
The E.M.I. anti-static aerial equipment.

(Continued on page 23)

Practical and Amateur Wireless SERVICE DATA SHEET No. 2 FOR THE A.C. £5 SUPERHET THREE



Plan of Top of Chassis



Plan of Bottom of Chassis

Approximate Voltage Readings

D.C. Voltmeter — to E

,, + to 1=120 volts.
,, + to 2= 75 volts.
,, + to 3=180 volts.
,, + to 4=180 volts.
,, + to 5=180 volts.
,, + to 6=200 volts.
,, + to 7=190 volts.
,, + to 8=220 volts.
,, + to 9=250 volts.

A.C. Voltmeter across Mains Transformer
0v. and 175v.=175 volts.
,, across HH of valve-holders=4 volts.

Approximate Resistance Readings

Coils 1 and 2.
Ohmmeter across terminals 4 and 6=8 ohms.
,, ,, ,, 1 and 3 (long wave)=19 ohms.
,, ,, ,, 1 and 3 (med. wave)=3 ohms.

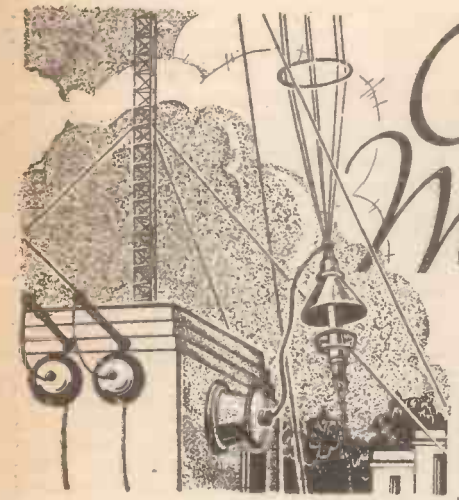
Coil 3.
Ohmmeter across terminals 4 and 6=8 ohms.
,, ,, ,, 1 and 3 (long wave)=27 ohms.
,, ,, ,, 1 and 3 (med. wave)=7 ohms.

I.F. Transformers.
Ohmmeter across terminals 1 and 2=43 ohms.
,, ,, ,, 5 and 7=43 ohms.
,, ,, ,, 6 and 7=26 ohms.

L.F. Transformer.
Ohmmeter across terminals P and HT = 1,200 ohms.
,, ,, ,, G and GB = 5,000 ohms.

Approximate Current Readings

Milliammeter connected at X1=6 m.a.
,, ,, ,, X2=3 m.a.
,, ,, ,, X3=5 m.a.
,, ,, ,, X4=6 m.a.
,, ,, ,, X5=30 m.a.
,, ,, ,, X6=50 m.a.



On Your Wavelength

By Thermion

Television

A READER takes me to task for my recent paragraph about television. It will be remembered that before Radiolympia I stated in these columns that I had very good reason for believing that television apparatus, notwithstanding newspaper statements to the contrary, would be exhibited at Radiolympia. In that statement I was perfectly correct, for I have it as a fact that representations were made to the Baird Company, to the Cossor Company, and to others interested in television, to combine forces and to produce a joint exhibit. These negotiations, however, broke down at the last moment, and nothing came of it. I was not permitted to give these facts while the matter was *sub judice*. I mention them now to satisfy one irrepressible correspondent who has sent me a scurrilous letter that I was talking through my bowler. This particular reader swallowed the newspaper propaganda hook, line and sinker, whereas my

One hyper-critical reader.

statement, which was made with an exact knowledge of the facts and the moves being made behind the scene, is rejected by him.

The B.A. and Crooners

NO less a body than the British Association attacked crooners, and their remarks are too good not to set on record. Those, therefore, who like to hear the velvet voices reminiscent of Charles Laughton registering strong emotion or the crying voice of Sir James Jeans reading a scientific paper will have to think hard for an answer to the following flagellation administered by Mr. P. H. B. Lyon, the Headmaster of Rugby: "It is a queer world, when a sleek, silky-voiced lounge lizard can perpetrate a few quatrains of noxious slush and be forthwith accepted by the toleration of the whole of a manly generation while the great spirits of the world building immortal verse out of their heart's stuff in poverty, in blindness, in despair, sing to them in vain." May I also quote from the *University Correspondent*, in the September issue of which I read the following: "Various musicians at an Oxford Summer School have been complaining about the prominence given to dance bands, crooners, and the like, and have expressed a fear that the effects of the banal lyrics in modern dance music and the dreadful vulgarity of many of them must necessarily have a pernicious effect on children and adolescents. This is incontestable; some of the lyrics of these dance tunes are positively revolting both in sentiment and expression. There is another point, too, that ought to engage the attention of the B.B.C. authorities. What is the use of spending time and money in spreading a feeling for good pronunciation if all that good work is to be undone by singers? The B.B.C. authorities are insistent upon correct pronunciation by announcers. Why do they not insist upon an equally rigorous attention to the niceties of pronunciation by vocalists and particularly by dance-band vocalists? Most of these gentry possess no cultured standard of accent whatever, and it is only too clear that they try to imitate the Haarlem accents of American dance-band singers." Great minds, you see, think in tandem.

Mess Production

A FRIEND of mine visiting a certain radio factory observed that eight sets out of ten were rejected by the viewers. This is a surprising state of affairs, and indicates the caution that should be exercised in buying a cheap commercial receiver. If eight out of every ten sets are unsatisfactory upon inspection at the factory, it would seem to indicate the reason why so many poor receivers reach the public. When dealers are pressing for a completion of their orders, the tendency of the manufacturer to let a few passable rejections go through is a human one. I have seen commercial receivers in dealers' shops with the usual label "Passed by, checked by, examined by," and so on, with components completely missing. Such receivers could not possibly have been checked; they would not pass a continuity test, let alone an aerial test. It does not speak well for the manufacturer in question that after all the inter-stage checking and inspection, eight out of ten fail to pass the final assembly inspection. Too, too defeating.

Crooner straining for top notes.

High Fidelity

REGARDING my note on page 654, and also the Editor's Radiolympia Reflections, I have received a most interesting letter from Mr. J. Brett, of Keswick. I reproduce it here *in extenso*:—

"May I refer you to your last two paragraphs on page 654, in the August 24th issue of PRACTICAL AND AMATEUR WIRELESS, in which you state your views on 'high fidelity'—the superhet and your personal views that a large number of

Rival designers.

listeners are quite content with local station reception and, therefore, require simple 'quality' receivers and not so much elaborate 'station getters' with all sorts of complicated circuits and expenses. I would just like to say I agree with you, and express my entire endorsement of every word you say, and am glad you have made those statements which, in my opinion, based on my own observations, are absolutely accurate and represent the requirements of the vast majority of listeners, when you get down to 'tacks' and the first novelty has worn off.

"Also I cannot but agree with the Editor's 'Radiolympia Reflections' when he says he is surprised, for so am I, that the battery set is so popular with people who might have 'mains' sets. I know of at least twenty-one people who have battery sets who actually have E.L. mains in the house, but I am also surprised that he (the Editor) noted very few wanted 'high fidelity' receivers. I think that must be because he saw only enthusiastic 'wireless fans,' for nearly all the 'home constructor' fellows that I know are DX fans, too, but I do not think it really is the true state of things generally. I also find a great deal of interest is being taken not in the superhet so much as a return to the straight set. You can pass on *my* 'reflections' on the *Editor's* reflections if you like.

"I've often wanted to write to you during the last seven or eight or, I believe, more years, and now I've started to do so, perhaps it would interest you for me to tell you how I have come to the aforementioned opinions. During the last four months I have been travelling about, as I am out of a job and have had to get out of my old home through the death of my employer, and having no settled place to go, my wife and I decided to visit several places where we had relations, friends, etc., before deciding where we would eventually live

(*Continued overleaf*)

(Continued from previous page)

or whether we'd go to New Zealand where I used to live. So that you shouldn't have any false ideas as to what I am or the size of my income let me state at once I am a craftsman, and wireless is my hobby, or should it be 'craze'? London is my ideal for one thing and one thing only—Music'—concerts always and opera. (I missed only one concert in one Prom season), but otherwise I can't bear the place. So that normally, outside of London and other big towns, my wants in the music world leads to Radio my wife also was and is an enthusiast, built her first receiver just after the War when I was abroad, used to sit up half the night to hear a few words or a record from Captain Eckersley at Writtle, then nearly went up when regular Broadcasting started. I wonder if it was as well for me that I was nearly always abroad at that time? Especially when she and Mills (a fellow, now dead, who went with Pye's in the early days) pulled down the chimney of the house putting up an aerial. By-the-by, speaking of Pye's, my wife had the—shall I say honour?—of helping to install the first commercial set that Pye's made. Excuse this digression, for what I want to say is I went into, as far as I count back, 124 houses in which there was a wireless set and only six or seven that hadn't. Most of the owners knew I was a wireless fan and switched on, but in roughly 50 per cent., as my visits were during evening and dinner time, the sets were already on, and

P & A.W. reader's banquet and suggestion for an annual banquet.

this were my observation, except in two cases—*they were all* on either the local station or Droitwich. Now how does that tally with your own observations?—*I* was absolutely struck by it. I couldn't help it—it was so obvious. The latter part of the time I should have been astonished if I'd found a foreign station being received.

"The two exceptions were: 1. A retired Colonel for whom I built the 'W.M.' super five, and he was running it from a D.C. H.T. unit and accumulator for L.T. It was going fine. *But* it was Sunday and he couldn't stand the B.B.C. programmes until after 9 p.m. at any price. So he'd got what to me is a sight worse—an advertisement programme——. No. 2 was a commercial A.C. set on which the switching of the medium waves had gone wrong.

"There were only two short-wave enthusiasts, both in the radio trade. When I dropped in on No. 1 he was busy with a morse conversation with another DX'er. When discussing with him the trend of wireless and set making, and also selling, his observations were caustic: 'I'm blessed if I know what they want,' and from our later conversation he appears to think the public will just go any way the manufacturers like to push their advertising campaign. But he agrees that after a time most people go for quality rather than foreign stations. One thing he was emphatic on was that he didn't think there was really any demand except that it is the novelty of the moment for 'All-wave Sets.' Especially the high-priced, complicated type. No. 2 trader is a DX fan pure and simple.

"My visits started in Devon and Somerset; went to the Midlands, then to Hunts, Cambs, Norfolk, Surrey. Thence to Derby, Staffs, Lancs, Westmorland, and finally to Scotland, and have now settled, providing I find suitable employment, in Cumberland.

"I've built a number of A.W. and W.M. sets, my present one is, or was, the Q.P.P. Super 60; I didn't like Q.P.P. quality at all, I had bought a special Heayberd's D.C. H.T. unit with a Cossor neon tube for regulation, so I altered the L.F. side and it has now a double-diode-triode second driver and a push-pull output with a Ferranti A.F.5c transformer and Ferranti M.1 speaker and transformer. Quality, one of the best I've heard that can be produced for less than £20. Now I have no D.C. mains, but the grid is on the way, so I'm just waiting and not making any more alterations. I mean, I'm not re-converting the set to battery type. But as I am almost sure to be on A.C. within the next few weeks, my great question is shall I again alter the set or shall I take the best of the components (the Ferranti transformers, for instance), and build a real quality set, just for local station and National reception only? That is what I want to do. So please, Thermion, tell the Editor you now know of at least one who shares your views and wants a set design for quality from local stations and, like you, I believe it would fill the requirements of scores of home constructors. Just pure quality and no costly refinements, and my mind always keeps going to a straight set, and especially with the Varley permeability tuners, about four or five valves—perhaps less, and triode or push-pull output. I do not think I shall build another superhet, for all the variable selectivity I.F. ideas now available for home constructors.

"In closing, let me thank you for the many hints and tips, and many pleasant hours reading you've given me.

"Yours sincerely,

"J. BRETT."

Notes from the Test Bench

Improving the Detector

DURING the past two or three years the grid rectifier has gradually lost its popularity owing to the advent of the diode, double-diode, and cold valves. It is generally believed that the diode is far superior to the triode grid rectifier, but this belief is, to a great extent, erroneous. It is true that a badly designed grid rectifier circuit can cause offensive distortion but, on the other hand, this type of rectifier can be adjusted so as to produce negligible distortion. The essentials of distortionless rectification are the use of a suitable H.F. and L.F. amplifier, the correct valve impedance, and the correct grid condenser, grid leak, and anode resistance values. These values should be chosen so that the decrease in anode current, caused by the application of the rectified carrier negative bias, will decrease the steady anode current by approximately 15 per cent. For best results the steady current should be between 5 and 8 m.a., and the decrease when a signal is tuned in should be between ¾ and 1¼ m.a. If this deflection cannot be obtained, the H.F. amplifier should be improved, and, on the other hand, if the output valve is overloaded before a deflection of ¾ m.a. is obtained, a lower ratio L.F. transformer should be used in the L.F. stage, or a valve having a higher undistorted output rating should be chosen for the output stage.

H.T. Current Measurements

IT has been emphasised in articles concerning fault tracing that the valves of a mains operated set must not be removed whilst the set is switched on, as the removal of a valve is likely to cause damage to the remaining valves due to a rise in anode voltage. In battery operated sets this is not the case, however, and therefore valve current consumption can easily be checked by removing each valve in turn. The milliammeter should be connected between the H.T— socket and the H.T.— lead. When all the valves are in circuit, their total consumption, plus the consumption of any potentiometers connected across HT+ and HT— will be obtained. The valves may then be removed in turn in order to check their individual consumption. When adopting this method of checking, the output valve should be removed first, as the removal of the detector valve whilst the output valve is in circuit is likely to cause damage to the latter. It is sometimes found that pronounced instability, in the form of a loud droning noise, is set up when the meter is connected in the H.T.— lead. This is due to the internal resistance of the meter causing L.F. oscillation, and may be remedied by connecting a 1mfd. condenser across the meter terminals.

Extension Speakers

WHEN the set has a push-pull output stage, best results are usually obtained by connecting the leads of the extra speaker *via* 1 or 2 mfd. condensers to the anode terminals of the push-pull valves.

Mains Aerials

Thus Ecossais:—

"I FEEL I must write to thank you for the able manner in which you smite these jazz-crooners. Yours is the first article I read, just to see if you have thought out any new ones. At the same time, being totally uneducated, musically speaking, those minor thunderstorms and large lumps of silence known as promenade concerts are to me equally unintelligible. Experiments of both types of the 'musical' art I consider are long overdue for the nut factory. Needless to say, I myself am considered not a little mad—because I prefer my music in the form of a recognisable tune. And that's that.

"I notice in this week's article that you have had trouble with your mains aerial. Your solution does not strike me as being particularly lucid. The point is this: the multiple earthed neutral (M.E.N.) system of supply is not by any means common in this country. I could not off-hand mention a single supply undertaking where this system is used. To enumerate advantages and disadvantages would require a book, so I will content myself with saying that, normally, a 4-wire 3-phase system has the star-point earthed at the substation. Probably your neutral is down to earth, and if your supply undertaking uses an insulated neutral, the mains engineer would not thank you if this earthing system were deliberate."

DESIGNING YOUR OWN WIRELESS SET

Following the Sequence of this Series of Articles, Two-stage Battery-operated Amplifiers are Dealt with Here, and Details are also Given of the H.T. Economiser Circuit

LAST week we discussed the matter of deciding upon the most suitable type of L.F. amplifier for inclusion in a battery-operated receiver, and considered the three most popular types of circuit arrangement. We did not, however, touch upon the design of a two-stage amplifier such as would be desirable when the output from the detector valve was small, and when high-quality reproduction was considered an essential feature. In conditions like those set out, a single stage incorporating a pentode valve fed by means of a high-ratio transformer or coupling unit would be quite unsuitable; in the first place the quality would not be by any means ideal, and in the second, the necessary degree of amplification could not be employed, assuming that an output of not less than 350 milliwatts was required.

High Output—Low Amplification

There are plenty of valves capable of handling 350 milliwatts, but these are all of the super-power, low-impedance type, and provide only a small amount of amplification. For them to function satisfactorily, therefore, the input voltage must be comparatively high—if it is not, the output will simply be considerably less than that at which the valve is rated. And, as we have seen before, the output from a leaky-grid detector is very limited. It can thus be stated as a general rule that a two-stage amplifier is almost invariably necessary when a triode output valve is preferred, when a minimum of 350 milliwatts output is required, and when the detector is of the leaky-grid variety. It is for this reason that a two-stage amplifier is nearly always desirable in the case of a portable receiver or of a short-waver. There is yet another occasion when the two-stage amplifier fully justifies the slightly extra cost which it entails; this is when a diode or metal-oxide detector is employed and the set is also to be used for gramophone-record reproduction. In this instance the pick-up must be connected in the grid circuit of the L.F. valve, because the detector cannot be used for amplification, does not usually provide sufficient amplification by itself.

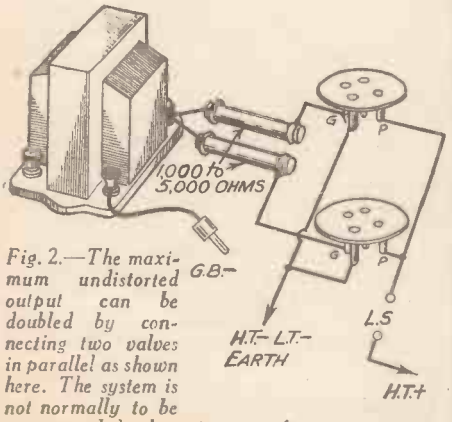


Fig. 2.—The maximum undistorted output can be doubled by connecting two valves in parallel as shown here. The system is not normally to be recommended, but it is often convenient.

Suitable Coupling Arrangements

When it has been decided to build a two-stage amplifier it is necessary next to consider what arrangement of valves and coupling circuits will prove most satisfactory. We have the choice of using two transformer-coupled stages, two resistance-capacity-coupled stages, or one of each. It is generally thought that a pair of R.C.C. stages is best from the point of view of quality, but there is generally a fallacy and a single L.F. valve (even a pentode)

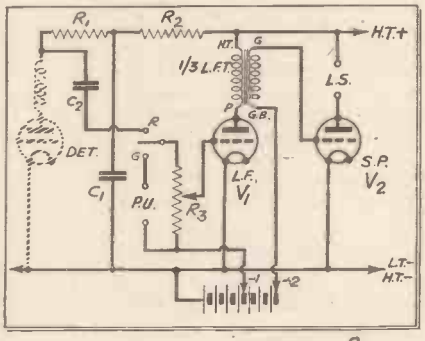


Fig. 1.—The circuit of a two-L.F. amplifier suitable for use on radio and gram. Values for R1 and R2 are given in the text.

in this reckoning, because the coupling resistances entail a very considerable voltage drop, with the result that the available H.T. voltage may easily be reduced to less than half that of the supply unit. This objection can be overcome by using two choke-capacity-coupled valves, but a choke is little more efficient than the average good transformer, so there is no great benefit to be derived from following this course. Without arguing the matter fully, it can be stated that it is generally most satisfactory to use R.C.C. in the first stage (to couple the detector to the first L.F. valve) and to employ a transformer between the two L.F. stages. The general circuit arrangement is shown in Fig. 1, where pick-up connections and switch are also indicated. With regard to the values of the components, much depends upon the exact characteristics of the valves employed. Assuming that the usual H.L. or det. valve is used in the detector stage, an L-type valve can be used for V1 and a super-power valve for V2. The anode-coupling resistance marked R1 should have a value equal to approxi-

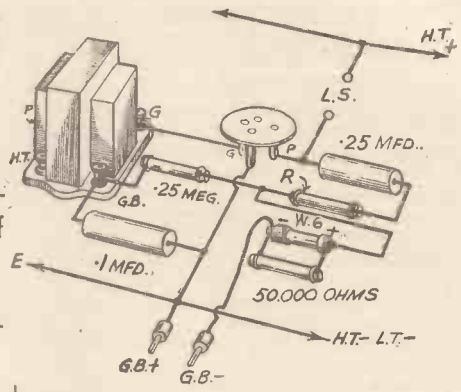
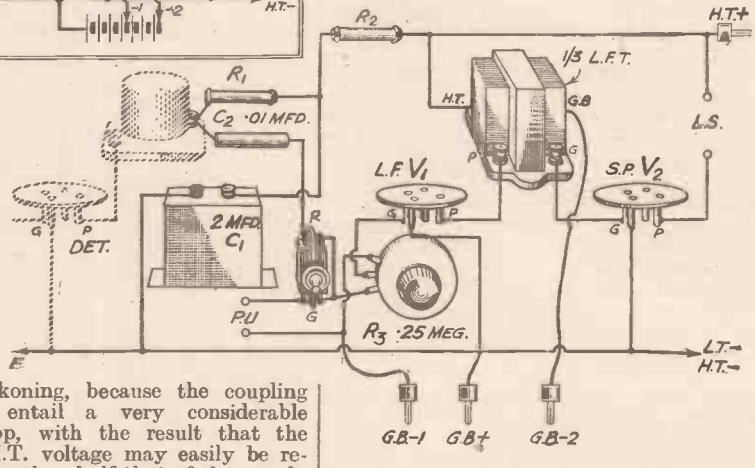


Fig. 3.—Showing the connections for an H.T. "economiser" circuit employing a metal-oxide rectifier. The value of R depends upon the characteristics of the output valve.

mately twice the impedance of the detector valve, which means that the resistance should lie between 30,000 and 50,000 ohms. The decoupling resistance R2 is not usually critical, and it will generally be found satisfactory to choose this so that the combined resistance of R1 and R2 in series is about 50,000 ohms.

The coupling condenser C2 should be a good component, having a capacity of approximately .01 mfd. and should have a rated working voltage of not less than 300, for the reason given last week. The grid leak, marked R3, is a 250,000-ohm potentiometer of the carbon-track or "composition" type, and serves also as a reliable volume control on both radio and gram. As to the L.F. transformer, this should be



of a reliable type with a primary winding rated to carry up to 5 milliamps. This means that the component should not be of the cheap midget type, which is generally suitable only when a parallel-feed system is used. The most suitable ratio is generally 1:3, and if a higher ratio were used there would be a danger of overloading the output valve on loud signals, whilst the quality of reproduction would probably be impaired to a certain extent.

Connecting Power Valves in Parallel

In passing, it might be mentioned that when one or two small power valves are available, and it is not desired to go to the expense of a new valve of the super-power type, it is frequently quite satisfactory to connect two of these in parallel to produce the same output as that provided by the "larger" valve. Thus, two valves, each

(Continued overleaf)

DESIGNING YOUR OWN WIRELESS SET

(Continued from previous page)

rated at, say, 180 milliwatts, could be so connected to provide a maximum undistorted output of approximately 360 milliwatts. The valves must both be of the same type and, preferably, they should be of equal age so that their characteristics can be relied upon to be almost identical. When such is the case, the valves can be connected as shown in Fig. 2, a "stopper" resistance being included in the grid lead to each; these resistances tend to compensate for any slight variation in the valves and prevent the tendency towards instability. The value of the resistances is not very important, but should lie between 1,000 and 5,000 ohms.

H.T. Economy

The greatest objection to the use of a super-power valve, or of two valves in parallel, is the rather high high-tension current consumed. Thus, the Cossor 230 XP (max. undistorted output, 450 milliwatts), takes an average anode current of nearly 20 milliamps at 120 volts. This is much too great for the standard type of H.T. battery, and is rather on the high side even when using a super-capacity battery. Actually, therefore, it is best to employ an H.T. accumulator or an eliminator, but a large-capacity battery can be used fairly economically by fitting an "economy" device in the output circuit as shown in Fig. 3. It will be seen that a W.6 "Westector" is connected in series with a .25-mfd. fixed condenser between the anode of the output valve and the negative terminal of the G.B. battery. A load resistance of 50,000 ohms is wired in parallel with the "Westector," and a fixed potentiometer consisting of a .25-megohm resistance and another resistance, marked R, is connected between the anode-circuit condenser and the G.B. negative lead to the L.F. transformer, and a by-pass condenser of .1 mfd. is joined between the G.B. supply lead and earth. The value of R depends entirely upon the output valve, but for most super-power valves it may be 20,000 ohms. The object of this "economiser" circuit is to regulate the G.B. voltage applied to the output valve in accordance with the signal voltage which is being handled. For this reason, the G.B. tapping is adjusted to a point which provides about 50 per cent. more voltage than that normally required. When a signal is applied to the valve the rectified voltage developed across the "Westector" opposes that of the G.B. battery and so cuts down the bias applied to the valve. The "opposition" voltage, moreover, is proportional to the signal strength, and therefore the H.T. current is also varied in proportion to the strength of the signal being handled. The effect can thus be seen to be similar to that of class B or Q.P.P. working. In practice it is found that the average current consumption of the valve is only about one-third of that taken when the "economiser" circuit is not employed. As a matter of general interest it should be pointed out that the system just described is applicable to all power valves and pentodes, and is in all cases perfectly successful provided that the correct value of resistance is chosen for R. It would not be practicable to give this value for every type of valve, but the information can be obtained in connection with any particular valve by writing to our Free Advice Bureau; alternatively, it can be obtained from the makers of the "Westector" when ordering this component.

Q.P.P. and Class B

We have not yet given any attention to class B and Q.P.P. amplifiers, but these are very similar in principle to the normal push-pull circuit. The main difference, however, is that a greater output can be obtained for a given current consumption, and that the actual high-tension current consumed is always proportional to the strength of the signals reproduced by the loud-speaker. The reason for this is that the valve or valves are normally biased to such an extent that they pass scarcely any anode current, and the bias voltage is automatically reduced by the audio-frequency voltages representing the signal being handled. It is not proposed to enter fully into the theory of the systems here because that has been done in previous articles in this journal. We will, instead, consider the practical details. The average maximum output from a pair of high-efficiency pentodes connected in a Q.P.P. circuit and fed by a 120-volt H.T. battery is 1,000 milliwatts, whilst the corresponding figure for a class B amplifier used under similar conditions is about 800 or 1,600 milliwatts, according to the type of class B valve employed. Full details will be given in the next article of this series.

A SET IN A TOFFEE TIN

A Novel and Inexpensive Single-valver with a Dual-range Coil

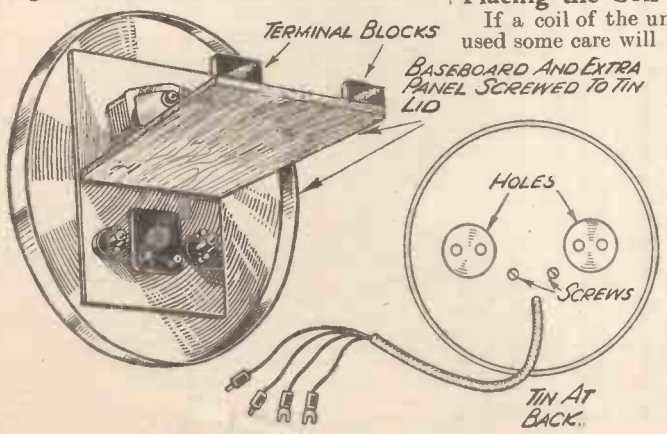
SOME weeks ago I described an unusual one-valve short-wave set in which a sixpenny cake-pan acted as panel, chassis, and cabinet. As the result of another inspiration I am able to describe an even more novel and inexpensive arrangement.

The set illustrated is built in an empty toffee-tin. It is a one-valve set with a dual-range coil, and may either be a broadcast or short-wave set—or even an adapter or short-wave converter. It is not proposed to go into details, but to convey the general idea.

Details of Assembly

Obtain an empty round toffee-tin of suitable depth and diameter. This should have a plain lid and be free from advertising matter. It is easy to give this a coat of paint if necessary. Cut a piece of plywood to the same depth as the tin, and a little less in width than the lid, after which drill the lid to take the condensers and switches, and then mount the baseboard. If desired, the condensers could first be mounted on a small square of plywood or metal, and the locknuts mounted on the lid, thus fastening panel and lid and giving greater rigidity.

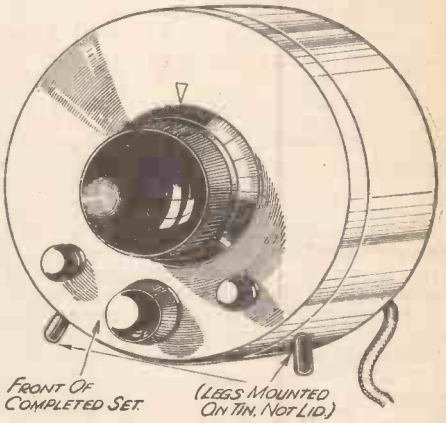
Holes are made in the bottom of the tin to allow 'phones and aerial to be connected, and for fixing screws and cable. The "feet," fixed where shown, are 4 B.A. bolts passed through ½in. ebonite pillars. Both the tin and lid must be earthed.



Details of layout of a novel single-valve set.

Placing the Coil

If a coil of the unscreened type is to be used some care will be required in placing this coil in such a position that it is not affected by the proximity of the metal case. The case could, in this instance, be earthed and thus used to prevent direct pick-up in the case of a powerful local transmitter. This earthing precaution could also be adopted where a screened coil is employed, and it will, in fact, be found one of the advantages of using this type of containing case.



Front view of the finished receiver.

Where the circuit arrangement permits, the panel-mounted controls could be joined direct to the lid and earth connection thus obtained, although a separate wire soldered between lid and case might be advantageous in the interests of a perfect electrical connection.

SHORT WAVE SECTION

Receiving The Ultra-Shorts

An Explanation of the First Points to be Considered, with Details of Suitable Circuit Arrangements.

ULTRA-SHORT wavelengths are now definitely on the wireless map, and will doubtless come into widespread use within the next year or two. They are looked upon with a certain amount of scepticism in many instances, just as ordinary short waves were a few years ago, but they will probably prove to be as invaluable as the wavelengths between 15 and 100 metres are to-day. It must be admitted that the number of transmitters at present operating on wavelengths below 10 metres is comparatively small, but it is growing every day, for enthusiastic amateur transmitters are not being slow to appreciate the benefits of 60-megacycle (5-metre) working. There are also a few experimental television transmissions on the ultra-shorts, and there will soon be more of these.

The Simple Detector Circuit

It is only natural, in view of the above-stated facts, that the experimenter who has previously taken an interest in short-wave reception should decide to "go down" still farther. The only question which confronts him concerns the best method of building a 5-8-metre receiver; he wants to know the most suitable type of circuit as well as the correct method of using it. As the simple detector valve with reaction has proved itself so effective for all normal short-wave reception, it would be feasible to expect that this would be as good as any for ultra-short-wave reception, but experience does not quite seem to bear this out. In fact, it is generally found that this popular type of circuit will not oscillate at the extremely high frequencies, or that oscillation cannot properly be controlled over the waveband, or that the degree of sensitivity provided is particularly small. Probably some of these difficulties could be largely overcome by using an efficient and special aerial system of the di-pole or other "tuned" type, but the average amateur does not have the facilities for erecting a "collector" system of this kind; instead, he has generally to be content with a simple vertical wire in conjunction with a decent earth connection.

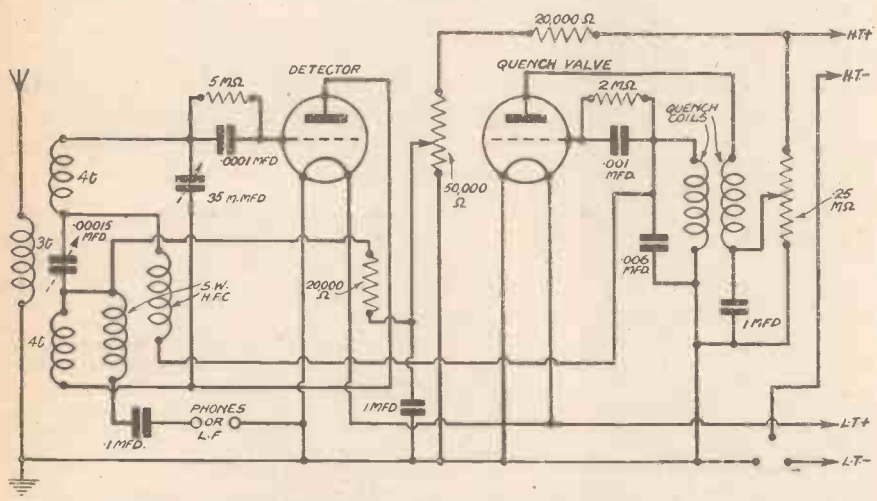


Fig. 1.—The circuit of a highly-efficient and up-to-date two-valve super-regenerative receiver for use on the 5 to 8-metre waveband.

Advantages of the Super-regenerative Circuit

We would not suggest that a special U.S.W. aerial is not worth while when conditions permit of its use, but when it cannot satisfactorily be provided—or even if it can—the most satisfactory circuit of the simple and inexpensive type is the super-regenerative arrangement consisting of two valves followed, if desired, by an L.F. amplifier. This type of circuit is extremely efficient and can be controlled very easily even when any odd length of wire is used as an aerial. A suitable theoretical circuit is given in Fig. 1, where it will be seen that the detector valve is wired in a form of Hartley circuit, whilst the quenching valve is connected as a normal oscillator with series reaction. Three ultra-short-wave coils are used in the detector circuit, and the correct numbers of turns (of ¾in. inside diameter) are indicated. The amount of reaction feed-back is governed largely by the .00015-mfd. (max.) pre-set condenser, but fine control is provided by the 50,000-ohm potentiometer in the H.T.+ lead. Tuning is, of course, carried out by the 35 m.mfd. condenser which is connected across the two 4-turn coils.

It is scarcely necessary to mention that the tuning condenser must be fitted with a very reliable slow-motion drive, but it is important to explain that the pre-set condenser should be one of the air-dielectric type which has recently been developed for U.S.W. use. The tuning and reaction coils for the second, or quenching, valve actually comprise a quenching-coil unit, and as such can be obtained from one or two manufacturers. The two H.F. chokes may be of any reliable type of short-wave compo-

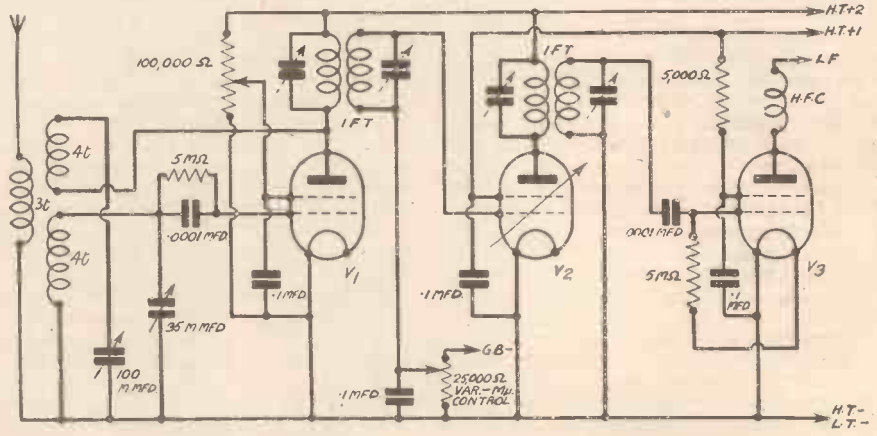


Fig. 2.—This is a skeleton circuit showing the essentials of an ultra-short-wave superhet employing 15 megacycle I.F. transformers.

nent, and all of the other parts are standard. It will be seen that a .25-megohm potentiometer is used to control the voltage applied to the anode of the quenching valve, and this should be of a good "silent" type.

Operation

With regard to the operation of the receiver, the pre-set condenser should be set to about two-thirds of its maximum capacity, after which the 50,000-ohm potentiometer may be adjusted to its midway position, and the .25-megohm potentiometer set about "one quarter on." After that, tuning is carried out in the usual manner, when normal reaction control is accomplished by means of the 50,000-ohm control. It is hardly possible to give exact details regarding the use of the .25-megohm control, but this will not require to be used very often and should be set to the position which gives maximum signal strength combined with a minimum (or almost complete absence) of background "hiss." Both valves may be of the H.L. type, and an H.T. voltage of 100 is adequate. When desired, an L.F. valve can be added in the usual manner.

The U.S.W. Superhet

The experimenter who prefers to have a somewhat more ambitious receiver than the simple super-regenerative just described will turn to the superhet. This is, in fact, a very desirable type of ultra-short-wave receiver, and it might be found well-nigh essential for the good reception of the high-definition television programmes, where a wide frequency response is required; this latter can be obtained by the use of the new I.F. units working on about 12 megacycles and having a band width of 1 megacycle.

A suitable and simple type of U.S.W. superhet circuit is given in Fig. 2, where it will be seen that the first valve functions as an autodyne frequency changer, the grid winding of the coil being tuned with a 35 m.mfd. condenser, and reaction being controlled by means of a 100 m.mfd. condenser. Both of these condensers should be provided with good slow-motion drives, and the condensers themselves must be of a type specially designed for U.S.W. work. It is possible to obtain a coil assembly suitable for this circuit from such a firm as B.T.S., and the special I.F. transformers are made by both B.T.S. and Bulgin.

The circuit calls for very little explanation since, in general principles, it is almost identical with the usual and popular arrangement used for reception on 10 to 100 metres. It will be seen that there is no earth connection, but this can generally be added without producing any ill effects; sometimes, however, the earth connection tends to "kill" oscillation, and it should then be dispensed with. The three valves shown may all be of the variable-mu S.G. type, or V1 and V3 may be plain S.G.s, and all other components may be standard short-wave ones.

Leaves from a Short-wave Log

WHEN, for the benefit of distant listeners, the foreign stations give out their call in more than one language, English is almost always included, and in consequence no difficulty is encountered in identifying the transmission. But in the case of short-wave experimental stations, of which so many broadcasts are now being picked up from South America, in many instances the call is only given in the Spanish language, and the pronunciation of the call letters and figures is inclined to mislead the British listener. If he hears the sound *aye* he is liable to interpret it as the letter A, whereas, of course, E is intended.

Spanish Alphabet

To facilitate identification the pronunciation of the Spanish alphabet is given hereunder:—

A (*ah*); B (*bay*); C (*thay*); D (*day*); E (*aye*); F (*effey*); G (*rhay*); H (*ah-ray*); I (*ee*); J (*rhota*); K (*cah*); L (*ellay*); M (*em-may*); N (*en-nay*); O (*oh*); P (*pay*); Q (*coo*); R (*er-ray*); S (*es-say*); T (*tay*); U (*oo*); V (*vay*); W (*doo-ble-vay*); X (*ay-kis*); Y (*yay*, or *ee-gray-yee-ah*); Z (*thay-tah*).

As regards numbers, it would also be wise to make a note of the following:—

1 (*oo-no*); 2 (*dos*); 3 (*trays*); 4 (*coo-ah-tro*); 5 (*cin-ko*); 6 (*says*); 7 (*see-ett-aye*); 8 (*oh-cho*); 9 (*noo-aye-vay*); 10 (*dee-ays*).

The Portuguese language we only hear from its native land or from Brazil, and it differs somewhat from Spanish—not so much in the alphabet, however, as in figures. 1 you will hear as *oom*; 2 (*do-is*); 6 (*say-is*), and 8 (*oh-ee-to*). The other numerals resemble Spanish so much that you cannot mistake them.

If you memorise these sounds when you hear them in the headphones or loud-speaker, they will be easily translated into their English equivalents. While on the subject of languages, I find that many readers misunderstand the words *Appel Général*, which are so often picked up in the amateur transmitter band. They are used by French, Belgian and frequently by Spanish and Portuguese fans, and mean "general call"—namely, "calling all stations." In one instance a correspondent asked me whether this signified that an experimenter was calling a general!

A Portuguese station which was previously heard on one or two occasions in the British Isles on or about 210 metres has suddenly appeared in the short-wave band. It has been logged on 51.79 metres (5,790 kc/s), and is situated at Oporto. A report from a correspondent states that it is awaiting official permission to carry out daily broadcasts. So far it has been difficult to identify the call letters, but they would appear to be either CT1HO or CT1HL, and hitherto have been used for amateur experimental transmissions.

Radio-Colonial Paris

If a search is to be made for a particular station, considerable assistance is afforded if it is made at the time one knows that a special transmission is taking place—namely, a broadcast of which details have been previously advertised. Such an opportunity is now given by Radio-Colonial, Pontoise (Paris), which on its three channels, 19.68 metres (15,243 kc/s), 25.27 metres (11,885 kc/s) and 25.6 metres (11,720 kc/s), is relaying, at fixed intervals, concerts from the Vichy Casino. They are carried out on Mondays at B.S.T. 21.45; Wednesdays and Thursdays at 21.30; Thursdays again at 16.30, and on Saturdays at 17.45.

Although transmissions from a number of South American stations are now being regularly captured, it is a noteworthy fact that these transmitters are prone to change their channels without due warning, or at least before the notification of such an alteration has had time to reach us. For this reason, it is not always an easy matter to keep a wavelength list up to date. In some instances the variation is not a big one, in others when the station has found a channel unsuitable, a fresh start is made in a totally different corner of the waveband. Herewith, latest information received—to facilitate entries into logs, the stations are mentioned as they are received working up the scale:—

HJ5ABE, Cali (Colombia), now operates on 21.28 metres (14,100 kc/s); the call is: *Radiodifusora Colombia, Cali*, and the studio has adopted a deep three-note interval signal which is struck before each announcement.

Guatemala

Almost immediately below PLV, Bandoeng—another good landmark—the ministry of Public Works at Guatemala is trying out a short-wave transmitter (TG1X) on 31.75 metres (9,450 kc/s). So far broadcasts have only been made on Sundays between B.S.T. 06.30-08.00; the programme relayed for experimental purposes is that of TGW, the medium-wave broadcaster in Guatemala City. The announcements are in Spanish.

A correspondent reports having picked up a call and broadcast on 37.61 metres (7,976 kc/s). It was logged as HCETC, Quito (Ecuador); an announcement was made to the effect that the station was on the air on Thursdays and Sundays from B.S.T. 02.00. The call was no doubt heard through interference and is probably mutilated, as the third letter (E) is more likely to be the figure 2.

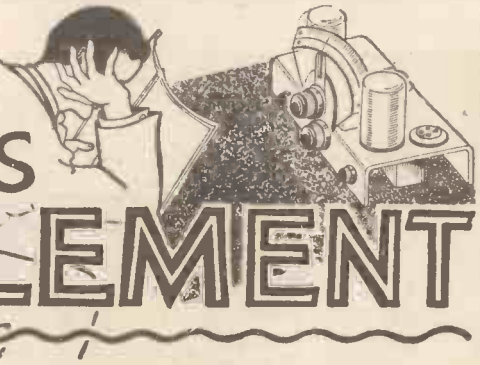
On 40.6 metres (7,390 kc/s) there should be no difficulty in finding XECR, Mexico City, of which the power has been raised recently to 20 kilowatts. It is operated by the Mexican Government (Foreign Office), and is on the air on Sundays from midnight B.S.T. to approximately 01.30. There is a likelihood that the call XEBT may be coupled to the announcements, as it is from this medium-wave station that programmes originate.

New Peruvian Transmitter

From Peru comes the news that a new transmitter OAX4G, at Lima, is working on high power every Thursday between B.S.T. 01.00-05.30; the channel used is 48.15 metres (6,230 kc/s). A new-comer also is HJ4ABJ, Ibaque (Colombia), on 47.62 metres (6,300 kc/s), and of which the call, I understand, is *Radiodifusora Ibaque* (phon: *Ee-back-ay*) *Ecos de la Combeima* (phon: *Com-bay-ee-ma*). Works daily from B.S.T. 01.00-04.00.

NEW WAYS WITH OLD PROBLEMS.

BEGINNER'S SUPPLEMENT



A Few Practical Pointers to Bear in Mind When Overcoming Problems of a Constructional Nature.

THOSE who have "taken up" radio somewhat recently can have no real idea of the difficulties the "old hands" used to encounter, and the devices adopted owing to the crudeness of some of the apparatus available, and often the complete absence of equipment which now is considered essential. Nowadays, the relief from small constructional difficulties and the improvement in the efficiency of components of all kinds gives the amateur more time for experimenting.

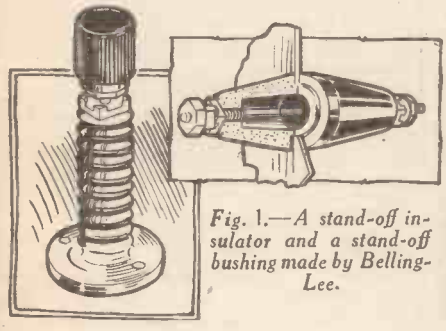


Fig. 1.—A stand-off insulator and a stand-off bushing made by Belling-Lee.

On the Aerial Side

While a good and high extended aerial is acknowledged to be by far the best proposition for every class of reception it is not always easy to arrange one in the space available. One of the most common difficulties is the running of the down lead which, of course, should be well spaced from roofs, walls, gutters, and so forth. So often a crazy arrangement of reel insulators supported on odd pieces of wood had to be used to direct the route of the wire, but now there are neat "stand-off" insulators in a variety of makes and designs which do the job in an efficient and neat manner. Some of the latest, made of moulded insulation, can be had on either straight stems or mounted on right-angled brackets, and both types may be arranged for screwing direct into wood, or with the brackets drilled for fixing to either wood or masonry (See Fig. 1).

Apart from their use as supports for down leads, these insulators make possible the erection of a vertical wall aerial, which is often regarded as the next best thing to an extended aerial. It is generally agreed that height is rather more important than horizontal span in an aerial, and a vertical wire taken up to the greatest permissible height and spaced a full 6in. from the wall of the house is undoubtedly better than a loft aerial, and can usually be arranged without any difficulty.

Component Grouping

Turning to the interior of the set itself, it is extraordinary what trouble was sometimes experienced in accommodating all the small components by way of resistors, condensers, and so on, required for a modern high performance set. Even when using the "wire-end" type of components, and chassis construction in place of the older base-board lay-out, it was not the easiest matter to find places for all the small components in a manner which avoided all unwanted couplings, and at the same time left the component reasonably accessible, in addition to giving a fairly neat appearance. Then commercial set makers started arranging their small components on strips of insulating board, where all were neatly grouped and get-at-able, an example of which is shown in Fig. 2.

Group-boards are now available with rows of slits through which the wire ends of the components may be threaded and finally bent and cut to length before soldering together (see Fig. 3). Up to twenty-four-way boards are obtainable, and these may be cut up into sections containing the exact number of components needed, so that, if considerations of lay-out render two or three separate groups of components advisable, this can be easily and cheaply arranged.

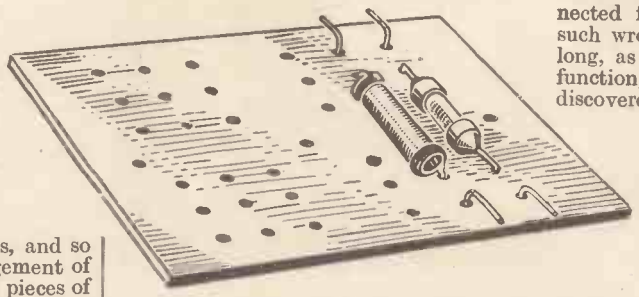


Fig. 3.—The modern form of "group board": has holes at varying distances apart to neatly accommodate components of different sizes.

Condensers

When a set is constructed on the chassis principle, the chassis itself is usually employed as the common negative connection, and it therefore follows that one end of a large number of components may conveniently be joined direct to the chassis. This has often meant a number of separate screwed or soldered connections to the chassis—not always an easy job, especially when using aluminium sheet. Electrolytic condensers have, of course, always been available with the case arranged as the negative pole, and with arrangements for screwing this to the chassis, but it is only just recently that paper condensers of small values for use in all parts of a circuit have been available with a similar fixing. This means that the majority of the fixed condensers in a set may now be anchored in position by the screw which completes also the connection to the negative lead, thus saving time, space, and one wire, and making for a more rigid wiring system.

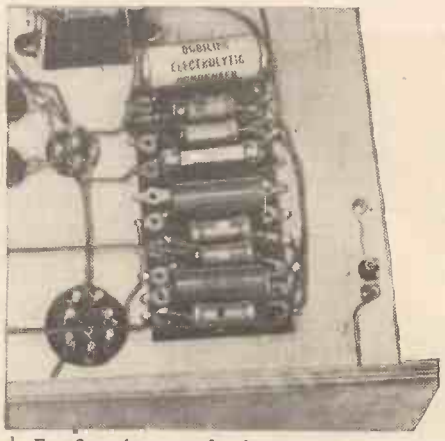


Fig. 2.—An example of component grouping as typified in the under chassis layout of the A.C. Hall-Mark Four.

Mention of electrolytic condensers is a reminder that since these are polarised, there is some risk of their being damaged if used in a universal set on D.C. and the mains plug is accidentally reversed. There are, however, now universal or "reversible" electrolytics which do not suffer damage if they are wrongly connected for a few minutes. Of course, such wrong connection would not be for long, as a set reversed on D.C. will not function, and the mistake is speedily discovered.

In the old days it used to be difficult to evolve a really satisfactory switching system to make the different changes of connections required in experimental and other receivers. To-day, most ordinary routine switching requirements can be met by standard switches of excellent design, and where unusual requirements have to be met there are multiple switches with up to as many as thirty-two pairs of contacts, and with up to six operating positions. Not only are these of substantial construction, making good, low resistance contact, but the capacities between adjacent circuits are very low—only a fraction of a micro-

(Continued on page 21)

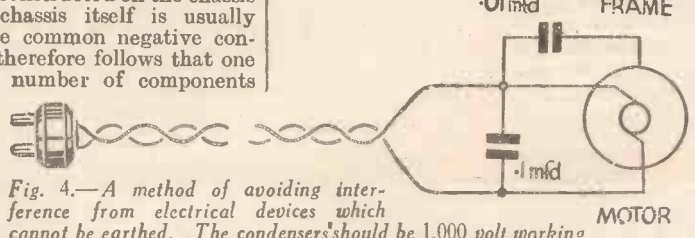


Fig. 4.—A method of avoiding interference from electrical devices which cannot be earthed. The condensers should be 1,000 volt working pressure and fitted not more than 12 inches from the motor.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

C. R. C. (Northwood). Tone may be corrected by connecting a .01 mfd. condenser across the speaker. If a five-pin pentode is to be fitted a five-pin valve holder must be substituted for the existing four-pin holder of the output valve. The four outside sockets of the new holder should be wired in the same way as those of the four-pin type, and the centre socket must be connected to an H.T. voltage of between 100 and 120 volts. Postal replies are not sent unless a stamped addressed envelope is enclosed with the inquiry.

W. R. (Glasgow). Your diagram is in order, and therefore the hum is probably being picked up from an external source, and should be cured at its source. It is suggested that a .001 mfd. condenser be connected across each half of the mains transformer H.T. secondary winding, however, as the hum may possibly be of the modulated type.

E. A. L. (Chiswick). We suggest that you build the Lucerne Straight Three, blueprint number A.W.437. The diagram you enclose is of a dual range iron-core coil.

A. C. (St. John's Wood). Two voltage doubler rectifiers may be connected in parallel in order to obtain a current of one and a half times that obtainable from one of the rectifiers. The mains transformer must then be capable of supplying the extra current, of course.

D. F. H. (Maidenhead). We suggest that you connect a .001 mfd. condenser between the A.C. terminal of the rectifier and MB, and between the juncture of the two electrolytics and MB, and also test the electrolytics. Try readjusting the trimmer condensers, and if no improvement is effected test the first valve and the coils.

H. N. (Newburn). We suggest that you obtain an eliminator giving an output of approximately 25 m.a. e.g., Ekco, Atlas, Regentone). Whilst the existing power valve is being used, a 3,000 ohms resistance may be connected between H.T.+ of the eliminator and the H.T.+ lead of the set in order to reduce the voltage. The eliminator should have an S.G. tapping, preferably of the variable type.

B. H. (Sutton Coldfield). It will be necessary to completely redesign your receiver if A.C./D.C. operation is desired. We regret that we cannot undertake to do this, and suggest that you refer to our A.C./D.C. design, the Universal Hallmark. We do not send a postal reply unless a stamped addressed envelope is enclosed with the inquiry.

No Name (Oldham). You omitted to give your name and have, therefore, created a breach of our rules. You also omitted the query coupon.

A. McR., Ltd. (Adelphi). Messrs. Sound Sales, Ltd., of Tremlett Grove Works, Junction Road, London, N.19, can supply the component in question.

G. N. P. (Reigate). The connections for the Bulgin C.40 coil are as follows: Aerial to terminal No. 4; earth and one side of wave-change switch to terminals 3 and 5; grid condenser (or fixed vanes of tuning condenser) to terminal 1, and reaction condenser moving vanes to terminal 6. The other side of the wave-change switch is joined to terminal 2. If the coil is provided with coloured leads, these correspond to the above numbers in the following manner: Green, terminal 4; red, terminal 1; blue, terminal 2; grey, terminal 6, and yellow, terminals 3 and 5.

R. T. R. G. (Leicester). We are sorry that we have no information regarding the particular coil you refer to. Perhaps the makers could help you. They are Messrs. H. Clarke and Co. (Manchester), Ltd., Atkas Works, Patricroft, Manchester.

W. C. C. (Leeds 2). The trouble may be due to microphony. Try screening the valves with some thick material which will prevent the glass from receiving the sound impulses. If this does not cure the defect, it may be due to interaction between some L.F. components such as transformer, choke, etc.

C. K. (Garston). We regret that the Orbit is the only circuit we have published using the coils in question.

S. C. (Herne Bay). We are sorry that we cannot diagnose the fault from the details given. It may be due to overloading, or to insufficient H.T. on the output valve. There may be some serious circuit fault, and therefore a circuit diagram with full working characteristics should be sent to us.

Realistic Reproduction and its Problems — 2

Points Concerning the Detailed Design of a Distortionless Receiver are Dealt With in This Article

By DAVID SUTTON

WE have already decided that in order to avoid attentuation of the side bands (which means loss of high notes and overtones) we must content ourselves with a rather flatly-tuned receiver. We have accepted the fact that this will limit our listening to comparatively few programmes—to signals which are considerably stronger than any on nearby wavelengths.

To what extent must this flat tuning be applied? From the quality point of view, the flatter the better—but it must also be remembered that the flatter the tuning the smaller the number of stations it will be possible to receive free from interference.

Now, in general purpose or ordinary receivers, high-frequency stages are employed mainly for two purposes—first to increase the sensitivity of the set, thus enabling more stations to be received; and, second, to increase the selectivity of the receiver, so that interference between stations is reduced.

H.F. Amplification

In a quality receiver a considerable degree of high-frequency amplification is desirable as, by avoiding the temptation to push the efficiency of each high-frequency stage to the limit, it is possible to build up undistorted high-frequency signals to a strength which will permit the use of diode detection—the most perfect type of detection from the quality point of view, and in many cases to use the output from the detector to excite the grid of the output valve without any other low-frequency amplifying stage. By these means it is possible to avoid many other sources of distortion commonly found in sets where the utmost degree of amplification is insisted on in every stage.

It seems rather strange, perhaps, to jump suddenly from a discussion of the high-frequency amplifying stages to the output valve, but it is impossible to explain clearly why certain features appear in the designs of quality receivers without first dealing with the low-frequency side of the set. In fact, the correct way to design any receiver is to work backwards from the speaker and output valve to the aerial, and it is a great pity that so few designers appear to adopt this practice.

For the purpose of this article, however, we will neglect the speaker and will assume that we have selected a speaker of approved performance which suits our purpose.

Power Output

We must now consider the amount of output power which we shall require from our set. Now this is a point on which many amateurs go astray. They read that a certain valve has an output of, say, 2½ watts, and then they proceed to try and get 2½ watts out of it, with most devastating results. They either forget or do not know that the 2½ watts, or whatever the figure is which is given as the output, is the *maximum* output free from distortion which can be obtained from the valve.

During a broadcast performance the strength of the audio-frequency signal is continually changing—not only from item to item (for a military band ought to sound louder than a pianoforte solo) but also during a single piece of music. Clearly during a soft passage of music less low-frequency power is radiated than during the loud passages. If it were not so, the effects of light and shade in the music would be lost. So it happens that during the major portion of any item the actual audio-frequency signal (or depth of modulation) is only a fraction of the maximum possible; but when the grand finale comes, with its thunder of drums and crash of cymbals, and with every instrument playing fortissimo, the signal is at its maximum. And it is at such moments only that the output valve should be asked to give something approaching its rated output.

It is a fairly safe rule, therefore, to budget for an output valve whose rated maximum output for 5 per cent. distortion is about five times the *average* output required from the set. This is the minimum "factor of safety" which should be allowed in a quality receiver, and in some cases a very much bigger margin is provided.

Now, half a watt of audio-frequency power is about right for normal volume in an average domestic room during the quieter portions of the programme, so an output valve rated for from 2½ to 3 watts maximum output is about the smallest suitable for a quality domestic receiver.

Half-watt Output

At this point somebody is sure to remark that a very much smaller output of power than half a watt is more than ample for domestic reproduction. I am perfectly aware that under the conditions of distortion obtaining in ordinary receivers, a valve having a maximum rating of only one watt and giving, at average modulation, something under a quarter of a watt, is as much as, if not more than, a critical listener can stand and that, under these same conditions, a set fitted with a 2½-watt valve and running "all out" is unbearable.

But with a set designed for real quality a very much larger volume level can be used without seeming in any way excessive, for with such a set the sound does not seem to be projected at you in a mighty blast, but just pervades the whole room. There is no effect of "arrival"—the sound is just "there."

Besides this, of course, there is always the volume control available, and by reducing the signal input the volume level can be adjusted to suit individual tastes, while at the same time the factor of safety will be correspondingly increased and quality on loud passages rendered still better.

Output Valves

There are several excellent output valves for A.C. sets rated at from 2½ to 3 watts or more of undistorted output. If greater volume or a larger factor of safety is required, bigger valves, rated at 5 or even 7 watts may be employed, or two 2½-watt valves may be used in push-pull.

Having decided upon a suitable output valve, it is necessary to ascertain from the maker's data the audio-frequency grid input voltage necessary to load it fully. The earlier stages of the set must then be designed to provide this audio-frequency voltage. In ordinary receivers, voltage amplification is usually divided between the high-frequency stages, the detector, and possibly an additional low-frequency stage. One or two high-frequency amplifiers, or, in the case of superhets, intermediate-frequency amplifiers, provide a considerable degree of voltage amplification. If the detector is of the triode or pentode type there is further amplification in this stage, often sufficient to provide the full voltage necessary to "load" the output valve.

Causes of Distortion

Every stage of amplification, however, is a possible means of introducing distortion, not merely or even mainly in the valves but due to the non-linear characteristics of the associated circuits and components. Provided, therefore, that care is taken to avoid overloading in any stage, the simpler the receiver and the fewer stages employed the better. It is particularly easy to introduce distortion in the low-frequency amplifying stages owing to the wide range of frequencies which have to be handled, since the different frequencies are not treated equally by various parts of the circuit.

Special Features in

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Technical Articles.
Problems of the All-wave Receiver. By J. H. Reyner, A.M.I.E.E., B.Sc. Your Ideal Short-waver. By G. Howard Barry. Simple Multiple Tone Control. By Noel Bonavia Hunt, M.A.

Television.
Principles of Natural-colour Television. By Morton Barr. The Simple Arithmetic of Television. By Percy W. Harris, M.I.R.E.

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PRACTICAL AND AMATEUR WIRELESS, 21/9/35.

BEGINNER'S SUPPLEMENT

(Continued from page 17)

microfarad, so that they may be used with impunity in any part of the circuit.

Volume Controls

In this connection it is noteworthy that very serious attention has been paid of late to the production of volume controls—in other words, variable resistances—of sound design and silent operation. Previously, the volume control was the most unsatisfactory component amongst the small radio parts, but now, with metallised resistance elements, new methods of securing them, better design of sliders and generally sounder mechanical and electrical construction, these components are quite satisfactory. There are also two-way faders, of sound design, which are available at reasonable prices, making it possible to fade out, say, a microphone circuit, and fade in a gramophone or radio transmission, or to fade gradually from one turntable to another. Such a device will be useful to experimenters, to those who interest themselves with public address equipment, and also those who have joined the ranks of the amateur transmitters.

Avoiding Interference

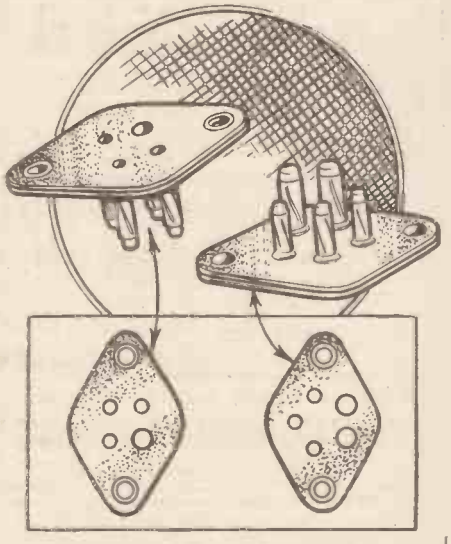
It is still not possible to compel the owners of offending machinery to fit suppressor devices, but such devices are now quite inexpensive. Quite as important is the fact that in a great many districts man-made static is produced to a greater degree by household appliances than by industrial plant, and the new suppressors for use with small domestic appliances are not only cheap, but are simple to install and involve no risk whatsoever. In the past many householders have fitted suppressor devices at the meter, or at the mains input to the set, neither of which has much effect on the interference produced by sewing machines, hair-driers, vacuum cleaners, and the like. Unfortunately, these smaller appliances are usually arranged for connection to ordinary two-pin plugs which have no provision for earthing the frames of the motors, but now handy suppressors of the condenser type can be purchased for inclusion in the flex lead to the appliance, and have the effect of placing a condenser across the mains, and another from one of the mains leads to the motor, as indicated in Fig. 4.

Facts & Figures

COMPONENTS TESTED IN OUR LABORATORY.

Clix Midget Valve-holders

THE Hivac midget valves will in future be fitted with small pins in place of the original blobs of solder, and to accommodate the new types, Messrs. Lectrolinx are manufacturing some small valve-holders somewhat on the lines of the ordinary Clix chassis type. These are of paxolin and have small sockets fitted, no terminals being



The new Clix Midget valve-holders.

provided for connection. The socket ends are prepared for a soldered connection, and this is obviously the only method of connection which can be adopted with such small bases. There are two types of holder—4-pin and 5-pin, and the sockets are of different sizes. In the 4-pin type three sockets are of small diameter, whilst one is of large diameter, and in the 5-pin type two pins are of large size. This makes it readily possible to insert a valve quickly without various trial fittings, and the paxolin is brought above the ends of the sockets and thus prevents accidental contact of socket and pins when the valve is in an incorrect position. Four-pin holders cost 10d. each, and 5-pin 11d. The holders are of the two-screw fixing type and are suitable for either metal or wooden chassis.

Messrs. Burne-Jones—Change of Address

TO cope with increasing business and new developments in marine and geophysical apparatus, Burne-Jones & Co., Ltd., have moved into commodious modern premises. Components and set production is carried out on a spacious floor, while presswork, machine tools, tool-room, and spraying plant occupies a separate floor. Already the company have manufactured upwards of 25,000 sets for the use of blind persons in the United Kingdom. The new address is 309-317, Borough High Street, London, S.E.1. The telephone number remaining as before Hop 0495.

A New AC/DC Philco

THE Philco Radio and Television Corporation of Great Britain, Limited, of Perivale, Middlesex, announce a new universal mains superheterodyne receiver to be known as the Model 280 Baby Grand. As its name indicates, the new Philco is a table-model receiver, and it is listed at 11½ guineas. The cabinet is ornamental and pleasing in design, the dimensions being: top to bottom 18¼ins.; side to side 14¾ins.; front to back 10ins.

The principal features of this new Philco receiver are five high-efficiency valves; 9 kc/s superhet selectivity; 190-275 volts A.C. or D.C. without change; new type barretter valve; full automatic volume control; 3-point tone control with bass compensation; 8in. auditorium moving coil speaker; 3 watts undistorted output; increased wave range—medium, 540-1,500 kc/s; long, 150-400 kc/s (metres, 555-200, and 2,000-750); sensitivity switch; inbuilt filter system; rubber-mounted chassis and tuning condenser; plug-in aerial and earth connections; gramophone pick-up sockets with front knob control; extension speaker sockets; ventilated back; kilocycle calibration and station names; free insurance policy against fire, theft, and accident.

Improved Statoformer

MESSRS. WARD & GOLDSTONE have now modified the Statoformer interference suppressing device, which formerly was intended for use on medium-wave bands. The improvement consists in the incorporation of a long-wave winding, thus bringing the Statoformer into effect over the entire broadcast range. The new model costs 9s. 6d., but the makers will be prepared to modify old models for a charge of 3s. 6d. Alternatively, a special auxiliary unit may be obtained for 2s. 6d., and this may be used in conjunction with the old model to bring it into line with the new device. The address of Messrs. Ward and Goldstone is Frederick Road, Salford, 6, Lancs.

Bulgin Universal Resistances

FOR regulating the supply to the heaters of the universal type of mains valve some form of dropping resistance is required, and a special component is manufactured in two different forms by Messrs. Bulgin. The universal valves are designed, of course, to pass an identical current, when the question of voltage dropping is simplified, as it is only necessary to ensure that the correct current is passed, and the two resistances in circuit may then be easily ascertained. As the majority of the universal valves are rated at 13 volts, the calculation is simplified, and the makers of the resistance are thus enabled to provide a component to use with a definite number of valves. In the Osram range of valves there is a rectifier which is rated at 26 volts, and for the purpose of calculation this must be taken as two 13-volt valves. The resistance is provided with clamps which serve for connecting points for mains of different ratings, and in the enclosed or single enclosed types this range is from 200 to 250 volts. In the skeleton models a further tapping point is provided for mains of 100 to 110 volts. The heat-proof former is wound with high-grade nickel alloy wire having a negligible temperature coefficient, so that within wide limits the resistance remains constant irrespective of the heat which is generated. It is advisable, however, to provide adequate ventilation to avoid an undue rise in temperature in view of the possibility of damaging other components situated close to the resistances.

Eddystone Air-tuned I.F. Transformers

THE transformers under review are manufactured by Messrs. Stratton and Co., and are seen in the accompanying illustration. The external case consists of a neat cellulosed box measuring approximately 3in. by 2in. by 3in., and the colour of the finish is that now referred to as "battleship grey." The four connecting points, Grid, G.B., Plate, and H.T. are embossed on the sides of the box, and 12in. flexible leads project from holes at these points. To avoid mis-matching the leads should not be crossed or twisted, but should run in the most direct manner possible to the appropriate point. Two holes are visible on top of the case and are marked primary and secondary, and enable the air dielectric trimming condensers to be adjusted. These are miniature brass components, having a minimum capacity of 3 m.mfd. and a maximum capacity of 65 m.mfd., and thus they enable a frequency band of approximately 100 kc/s to be covered with the particular coils which are fitted. These are Litz wound and the inductance of both primary and secondary is such that they cover the band from 400 kc/s to 500 kc/s. The two coils are permanently mounted at such a distance that a band-width of approximately 7 kc/s is obtained. The transformers have been tested and found highly efficient, the trimming condensers remaining set at any position of their adjustment, and ordinary vibration will not modify the settings. The cost of these transformers is 13s. 6d.

The air-tuned Eddystone I.F. transformers.

NOISE-FREE AERIAL SYSTEMS

(*Continued from page 8*)

Similar results are procurable by the use of a special flex feeder cable, comprising two twisted conductors, well insulated and embedded in rubber, and with a surge impedance of 120 to 150 ohms at about 20 metres; other parts of the aerial system remaining the same, and as advocated.

There is no doubt that by employing one of each aerial arrangement mentioned, an all-wave receiver can be expected to give an improved noise-free performance.

Downleads

Both downleads can pass to the set at a common leading-in point, consisting of a hole through the wood framework of a window or a bushed hole in a glass pane, or even a large diameter plain ebonite tube. It is of vital importance that the downleads are not broken by means of special fitments, as the exposed points are then capable of picking up noises from the "blanket" of electrical static which surrounds a building. As already mentioned, the matched transmission line downlead for broadcast wavebands can be treated like an electric cable, but slightly more careful treatment is necessary for the low-loss type. This should be fixed to extension brackets attached to the outside wall in order to relieve the horizontal aerial of the weight, and to prevent high winds and rain causing disintegration of the protected foil screening.

The short-wave aerial feeder cable on the other hand, must be treated like a normal downlead and be brought in preferably at an angle to the building, and not less than 15ft. from it for its major length. This is not a difficult condition to fulfil, because the feeder cable length (up to about 100ft.) has no apparent effects on signal strength.

MODERNISING YOUR SUPERHET

(*Continued from page 6*)

this type are made by Varley, and sold under the name of the "Variband" I.F. unit at 17s. 6d. complete.

Volume Control

It would be possible to effect a further modernisation by replacing the triode second detector by a double-diode-triode, and by providing for A.V.C., but this would not generally prove to be worth while in the simpler type of set to which reference is being made, besides which it would involve fairly considerable alterations which many constructors would prefer to avoid. If A.V.C. is desired it may be added by following the instructions given by "The Experimenters" in their article in the May 25th, 1935, issue of this journal. In most cases, however, it will be preferable to be content with ordinary manual volume control, which can be obtained by using the connections shown in the skeleton circuit in Fig. 7: it will be seen that the control operates on both the pentagrid and I.F. valves, and is obtained by means of a 50,000-ohm potentiometer connected in the usual manner. The grid leak used in the circuit of the first valve provides ample decoupling for that valve, and a 50,000-ohm non-inductive fixed resistance is used in conjunction with a .1-mfd. fixed condenser for decoupling the second. Also note that a three-point on-off switch is used in place of the previous two-point component, since it is necessary to break the H.T., L.T. and G.B. circuits simultaneously.

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

INSTITUTE OF SCIENTIFIC RESEARCH

READERS of this journal who may have seen, from time to time, reports in PRACTICAL AND AMATEUR WIRELESS of the activities of the Institute of Scientific Research will be interested to learn that a Q.S.L. card forwarding bureau is being formed in conjunction with this organisation. All readers interested in this scheme are invited to send a stamped addressed envelope to the Q.S.L. Bureau, I.S.R., West Park Drive, Roman Avenue, Leeds 8.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

ON August 30th to 31st the Anglo-American Radio and Television Society held a novel dance at Uxbridge, during which those present danced to dance music broadcast in a special concert dedicated to the Anglo-American Radio and Television Society by W2XAF in Schenectady.

Volume was excellent, and despite the fact that the hall was quite big there was no trouble in hearing and dancing to the programme throughout the length and breadth of the hall.

A similar dance will be held at a later date. In the meantime a dance organised by the Society is being held at Gerrard's Cross on September 11th.

On October 15th YV2RC, Caracas, Venezuela, is broadcasting a special Anglo-American Radio and Television Society concert. Reports of reception are welcome, and these may be addressed to Mr. Leslie W. Orton, at "Kingsthorpe," Willowbank, Uxbridge, or to the station concerned.

On October 30th the West Middlesex and East Bucks Branch is holding its first winter meeting. A demonstration of a modern all-wave receiver will be among the attractions.

On September 6th the Anglo-American Radio and Television Society Dance Orchestra broadcast from Radio Normandie for the first time. It is under the leadership of Mr. Albert Williams.

PROPOSED NEW CLUB FOR PLYMOUTH

WILL readers who reside in or about Plymouth who are interested in forming a radio club communicate with Mr. J. H. Light, 4, Peverell Terrace, Peverell, Plymouth?

IMPRESSIONS ON THE WAX

By T. Onearm

OF th many interesting records produced by the Columbia Graphophone ompany for this month that of Guila Bustabo, the girl wonder of the violin, is considered their best recording. The amazing proficiency of this artist will leave a lasting impression upon all who hear this record. Though a mere girl, she performs with the maturity of a master. The titles she has chosen for this 12-inch record are Mendelssohn's "On Wings of Song" and "Praeludium and Allegro," both of which are played with consummate skill. The number of this record is *Columbia LX*401.

Orchestre Raymonde Waltzes

THE Orchestre Raymonde can always be depended upon for the delightful and unusual, and in the new list of Columbia it maintains its high prestige in cleverly played versions of Johann Strauss's "Love is my Life" and Lanner's "Romantique" waltzes, both brilliantly arranged by G. Walter, who is the leader of the orchestra. An interesting feature of this record is the introduction of the Electronde, an instrument from which music is obtained by a waving of the hand, setting up electrical vibrations. *Columbia DB*1573 is the number of this interesting record.

Maclean's "Monastery Garden"

IT is a truism that Quentin Maclean never makes an indifferent record; in fact, it is his own individual interpretations of standard favourites that create the demand for them on his records.

Such is the case with Albert W. Ketelbey's time-honoured "In a Monastery Garden," which Maclean has done for Columbia in their latest list. The opening bird notes in the hallowed sanctuary, the Kyrie Eleison (sung by a vocal quartette), and the many other familiar things in this evergreen tone poem—Maclean has brought them all out with wonderful clarity and effect on the super Trocadero Cinema organ. This is a 10-inch double-sided record, and its number is *Columbia DB*1571.

"The Strong Go On"

LANCE FAIRFAX, the brilliant baritone, actor, and broadcaster, has scored another tremendous hit with the new song entitled "The Strong Go On" in company with "Shannon River" on *Columbia DB*1572. Fairfax is still identified with the success of the song "For Love Alone," which he sang in a Henry Hall Guest Night, and his Columbia record of this testifies to the splendid impression he made.

Two studies in the macabre come from Malcolm McEachern on Columbia this month. One is Kipling's "Hanging of Danny Deever," set to music by Walter Damrosch, the eminent conductor, and the other is "The Witch of Bowden," written and composed by Ogilvie and Smith. McEachern exploits his magnificent bass voice in these grim songs and achieves the maximum effect with his phenomenal low notes. The number of the record is *Columbia DX*701.

Turner Layton as a Star

THE farewell performances of the American duettists Layton and Johnstone, now being given throughout the country, remind us that with these artists parting company, Turner Layton (he at the piano) is starring on records with Columbia. The big hits from the film "Roberta" (which is generally released this month), form this artist's current contribution to Columbia. They are "Lovely to Look at" and "Smoke Gets in your Eyes" on *Columbia DB*1574, and Layton's piano playing is an additional attraction.

Larry Adler in New Hits

DEPEND on it that any tune which presents exceptional difficulties in the matter of its execution, Larry Adler will play on his mouth organ. This month on Columbia he provides a sensational rendering of the song "I Won't Dance" (from the film "Roberta"), one of the snappiest dance tunes of the year. Not only that it is full of surprising twists, difficult enough for any full band to play, and crowded with pitfalls for a single player of a small mouth organ, but after his amazing "Rhapsody in Blue," we know that Larry Adler can do anything with his instrument. Coupled with this tune is "Why was I Born," the number of the record being *Columbia DB*1576.

Orchestral "Cloches de Corneville"

ROBERT PLANQUETTE, the French composer, achieved his greatest success with the three act operetta "Les Cloches de Corneville." Its tuneful songs and orchestral items have remained in the repertoire of military bands and orchestras ever since it was produced in 1877, and it is good to see an orchestral fantasia of it in recorded form by the Vienna Symphony Orchestra on a Columbia Record just issued, the number of which is *Columbia DB*1570.

LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.

All letters must be accompanied by the name and address of the sender (not necessarily for publication).

You're Telling Us!

DEAR THERMION,—Anent your remarks about correspondent E. H. (Freshfield), I would like to say that the average radio enthusiastic schoolboy can and does make sets. But when you say "Very few, if any, can design a set" it is a bit too much. As a schoolboy of fifteen, who always designs his own sets, I feel I must protest, if only to ease my conscience. Incidentally, I have been at radio now exactly two years, and on your paper, which I have taken for most of that time, rests the credit for my progress. Cutting the debunking, I must say that I like your column very much and I heartily agree with your views about crooners—drown the lot!—R. E. VINCENT (Goodmayes).

Our Short-wave Section

SIR,—I have been a regular reader of your paper from the beginning and I would not give it up now for anything. I have only one complaint to make—the short-wave section is not large enough. I should be very pleased to get in touch with any reader interested in S.W. work and using a one-valve set.—D. CHAMBERLAIN (150, The Broadway, Wimbledon, S.W.19).

[*Any interested reader in the Wimbledon district is invited to get in touch with Mr. Chamberlain.*—ED.]

Lampex Band Pass Four: A Correction

SIR,—We noticed in your show report number a slight error regarding our Band Pass Four Set, which is only made for A.C. or A.C./D.C., and not for battery operation. The battery set is our type S.G.3, which has very nearly band pass characteristics in so far as variable selectivity is incorporated in the aperiodic aerial circuit in conjunction with the input volume control, and has the property of retaining true variable selectivity without upsetting the alignment of the ganged tuning circuits. This system is also incorporated in the Band Pass Mains set, which, of course, is a distinct advantage for this type of set. The peak separation being from 7 kc/s min. to 9.5 kc/s max., on medium-wave band.—LAMPEX RADIO AND ELECTRIC CO. (London, N.7).

Transmitting Data

SIR,—My letter, though a little after, no doubt, scores of others on the above subject, will convey to you the feelings of most readers and enthusiasts in this territory.

I appreciate J. C. Johnson's letter, and feel that data of this nature is essential and more especially through the medium of your valuable journal. Whoever cares to abuse the privilege of this knowledge certainly calls for the full powers of the law upon their head.

Our paper, as I and many of my friends here term it, has given us in this out of the world place so much help that we appreciate your motives in withholding this information, more especially as your articles are so easy to digest, and so very comprehensive.

Personally, I feel that if we are to progress with experimenting, it is essential that a little space be provided for the gaining of sufficient knowledge to pass the tests set by the different authorities, especially when an entrance fee is required.—"YDNAS" (Vila Pery, B.E.A.).

Articles on Transmission

SIR,—I have of late noted that a fair amount of correspondence relative to articles on transmission, both theory and practice, have appeared in your estimable journal, and as an amateur of some years' standing I should like to add my name to the list of "Hams" who support the suggestion of said articles appearing in your paper.

I would like also to suggest that you give readers an article giving full details for the construction of a low-power C.W. and telephony transmitter, crystal controlled, of course, the articles giving practical, in addition to theoretical, details of the set with full operating data. It would, I think, be found that such an article would receive a hearty welcome from the more technical of your readers, and the recent correspondence proves that the number of that class of reader is by no means small. Wishing your journal continued success in the field of radio construction.—STANLEY C. P. MARKS, 2BGJ (Dagenham).

The Social Side

STOP Press from Scottish Radio Exhibition. First winner Challenge Bowl presented by Radio Manufacturers' Association of Great Britain for competition at Annual Joint Meeting in Glasgow of the Radio Industry and the Scottish Radio Golf Societies yesterday was C. W. Bridgen, General Sales Manager of the Ferranti great radio and engineering concern.—BAGGS (FERRANTI).

CUT THIS OUT EACH WEEK

Do you know

—THAT very high efficiency is claimed for a new method of coil winding in which no iron core is employed.

—THAT the ratio of an H.F. transformer can have a marked effect upon the performance of a receiver employing an H.F. stage.

—THAT increased efficiency is obtainable when an H.F. choke is provided with an iron core.

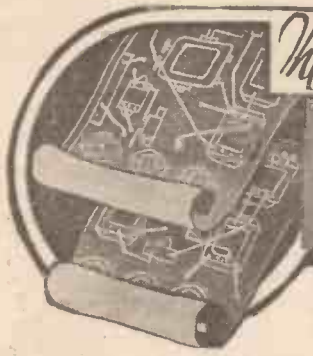
—THAT special filter arrangements may be adopted when using two loud-speakers, so that various frequency bands are handled by the separate speakers.

—THAT a hum-bucking coil is a valuable part of a pick-up when used with a synchronous motor.

—THAT it is possible to purchase special cable and plug points, etc., for remote control-switching purposes.

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

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



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Atom Lightweight Portable	2.6.34	PW36
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Armada Mains Three	18.8.34	PW38
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D.C. £5 Superhet Three	1.12.34	PW42
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Universal Hall-Mark	9.2.35	PW47
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Short-Wave Converter-Adapter	23.2.35	PW48A
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	11.5.35	PW50
Genet Midget Three	*June* '35	PM1
Cameo Midget Three	8.6.35	PW51
F. J. Camm's 2-valve Superhet	13.7.35	PW52

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STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.		
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Two-valvers: Blueprints, 1s. each.		
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Three-valvers: Blueprints, 1s. each.		
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P.T.P. Three (Pentode-Triode-Pentode)	*June* '35	WM389
New Regional Three (D, RC, Trans)	25.6.32	AW349
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New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
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Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF Pen, D, Pen)	14.4.34	AW481
£5 5s. Three: De-Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.B Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378
Four-valvers: Blueprints, 1s. 6d. each.		
65/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
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Five-valvers: Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (2SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379
Mains operated.		
Two-valvers: Blueprints, 1s. each.		
Consoelectric Two (D. Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Three-valvers: Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D. Pen) A.C.	10.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	*Nov.* '34	WM374
Four-valvers: Blueprints, 1s. 6d. each.		
A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	—	AW380
A.C./D.C. Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2 SG, D, Trans) A.C.	—	WM379
All Metal Four (2 SG, D, Pen)	*July* '33	WM320
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.		
1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM260
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375
Mains Sets: Blueprints, 1s. 6d. each.		
1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super A.C.	—	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apl.* '35	WM385

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.		
General-purpose Portable (SG, D, RC, Trans)	—	AW351
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Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	—	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.		
S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452
Two-valvers: Blueprints, 1s. each.		
Home-made Coil Two (D, Pen)	14.7.34	AW440
Three-valvers: Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenters' 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet, Converter	*Dec.* 1, '34	AW457
The Carrier Short-waver	*July* '35	WM390
Four-valvers: Blueprints, 1s. 6d. each.		
"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver	*Mar.* '35	WM383

Mains Operated.

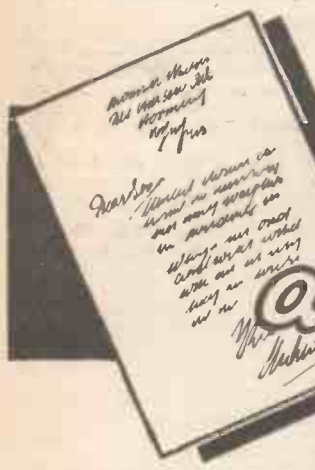
Two-valvers: Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave-Converter	*Jan.* '35	WM380
Three-valvers: Blueprints, 1s. each.		
Emigrator (SG, D, Pen), A.C.	—	WM352
Four-valvers: Blueprints, 1s. 6d. each.		
Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5, '35	AW462

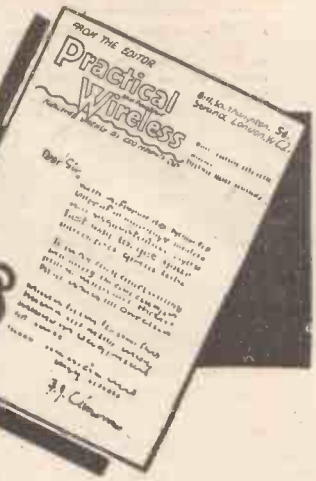
MISCELLANEOUS.

Enthusiasts Power Amplifier (1/6)	*June* '35	WM387
Newstyle Short-wave Adaptor (1/-)	*June* '35	WM388

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

Queries and Enquiries





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

SPECIAL NOTE

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

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

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

An H.T. Problem

"I have been troubled for nearly a year by the fact that my H.T. is not lasting as long as it used to do—in fact, not much more than half as long. The set is a two-valve, and used to give ample volume on 60 volts. Now I have to put it up to about 80, and instead of lasting five months as it used to do it gives out after about two and a half to three months. I only use grid-bias for the second valve and this is set at 3 volts for 100 volts H.T., and I leave it on at that value even though I am running the set at 80. I have tried three speakers and all give the same result."—J. B., Jnr. (Manchester).

WE note that you have been troubled by this matter for nearly a year, and therefore assume that you are still using the original valves. These may now have passed the period of their useful life and be consuming more current and giving a weaker signal. The output valve will probably prove well worth while replacing. On the other hand, there may be a fault in the circuit which is placing a drain on the H.T. supply, and you can verify this by inserting a milliammeter in the H.T. negative lead and switching the set off. There should be no reading. If there is, then there is a leak in the circuit, and this may be due to a broken-down component or a short circuit which has been introduced due to a loose or broken lead. A careful examination should enable you to trace this, as it is only a simple two-valve set, but we think that the most likely cause of the trouble is the fact that the valves have finished their useful life.

Fitting a Modern Coil

"I enclose a plan of my one-valve set, the tuning of which is carried out by means of two plug-in coils. I want to fit a 4- or 6-pin coil and should be glad of a wiring diagram and details of the most suitable coil. The volume is increased by moving one coil nearer the other."—B. (Hannington).

IN a simple circuit of this nature you will need, in addition to the coil, a reaction condenser, and in some cases a wave-change switch. The majority of modern coils are of the dual-range type and cover medium and long waves. Therefore some form of wave-change switch must be fitted. The volume increase to which you refer is actually a reaction control, and a condenser is necessary for this purpose in modern circuits. We would suggest that you buy any good modern dual-range coil (not of the ordinary plug-in type) and wire this according to the makers' instructions. The majority of modern coils are supplied with a diagram of connections, and you should not find it difficult to incorporate the coil in your set, and will then be able to get both medium- and long-wave stations and will find volume much more easily controlled.

Igranicore Coil Connections

"Some time ago I bought an Igranicore coil, Type O.S., through an advertiser in your paper. I have not yet had reason to use it, but now that I wish to do so I have mislaid the connection diagram. Could you please inform me how this coil is used?"—C. B. (E.1).

THIS coil is an iron-cored superhet oscillator coil, and is intended for use with a separate (triode) oscillator valve. The anode of this valve is connected to terminal No. 1, and the H.T. supply is joined to terminal No. 2. Terminal No. 3 is joined to the grid and to one side of the oscillator-tuning condenser, whilst terminal No. 4 is joined to the other side of the condenser and the filament. Terminal No. 5 is the coupling connection. The coil is intended for use with 110 kc/s I.F. transformers, and provides this separation with a .0005 mfd. variable with shaped plates.

Removing Hum

"With further reference to your letter, I have not tried the centre-tapped resistance across the heater terminals. Could you give me some idea of the values to use and outline the principle? Is the centre tap connected to earth? The I.F. windings on the mains transformer are already centre-tapped and earth."—J. C. P. (Walthamstow).

THE usual value for the resistance is 30 or 50 ohms. Although the actual L.T. winding is centre-tapped, it is possible that this centre point is unbalanced by the actual heater circuit wiring, and thus it is often found advisable to remove the connection between this point and earth and to fit a small potentiometer of the above value direct to the heater terminals on the valve-holder in the receiver. The arm of this potentiometer is then joined to earth, and it may thus be moved about until an exact electrical balance is found and the hum removed. It will not, of course, remove hum due to other causes, but it is one of the first precautions to take when hum difficulties are encountered.

An Aperiodic H.F. Stage

"I was advised to include an aperiodic H.F. stage to my short-wave set, but was not sure of the arrangement. I am enclosing the scheme as I tried it out, but it did not work. Perhaps you could correct this for me and suggest any inexpensive refinements."—R. C. H. (Ealing).

THE arrangement is quite in order except that you have shown no H.T. supply for the first valve (the aperiodic stage). You must now include an H.F. choke in the anode circuit of this valve and join the choke to H.T. positive. In other words, all that is necessary is to mount a choke near the new valveholder and join one terminal of the choke to H.T. positive and the other terminal to the junction of the .0003 mfd. condenser and the anode of V1. No other alteration should be necessary. The circuit is quite satisfactory in all other respects and should function quite satisfactorily.

The coupon on page 21 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Unless otherwise stated, all items are clearance, second-hand, or surplus lines, and radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C.4 (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the following Manufacturers' Unused Goods at a Fraction of the Original Cost: all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad, carriage extra; orders under 5/- cannot be sent C.O.D.; please send 1½d. stamp for large new illustrated catalogue, also August bargain supplement.

SPECIAL Bargains for callers at our Clapham Branch where Summer Sale is now taking place.

WORLD Famous Continental Valve Manufacturer; mains types, 4/6 each, H.L., L., power; high and low magnification, screen grid; variable Mu screen grid; 1, 3, and 4 watt A.C. output, directly heated pentodes; V.H.P., D.D.T. Diode Tetrodes, 250 volt 60 m.a. full wave rectifiers; A.C. D.C. types, 20 volts, 0.18 amp. filaments; screen grid; variable Mu screen grid; H., H.L., power and pentodes.

THE following Types, 5/6 each; 350v. 120 m.a. full wave rectifiers, 500v., 120 m.a., full wave rectifiers, 2½ watt indirectly heated pentodes.

2-VOLT H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable mu screened grid, 5- or 4-pin pentodes. H.F. Pen., V.M., H.F. Pen., 5/-.

THE following American Types, 4/6; 250, 210, 245, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 281. All other types, 6/6.

B.T.H. Moving Coil Speakers, matched pairs, 8in. 1,500 ohms. 7,500 ohms (1,500 speaker as choke 7,500 speaker in parallel with H.T. supply), with output transformer for pentode, 15/6 per pair; A.C. kit for pair, 12/6.

M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6; 100 henry chokes, 2/6.

A LARGE Selection of Pedestal, table and radiogram cabinets at a fraction of original cost.

BLUE-SPOT 29P.M., P.M. Moving Coil multi-ratio transformers, 15/-; handles 4 watts. Sonochorde ditto. Ideal for Battery Sets.

ELIMINATOR kits, condensers, resistances and diagrams, 120v. 20 m.a., 20/-; Trickle charger, 8/- extra, 150v. 30 m.a. with 4v. 2-4amp. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps, with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a. with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps, L.T., 27/6.

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

B.T.H. Truspeed Induction Type A.C. only, Gramophone Motors, 100-250v. 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor 200-250v. high quality pick-up and volume control, 45/-. Motor only, 35/-.

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

WIRE Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

MAGNAVOX 144, 15/-, 144 Magna, 25/-, 152, 17/6, 152 Magna, 37/6, 154, 12/6, Dual-Matched Pairs D.C. 144/152, 32/6. Ditto Magna, 62/6. A.C. Energising Kit to suit any of above 10/-, all 2,500 ohms. P.M. 7 inch, 16/6, P.M. 9 inch, 22/6. State transformer required.

12 TO 2,000 Metres without Coil Changing; huge purchase of all-band 2-gang screened coils, suitable for screen grid, H.F. stage (tuned) screen grid detector type receiver, complete circuit supplied, 12/6.

BRITISH made Meters, moving iron, flush mounting, 0-10, 0-15, 0-50 m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps., all at 6/-; read A.C. and D.C.

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg., 2/-; 5,000, 10,000, 15,000, 100,000, with mains switch, 2/-.

1,000 OHM, 150 milliamp, Semi-variable resistance, 2/-; 1,000 ohm 250 milliamp, tapped, for any number .18 valves, 3/6: 800 ohms, 350 m.a., tapped, 2/-.

COSMOCORD pick-ups with Arm and Volume Control, wonderful value, 10/6.

(*Continued at top of column two*)

(*Continued from foot of column one*)

THE following Lines 6d. each or 5/- per dozen: 4- or 5-pin baseboard or 4-, 5-, 6-, or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp, 2- or 3-point switches, Cyldon double trimmers, 6yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1 yd. 7-way cable, 9ft. resincored solder, 6yds. push-back connecting wire.

L.F. transformers, AF8, 6/6; R.I. DUX, 4/-; Telsen Radiogrand, 2/9; Voltra, 2/-.

RELIABLE Soldering Irons, 200, 250 volts, .2 amps., 2/6 each.

ELECTROLYTIC Condensers T.C.C., 8mf. 440v., 3/-; 550v., 4/-; 15 mf. 50v., 1/-; 15 mf. 100v., 1/-; 15 mf. 12v., 1/-; Dubilier 4 or 8mf. 500v., 3/-; 8 plus 4 500v., 4/-: 50v. 50mf., 1/9; 12mf., 20v., 6d.

U.S.A. 4, 8, or 12mf. 550v., 1/9; 100 mf. 12v., 1/3: 2,000 mf. 12v., 6/-. 8+4 mf. 500v., 2/3, 4+4 mf., 2/-.

PAPER Condensers. Dubilier 4mf. 500v. working 4/-; ditto 700v., 5/-; ditto, 800v., 6/-; Western Electric, 250v., working 1mf., 6d.; 2mf., 1/-; 4mf., 2/-; 1mf. 2,000v. working, 3/-.

CONDENSER Blocks 250v. working various taps, 6mf., 2/-; 10mf., 3/-; 8.5mf., 2/6.

MAINS Transformers. Premier all have tapped primaries, C.T., L.T.'s and Engraved terminal Board. H.T.8 plus H.T.9, 2 L.T.'s, 10/-; Rectifier, 8/6 extra; H.T.10 2 L.T.'s, 10/-; Rectifier, 9/6 extra; 250 plus 250 60 m.a. 3 L.T.'s, 10/-; 350 plus 350 150 m.a. 3 L.T.'s, 12/6.

WESTERN ELECTRIC Manufacturers type 350 plus 350, 60 m.a. 2 L.T.'s, 6/3; 350 plus 350 120 m.a. 3 L.T.'s, 9/6; 500 plus 500 150 m.a. 5 L.T.'s, 19/6.

VARIABLE condensers. Premier, all brass, short wave, .00015 slow motion, 3/9; British Radiophone, all brass, 2-gang, .00015 each section, 5/6; Ormond, .00025, 1/6; Polar, all brass, .0005 slow motion 3/11; Lissen 2-gang, .0005, front trimmer, disc drive, 5/11; Utility 3-gang fully screened trimmers and disc drive, 7/6.

BAKELITE reaction condensers, .00015, .00035, .0005, .00075, 9d.

LISSEN 3-gang, superhet coils, 6/-; Lotus 3-gang band-pass coils, 12/6; Iron core coils with circuit, 2/11 each; Varley band-pass aerial coils, B.P.5. type, 2/9; ditto band-bass transformer, B.P.8, 2/6.

H.F. Chokes Premier screened, 1/6; Premier short-wave, 9d.; pre-sets, any value, 6s.

PREMIER smoothing chokes, 25 m.a., 20 henries, 2/9; 40 m.a. 30 henries, 4/-; 60 m.a., 40 henries, 5/6; 150 m.a. 40 henries, 10/6; 60 m.a. 80 henries, 2,500 speaker replacement, 5/6.

PREMIER auto transformer 100/200-250 and vice versa, 100 watt, 10/-.

BRITISH Radiophone 2-gang S.W. Condensers, all brass, pigtail connection, 5/6.

CLARION S.M. drives, moving light, 2 inch knob for short waves, 2/-.

PREMIER SUPPLY STORES

20-22, High Street, Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest Station Clapham North (Underground).

1,000 BEST BARGAINS IN RADIO!

PRICES 25% BELOW COMPETITION.

Western Electric (21/-) microphones, 1/9; 100/1 transformers, 1/6; buttons, 2/6 doz.; S.Wave condensers, .00015, .00016 mfd., 1/10; T.C.C. electrolytics, 10, 25, 50 mfd., 10/- doz.; 8 mfd., 4 mfd., 1/11; .0001-.004 mfd., 2/- doz.

AMAZING NEW KIT BARGAINS. Each kit includes metal chassis, sundries and full instructions. Unapproached in the radio trade. Short-wave band-spread 3 (2 bands), 22/6. A.C. model (3+rectifier), 42/6. All-wave band-spread 3 (4 bands, 15-2,000 metres), 33/6. A.C. model, 50/-. Band-spread dual-band S.W. Adaptor (A.C., D.C., or battery), 13-55 m., 18/6.

Just a few of the hundreds of lines comprising the biggest surplus wholesale radio stocks in London. **Terms**: Over 5/- post free. Cash or C.O.D. **Our prices to the public brook no competition. Send 3d. stamps, to-day for complete wholesale catalogue. 3d. post free.**

J. BEARFIELD & CO. (Dept. 2). EST. IN 1919. 9, Bartholomew Close, London, E.C.1 (also 105, Upper St., N.1.).

RADIO TRADING FOR 16 YEARS.

HULBERT for Quality Surplus Speakers.

HULBERT. All speakers previously advertised still available. All are brand new and made by one of the best-known British makers of high-grade moving-coil speakers. Prices from 10/6. All Music lovers interested in realistic reproduction should write for list of amazing bargains. Repeat orders are coming in daily.
HULBERT, 6, Conduit Street, W.1.

BANKRUPT Bargains. List free. Mains sets A.C., D.C., all-wave, also battery sets, at very keen prices. I will quote for anything. Large stock components, valves, eliminators, speakers.—Butlin, 143B, Preston Road, Brighton.

MISCELLANEOUS

HOME-CONSTRUCTORS! Receivers repaired, modernised, 2/6 per valve. Wiring diagrams supplied. 1/6 per valve. Radio Service Bureau, 9a, Shepherd's Bush Road, London, W.6. Service Department—136a, Blenheim Road, Harrow.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

SOUTHERN RADIO'S WIRELESS BARGAINS. ALL GOODS GUARANTEED NEW, PERFECT and SENT POST PAID.

FOX INDUSTRIAL 4-Valve Amplifiers. A.C. Mains. 3½ Watt Output with two tuning coils. For Television. Radio, Gramophone and Microphone Chassis Complete, less valves, 30/-. With four specified Mullard Valves, £3 12s. 6d. Specified Speaker for same, 15s.

SPEAKERS.—BLUE SPOT 1935 Series with Universal Transformers to suit any circuit. 99P.M., 24/6, 45 P.M., 20/-, 99 P.M. (Extension Model, less transformer), 21/-. Celestion Soundex, 11/-. ALL IN SEALED CARTONS.

LISSEN 2-Valve Sets for D.C. Mains. Complete with Speakers and Valves. Contained in attractive Bakelite Cabinet. £2 10s. (List, £8), in sealed cartons.

LISSEN Skyscraper 3-Valve Screen Grid Battery Kits. Complete with 3 Lissen Valves, in sealed cartons, 42/- each (77/6 list).

TELSEN 3-Valve Battery Sets. Model S93. Complete with three Mazda Valves in handsome Bakelite Cabinet, 30/- (List, 75s.).

BURGOYNE CLASS "B" Three-Valve Sets. Complete with three Mullard Valves, Exide Batteries and Accumulator. Magnavox Moving-coil Speaker. Contained in magnificent modern cabinet. Finished in chromium. 1935 Series. £2 15s. Complete (List, £6 10s.). In sealed cartons.

MIDGET SETS. — "Lucille" 1935/36 Series. A.C./D.C. Universal Sets for 100/250 Volts. Medium and Long Waves. 5 Valves, complete with moving-coil Speaker in beautiful walnut cabinet. £3 19s. 6d. Similar Model for Medium Waves only, £3 10s.

ELIMINATORS.—Regentone 1935 Series. A.C. Mains, 200/250 Volts, Type W5a, complete with trickle charger, 39/6; W1a (less Trickle charger—carries 30 milliamps), 33/-; W1c (less trickle charger), 30/-. All in sealed cartons.

CONDENSERS.—Lotus 0.0005. Fully screened, with trimmers, escutcheons, dials and knob. 3-gang, 11/-, 2-gang, 7/3. TELSEN SINGLE VARIABLE CONDENSERS, 0.0005, 2/3; Plessy 4-gang Super-het, fully screened with trimmers, 7/3. Igranic, 1 mfd., 1/3, 2 mfd., 1/9. LISSEN HYPERNIK TRANSFORMERS: 4-1 ratio, 3/11 (List, 12/6).

COILS.—TELSEN Triple matched screened coils, Type W288. 10/9 per set; Twin Matched Iron Cored Type W478, 12/6; Telsen Intermediate frequency transformers, Type W482, 4/-; Igranic Super-het Coils, set of four (1 Osc., 2 I.F. with pigtails, 1 I.F. plain) 9/- per set (List, 50/-). Varley Square Peak Coils, B.P.5, complete, 2/3.

THE following Telsen Components in original sealed cartons at sacrifice prices:—

ACE L.F. TRANSFORMERS.—5/1, 2/9; Binocular H.F. Chokes, 2/-; Standard Screened H.F. Chokes, 2/-; Coupling Units, 1/1, 2/6; ACE MICROPHONES (P.O.) with Transformers, 5/- each. This Microphone can be used with any radio set and is a very efficient article.

AMERICAN VALVES.—A full range of valves for all American sets at 7/- per valve.

SOUTHERN RADIO, 323, EUSTON ROAD, LONDON, N.W.1 (near Warren Street Tube). 'Phone: Museum 6324.

SOUTHERN RADIO BARGAIN PARCELS.—We are offering the following parcels of mixed components at a fraction of their value. The items comprise up-to-date Radio parts, new and perfect, which are too varied to be advertised individually:—

5/- PARCEL.—Contains modern components valued at 20/-, including Resistances, Condensers, Coils, Wire, etc. Circuits of modern Receivers included with each parcel.

10/- PARCELS.—Containing Components valued at 45/-, including Volume Controls, Condensers, etc., also circuits.

20/- PARCELS.—This is known as the "small trader's" parcel, and contains a wonderful selection of components valued at 85/-. We have supplied this parcel to hundreds of Traders for re-sale at a profit.

SOUTHERN RADIO Branches at 271-275, High Road, Willesden Green, N.W.10; 46, Lisle Street, W.C.2. All Mail Orders to 323, Euston Road, London, N.W.1.

CLARION VALVES.—All brand new; battery types, 2-volt, H.2, H.L.2, L.P.2, 1/9; Super power, P.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt, 1 amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full wave rectifiers, 3/6; postage paid, cash with order, or C.O.D. over 10/-. Clarion Valves, Dept. 2, 885, Tyburn Road, Erdington, Birmingham.

ALL goods advertised in last week's issue, still available.
WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

FERGUSON Universal Midget Receiver for AC/DC. 100-250 Volts. Moving Coil Speaker. Wonderful tone and outstanding selectivity. Limited number. 65/- Car. Paid. Send for latest list, hundreds of other bargains. Pearl and Pearl, 190, Bishopsgate, London, E.C.2.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

VAUXHALL.—Polar Midget 3-gang condensers, straight or superhet., 8/9; Polar full vision, horizontal or Arcuate dial and drives, 4/6.

VAUXHALL.—Centre tapped iron cored L.F. transformers, bases, terminals, 110 k.c.; 6/6. Guaranteed.

VAUXHALL.—Set manufacturers' surplus, skeleton type Westinghouse rectifiers, H.T.8 9/6, H.T.9, H.T.10, 10/-, complete with fixing brackets; Westectors, W.4; W.X.6, 5/9.

VAUXHALL.—Dubilier condensers, 4 or 8 mfd., dry electrolytic, 500v. working, 2/6.

VAUXHALL.—Dubilier condensers, tubular non-inductive, 0.1, 6d., 50 mfd., 50v. working, 1/6; 50 mfd., 15v., 1/3; 0.05 6d., 0.002, 0.0002, 0.001, 0.0001, 4d. each.

VAUXHALL.—T.C.C. mica, 0.002, 2,000-volt test, 10d.; 0.0001, 4d.; 0.001, 0.01, 1/-; 1 mfd. Mansbridge, 1/3.

VAUXHALL.—Resistances by well-known manufacturers, 1-watt type, 6d. each; all values.

VAUXHALL.—Permanent magnets, universal, suitable for Class "B," power or pentode, 7in. cone, 16/6; 10in. cone, 23/-.

VAUXHALL.—Mains energised, 2,500 or 6,500 field coil, 10in. cone, 22/-; 7in. cone, 15/3; complete with humbucking coils; state power or pentode transformer; immediate delivery. Fully guaranteed.

VAUXHALL.—Colvern G.1, G.2, G.3, or G.1, G.2, and G.8; superhet. type, 30/-; Colpaks, £2/4/0.

VAUXHALL.—Benjamin "Class B" transformers, 1-1½, to 1, 6/6; volume controls, Radiophone, with switch, 5,000 to 500,000, 3/-.

VAUXHALL.—B.T.H. Minor, 16/6; Senior, needle armature, 29/-; Radiophone, 14/6; others from 10/-.

VAUXHALL.—B.T.H. Truspeed gramophone motors, 30/-; Universal D.C./A.C., 47/6; sealed cartons.

VAUXHALL.—Collaro 32 model, 32/6; Universal model, 47/6; complete unit, A.C. 200-250v., first quality pick-ups and volume control, 48/-.

VAUXHALL.—T.C.C., 200 mfd., 10-volt, 3/-; Continental valveholders for Universal valves, with terminals, 9d.

VAUXHALL.—Stentorian standard permanent magnets, 22/6; 4 mfd. condenser, 750-volt, terminals, Radiophone, 5/9; without terminals, 5/3.

VAUXHALL.—Repairs and conversions, any type receiver. Trade discounts allowed. Drawings and Advice, Queries, free.

VAUXHALL.—Clix valveholders, terminals, 7-pin 9d., 5-pin, 7d.; W.B. 5-pin, 4½d.; baseboard mounting, 6d., post paid 2/6 or over, or c.o.d.

VAUXHALL UTILITIES, 163a, Strand, W.C.2, over Denny's, the Booksellers. Temple Bar 9338. Send postcard for lists free.

WOBURN RADIO OFFER FOLLOWING NEW LINES:

W.R.C. SHORT WAVE COILS: 4-pin plug in to 4-pin valve-holder, 10-22, 20-45, and 42-90 metres, set of three 7/6, singly 2/8.

W.R.C. Short-Wave Chokes, 10-100 metres 10d.

W.R.C. Short-Wave condensers, .0001, .00015, .00016, .0002, .00025, .0003, all with slow motion, 2/-, two-piece Ormond slow motion dial to fit, 1/-.

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THE LEADING WORLD-WIDE WIRELESS WEEKLY!

Practical and Amateur Wireless

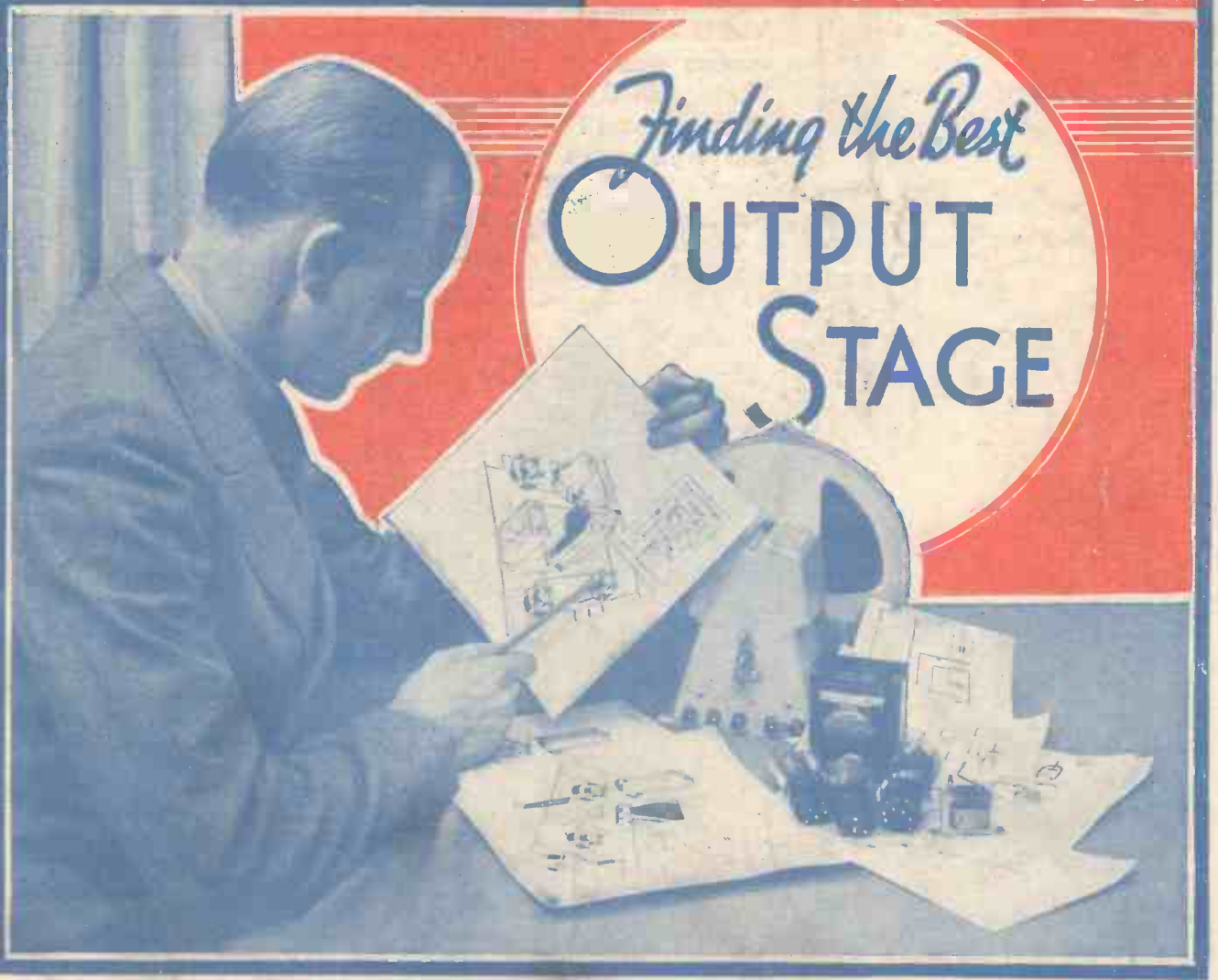
3d EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 7. No. 158. September 28th, 1935.

AND AMATEUR TELEVISION



Finding the Best OUTPUT STAGE

Competition Result on Page 36

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VII. No. 158. September 28th, 1935.

ROUND *the* WORLD *of* WIRELESS

Relay of Austrian Army Manœuvres

THE Austrian broadcasting authorities, greatly impressed by the B.B.C.'s running commentary on the Jubilee Naval Review, have decided to relay, during September, sound pictures of the manœuvres which the Army is carrying out this year. Similar successful broadcasts have already been made by Germany, Denmark, and Italy.

Is This a Record?

THE Rome medium- and short-wave stations, in the course of their broadcasts of talks and news bulletins, now transmit in fourteen different languages, namely, Italian, French, English, German, Spanish, Portuguese, Magyar, Croatian, Bulgarian, Albanian, Arabic, Greek, Rumanian, and Esperanto.

Oslo Linked to all Relays

THE northernmost Norwegian broadcasting station at Vadsö, which hitherto has taken its programmes from the capital by wireless link *via* Jelöy, is now fed, as are all other relays, by land-line. In the near future the Jelöy short-wave station will be used exclusively for the transmission of radio programmes for distant listeners overseas.

Radio Addis Ababa

A RECENT attempt to relay a broadcast from Abyssinia, by the United States stations, did not meet with success. The transmission was made through ETA, in the Abyssinian capital, a 3.7 kilowatt telegraphy station working on 39.37 metres (7,620 kc/s), and which had been converted for the purpose. Further attempts to broadcast telephony are to be made in the near future.

French Poste-Colonial Goes "All Foreign"

SHORT-WAVE transmissions from Paris-Pontoise are now to be made in several languages for the benefit of residents abroad. At the outset the broadcasts will be made at B.S.T. 01.10 for Canada in French; 01.20 for the U.S.A. in English, and at 03.00 in Spanish for South America. To cover the Near East a news bulletin is transmitted in the French language at B.S.T. 16.50.

A Distinction with a Difference

LISTENERS who have heard the closing down of the German and Austrian stations may have wondered why both use the same National Anthem. The fact is that the hymn was originally composed by Haydn for the Austrian Emperor, and the melody was adopted by Germany, to different words, at a much later date.

To Make Them Toe the Line

HITHERTO, many of the French stations have frequently strayed from the frequency allotted to them and thus caused interference in France as well as in other countries. The P.T.T. authorities have now opened an official listening post at Fort de Bicêtre, near Paris, which, similar to the service undertaken at Tatsfield by the B.B.C., in future will check all wavelengths.

On Other Pages

Are Studios Specialising?

ACCORDING to a report from the U.I.R., Budapest, of all broadcasting stations, is the one transmitting the most classical music; Madrid favours light entertainments, Tokyo talks, Stockholm sacred services, Rome operatic performances, Hilversum musical comedies and operettas, Radio-Paris lectures, and Copenhagen relays of sporting events. No claim seems to have been put forward by the French private transmitters for the broadcast of gramophone records!

French Interval Signals

IT is expected that within the next few weeks listeners will hear new interval signals from the French P.T.T. stations. Distinctive melodies have already been allotted to a number of them, but a selection must still be made for Limoges, Nice, Rennes, and the Eiffel Tower.

Some Loud-speaker

REFERENCE is made in a recent Soviet publication to a new loud-speaker which has been constructed by the Scientific Institute at Leningrad. Following experiments carried out over a period of eighteen months, it is stated that the inventors have produced a giant instrument giving out a volume of sound equal to twenty million headphones!

Radio's Modest Heroes

IT has now been ascertained that on the occasion of the partial destruction by fire of the Berlin Wireless Exhibition, two post office engineers who were attending to the transmitter in an underground room were unable to escape, and were victims of the catastrophe. It would appear that until the floor above them collapsed and buried them in the ruins, they were in constant telephonic communication with their headquarters.

The Centenary of a Radio Pioneer

ANDRE MARIE AMPERE, whose surname is familiar to every radio fan, died at Marseilles on June 10th, 1836. To commemorate his memory the French stations propose to organise a series of special broadcasts during the period of the annual International Fair at Marseilles, to be held from March 5th-15th, 1936.

Listen to the U.S.A. Stations

THE DX medium-wave season has started, and reports are already being received to the effect that some of the U.S.A. stations are being well heard between midnight and 04.00 B.S.T. WENR, Chicago (Ill.), 344.6 metres, WABC, New York, 348.6 metres, WBZ, Boston (Mass.), 302.8 metres, KYW, Philadelphia (Pa.), 293.9 metres, WTIC, Hartford (Conn.), 288.3 metres, and WCAU, Philadelphia (Pa.), 256.4 metres, are stations for which a successful search can now be made.

ROUND the WORLD of WIRELESS (Continued)

Microphone Bows

NEW-COMERS to the microphone will be heard in a variety programme from Plymouth in the feature entitled "Microphone Bows," on October 3rd. The artists include George H. Rundle (mouth organist), Joan St. Ewer (soprano), and Stan and Jan (the Inimitable Devonshire Rustics). George Rundle won the British Isles Silver Medal for mouth-organ playing in 1928.

Variety Broadcasts

THE B.B.C. Variety Department's plans for the Autumn include much that is novel and interesting. Adaptations of several musical stage successes are promised, including "The Cat and the Fiddle," with music by Jerome Kern, and "Countess Maritza." This will be the first English performance of Emmerich Kalman's greatest operetta, though the work has for long been a favourite with audiences on the Continent. Listeners will also hear a "musical murder-mystery," entitled, "Death in the Dressing-room," specially written for broadcasting by two well-known film-scenario writers.

"Music Hall"

ONCE a month there will be a "Music Hall" programme lasting an hour and a half, in which the cream of available music-hall talent will be brought to the microphone. The success scored by Bryan Michie in his "Variety of Music" features will result in their regular recurrence. A monthly "Gala," resembling those heard during the Jubilee celebrations, will be given by front-rank artists from the music-hall, concert, and theatrical worlds. There will also be many separate quarter-of-an-hour variety "Features," when outstanding personalities will give "solo" performances.

New Programme Features

INCLUDED in the autumn variety programme, in addition to the continuance of such tried favourites as the "Air-do-Wells," "The Red Sarafan," "Songs from the Shows," and others, there will be several new programme features. "The Saturday Magazine," for example, will be a forty-five-minute show on Saturdays embodying several regular features, including "In Town To-Night." "Tunes of the Town," another novelty, is a direct result of the successful adaptation some few months back of "A Kingdom for a Cow." Potted versions will be given of several musical pieces which will be running in London during the Autumn.

Sibelius Programme

ON September 26th there will be a Sibelius programme, in which listeners will hear the beautiful first Symphony and the Violin Concerto in D minor, with Arthur Catterall as soloist. The following Friday night will as usual be devoted to Beethoven, and the programme will consist of the Leonora Overture No. 2; the scena and aria, "Ah! Perfido," sung by Stiles-Allen; the Pianoforte Concerto No. 5 (Emperor) with Lamond, and the eighth Symphony. In the mixed programme on September 28th Eleanor Gerhardt will sing in the usual concert suite.

INTERESTING and TOPICAL PARAGRAPHS

THE NEW COSSOR RADIOGRAM

These Scottish scouts were very interested in the chassis of the new Cossor 10-valve Auto-fidelity Radiogram at the recent Scottish Radio Show

Piatigorsky will also be heard in Haydn's Violoncello Concerto in D.

New Tunes from America

ON his return from the United States, where he has gone for a month's visit, Robert Tredinnick will present a programme of records of "New Tunes from America." This will be heard by Midland listeners on October 1st.

Concerts from Liverpool

ON September 26th, a concert by Frank Stokes' Pavilion Theatre Orchestra will be relayed from the Pavilion Theatre, Liverpool, and on October 1st a variety programme will be relayed from the same theatre.

"The Scapegoat"

OWEN REED, who is now in charge of Midland radio drama—he was previously Feature Programmes Assistant—will produce a new play called "The Scapegoat" on October 2nd. It has been specially written for broadcasting by a Nottinghamshire artist who uses the pen-name of "Anthony Dale." The play gives a picture of life in an engineering factory where family influence has played too big a part irrespective of ability. An acute conflict develops over a defective consignment and a consequent, but quite unjust, dismissal; and there is a surprise ending.

"London Log"

A NEW fortnightly feature called "London Log," a Metropolitan Miscellany for the North, opens on October 1st. Mr. F. Buckley Hargreaves, a Yorkshire free-lance journalist and publicist, who now lives in London, will come to the microphone to give a northerner's angle on contemporary London life. As the series of talks develops it is expected that he will converse at the microphone with other Northerners who may feel themselves in exile in the Metropolis.

"Young Ideas"

BEGINNING on October 4th, a new half-hour feature programme of considerable interest will be presented every Friday at 7.30. This feature will be entitled, "Young Ideas: A Programme of Entertainment and Information for Young People of all Ages." It will consist of a number of short items strung together somewhat in the manner of "In Town To-night." Most of the items will be talks devoted to a wide variety of topical subjects, though there will also be outside relays and musical turns. Among the subjects upon which it has been decided to touch are: reviews of current affairs; eyewitness accounts of topical events; true adventure stories and readings of short stories; and modern science and engineering.

Operatic Programme

H. FOSTER CLARK will conduct the B.B.C. Midland Orchestra in an operatic programme on September 29th. The overture is from the "Boatswain's Mate."

SOLVE THIS!

PROBLEM No. 158

Rogers had a four-valve A.C. mains receiver which had given very good results for a considerable time. One evening, whilst listening to a programme, he noticed that the quality seemed to be poorer than usual, and that hum was also slightly more noticeable. He did not trouble much about it at the time, but the following day noticed that the anode of the output valve was glowing red at one point. He therefore decided to test matters, and connected a voltmeter across the bias resistance of the output valve as a first test. He could obtain no reading at all across this resistance, yet it was apparently in order as he could obtain a voltage reading from the anode of that valve to cathode. What was wrong? Three books will be awarded for the first three correct solutions opened. Envelopes must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 158 in the lower left-hand corner, and must be posted to reach this office not later than the first post Monday, September 30th, 1935.

Solution to Problem No. 157

When Jackson screened his receiver and earth wire he was effectively preventing pick-up on the wiring. It was this which had previously enabled him to get the local without an aerial, and consequently the screening prevented also the reception of this station. The following three readers successfully solved Problem No. 156 and books are accordingly being forwarded to them:

P. Swift, 102, King's Cross Road, Halifax, Yorks; C. L. Poor, 84, Sturton Road, Sheffield; W. T. Usborne, 3, Princes Terrace, Snodland, Kent.

FINDING THE BEST OUTPUT STAGE

Class B and Quiescent Push-pull Amplifiers are Fully Described in This Article of the Series.

By FRANK PRESTON

WE have now reached the stage of designing an L.F. amplifier for battery operation, which will provide a maximum undistorted output of 1 watt or more for a minimum consumption of high-tension current. As was pointed out last week, there are two alternatives; we might employ Q.P.P. or Class B. Of the two, Class B can be designed to give a rather greater output, but the consumption of both H.T. and L.T. is slightly higher. Also, Class B is a little more expensive initially due to the fact that the special double valve requires a preceding L.F. driver valve, whereas the two pentodes connected in quiescent push-pull may follow directly after the detector valve. So far as the quality of reproduction is concerned there is little to choose between the two, but in any case it is not normally quite so good as that to be obtained when using a super-power triode valve in the output stage. Nevertheless, the reproduction afforded will satisfy most requirements, and any slight loss in this direction is amply compensated by the large output and low consumption.

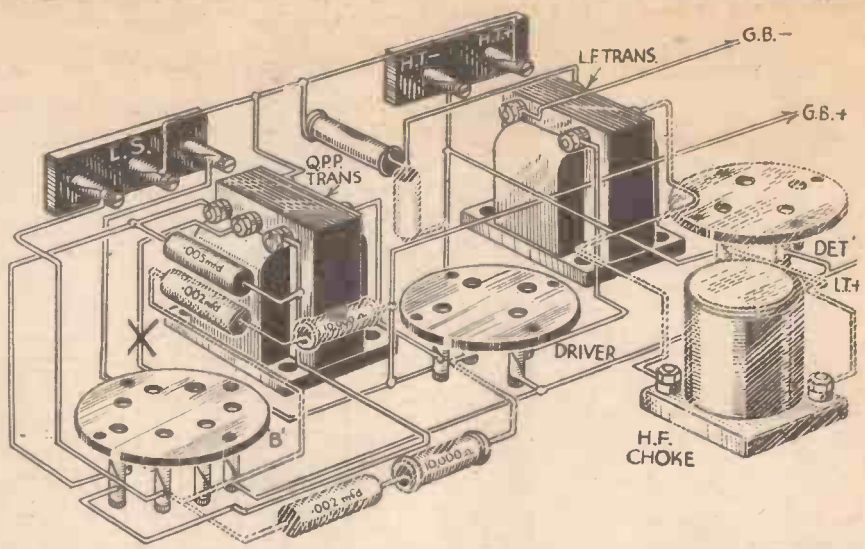


Fig. 2.—Pictorial diagram of a Class B amplifier, showing the points referred to in the text.

Q.P.P.

First of all let us consider a Q.P.P. amplifier, such as that shown in Fig. 1, using a pair of high-amplification pentodes, and fed from a leaky-grid detector (actually, the detector could be of any of the types dealt with in previous articles, but the leaky-grid is named because it is most frequently used). The circuit arrangement is perfectly straightforward, a special Q.P.P. input transformer being connected in the anode circuit of the detector and to the grids of the two pentodes. This transformer is one of the most important components in the circuit, and should be of good make—of which there are several. It should have a step-up ratio between 1 to 8 and 1 to 10, and the primary winding should be capable of carrying up to 4 or 5 milliamps. without the inductance dropping below about 20 henrys; an average rating for high-class components of this type is 25 henrys at 2 milliamps., which is very satisfactory. It might at first appear that the ratio quoted is particularly high, but it should be remembered that this is the "overall" ratio, and that the step-up to each half of the secondary is only one-half of the rated figure. And as the valves operate alternately the effective ratio is only about 1 to 4.5, which is by no means unusual in normal amplification.

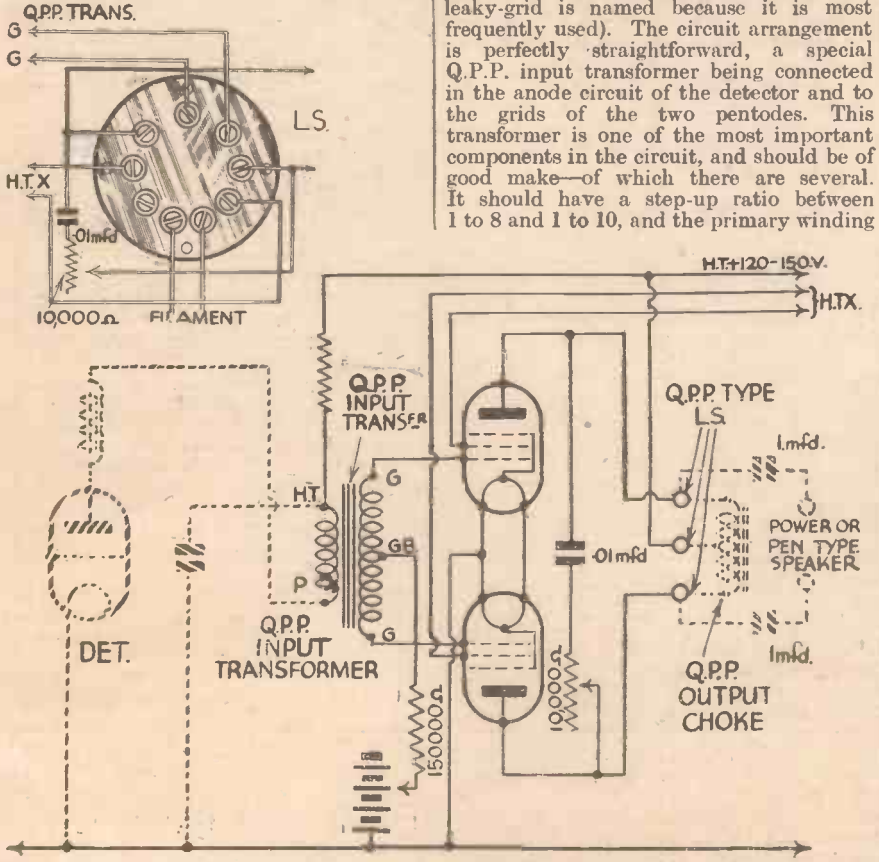


Fig. 1.—Connections are here given for the Q.P.P. circuit described. The connections apply when a pair of pentodes is used, but connections for a double (Q.P.P.) pentode are shown inset.

Matched Valves

It will be seen that a 150,000-ohm fixed resistance is joined between the centre-tap on the secondary winding of the transformer and grid-bias negative, and the object of this is to prevent any parasitic oscillation. The resistance acts in a very similar manner to those which are generally included in the grid leads to valves connected in ordinary push-pull. As to the valves themselves, these should be of a type similar to the Cossor 220 H.P.T., and it is generally advisable to buy them as a matched pair, since they should be as nearly identical as possible. The exact matching is one of the disadvantages of Q.P.P., but slight variations in characteristics can be balanced out by making accurate adjustment of the auxiliary-grid voltages. To permit of this it is possible to obtain high-tension batteries with 1½- or 3-volt tappings between about 100 and 120 volts, It is certainly desirable that a battery of this type should be used and that the two tappings marked H.T. X in Fig. 2 should be very carefully chosen. Despite the remarks made above with regard to the use of two matched pentodes, it is better to use one of the special double-pentode Q.P.P. valves now on the market. There is then no need for balancing, since the two halves are identical and the auxiliary grids are joined together so that the applied H.T. voltage is not at all critical. Connections are shown inset in Fig. 1.

(Continued overleaf)

FINDING THE BEST OUTPUT STAGE

(Continued from previous page)

The Speaker Feed

The output feed to the speaker may be by means of a Q.P.P. output choke, shown in broken lines in Fig. 1, or by means of a suitable transformer: the latter, however, is incorporated in most types of modern speaker, or can be obtained as a standard fitting when ordering. The choke is only really necessary when the speaker is fitted with a transformer intended for matching a single power or pentode valve, but care should be taken to see that the correct type of component is obtained. An ordinary output choke, even though centre-tapped, might be useless due to the fact that its D.C. resistance is too high. The most important point about Q.P.P. is that the anode-current consumption is constantly varying in sympathy with the signal intensity being handled, and a high resistance in the H.T. circuit would tend to prevent rapid current changes and would therefore cause serious distortion. It is for this same reason that it is essential to use a super-capacity high-tension battery with Q.P.P. if good quality is required. The *average* current consumption is not great, but the "peak" current—which is required for only a few minutes during each hour of listening—might easily reach 30 milliamps.; a standard-capacity battery *could*, in many cases, supply such a current, but the internal resistance of the battery would be so high that there would be a "time lag," and consequent distortion.

No mention has yet been made of the actual G.B. voltage required, but this can generally be taken as at least 50 per cent. greater than that required by the valves when used in a normal circuit arrangement. The voltage is best found by trial, and should be made as high as possible without introducing distortion on the quieter passages. As when using pentodes in a "straight" amplifier, a tone correction-device is required, and this takes the form of the usual .01-mfd. fixed condenser and 10,000-ohm resistance connected between the anodes of the two valves.

Class B

Class B amplification, or positive-drive as it is sometimes called, is similar in many respects to Q.P.P., although the circuit arrangement is entirely different, being as shown in Fig. 2. It will be seen that a small power valve (called the driver) is used between the detector valve and the double-triode class B valve. This may be connected to the detector by any of the methods described in previous articles in this series, but must feed into the Class B valve through a special type of push-pull transformer. This generally has a step-down ratio of about 1.5 to 1 overall, or 3 to 1 each half, and the secondary winding must have a very low D.C. resistance, since a rapidly-fluctuating grid current has to flow through it. The exact ratio of the transformer depends upon the valves used in the driver and Class B stages, and figures for a few popular valves are given in the accompanying table. The driver valve is biased in the usual manner (automatic bias is rarely successful due to the variation in total anode current), but the Class B valve is not usually given a negative bias. This is not an invariable rule, however, and such valves as the Marconi and Osram B.21, the Mullard P.M.2B.A. and the Mazda P.D.220A require a bias voltage of approximately 4.5 for an anode voltage of 120 ; bias is applied simply by connecting the lead marked X in Fig. 2 to a tapping on the G.B. battery instead of directly to the earth line.

Tone Correction

The output from the two halves of the Class B valve is applied to the loud-speaker in the same manner as that from the Q.P.P. circuit, and it is equally important that the correct type of choke or transformer be employed. Whereas tone correction is applied in the output circuit in Q.P.P., however, it is generally better to apply this in the grid circuit in Class B amplification. The correction device in this case may consist of a fixed condenser of about .005 mfd. wired across the secondary of the driver transformer as shown. The most suitable value is best found by trial, since it has a definite effect upon the tone of reproduction. Instead of following this method of correction some prefer to connect a .001-mfd. fixed condenser between each of the anodes and earth. Best results are to be obtained by using the rather more complicated arrangement shown in broken lines in Fig. 2, where a fixed condenser and fixed resistance are joined in series between each of the anodes and earth. The values of components indicated are suitable in the majority of instances for use with Class B valves, but where any doubt arises the values recommended by the makers should be adhered to.

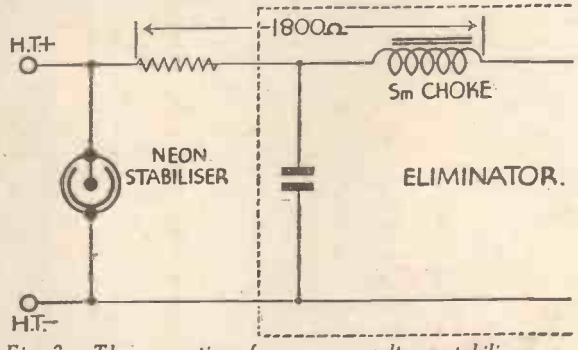


Fig. 3.—The connections for a neon voltage stabiliser—as required when operating a Class B set from an eliminator—are shown above.

The H.T. Supply

The high-tension supply is just as important in the case of a Class B amplifier as for Q.P.P. and similar conditions of "peak" currents arise. For this reason a super-capacity battery should be used, but there is no need for "close" tappings at the higher voltages due to the fact that the H.T. voltage is by no means critical. It is worth mentioning here that nearly every case of unsatisfactory reproduction when using Class B that has been investigated has proved to be due to the use of an unsuitable form of H.T. supply, or to the accumulator being of too small a capacity. The latter is a point which is often overlooked, especially when using one of the larger-output valves which take .4 amp. filament current; this is in addition to, say, .2 amp. passed by the driver, .1 amp. by the detector, and .2 amp. by the H.F. valve, so that the maximum current might easily amount to practically 1 amp. Many of the small mass-plate accumulators, although perfectly satisfactory for normal use, are unsuited for current loads greatly in excess of .5 amp. The above remarks apply, with rather lesser force, to Q.P.P.

Generally speaking, it is not a very satisfactory procedure to feed a Q.P.P. amplifier using two separate pentodes from an eliminator—because of the critical auxiliary-grid voltage—but a Class B outfit can be fed in this manner with complete success, provided that the eliminator is designed for Class B use, or that it is used in conjunction with a neon stabiliser which is connected as shown in Fig. 3. This system is effective only when the eliminator has a rated maximum output of 35 to 40 milliamps., and the object of the neon-lamp device is to maintain a constant voltage output irrespective of the current load. To do this effectively the resistance in the positive lead should be 1,800 ohms. This resistance is divided between the normal smoothing choke and a fixed resistance, which must be chosen according to the resistance of the choke (usually in the region of 1,000 ohms).

New Costa Rica Station

On 23.11 metres (12,980 kc/s), a new station, TIRCT, San José (Costa Rica) has been heard relaying a programme broadcast by TIRCC, of the same city, on 45.8 metres (6,550 kc/s). The latter, working on 500 watts, was previously TINRH, Heredia (Costa Rica), which a few years ago figured so prominently in our logs.

Immediately below JVN, Nazaki (Tokio), which has been often reported lately, you should now find CEC, Santiago (Chile), on 28.12 metres (10,670 kc/s), which, as a 4-kilowatter, although working a public telephony service with Spain, may also be heard testing at irregular intervals—usually between B.S.T. 02.30-03.00, and signs off with a peculiar bugle call.

On 29.41 metres (10,200 kc/s) the Cuban station reported to be CMHB, San Spiritus, would appear to be CO9WR, relaying a medium-wave broadcaster owning the former call. Possibly it is still in the experimental stage, as it has been heard on 25.48 metres (11,801 kc/s).

Also, HJ4ABL, Manizales (Colombia), has increased its wavelength to 49.46 metres (6,065 kc/s). The announcements are given out in Spanish, German, English, and occasionally Dutch.

USEFUL DATA CONCERNING TYPICAL CLASS B VALVES.

Valve Type.	Filament Voltage and Current.	Grid Bias (120v. H.T.)	Suitable Driver Valve.	Driver Trans. Ratio.	Max. Output (Milli-watts.)
Cossor 220B..	2v., .2a.	0	210 L.F.	1 : 1.2	1,250
Cossor 240B..	2v., .4a.	0	215 P.	1 : 1.2	2,000
Hivac B.230	2v., .3a.	0	L.210	1.5 : 1	1,250
Marconi and Osram B.21 ..	2v., .2a.	— 4.5	L.P.2	1.5 : 1	2,500
Mazda P.D.220A.	2v., .2a.	— 4.5	D.220	1.2 : 1	2,900
Mullard P.M.2B.	2v., .2a.	0	P.M.2D.X.	1.5 : 1	1,450
Mullard P.M.2B.A. ..	2v., .2a.	— 4.5	P.M.2D.X.	1.5 : 1	1,450

The Experimenters Explain

Automatic Volume Expansion—Which Provides a Ready Means of Increasing the Range of Volume Provided by a Receiver or Amplifier

IT is some time since the last article of this series was published, and we have received a number of letters from readers asking why our articles were temporarily discontinued. The fact of the matter is that there have been few new principles developed during the past few months, although practical improvements on existing arrangements have been very much in evidence, especially at Radiolympia.

There is now one very new development which we are sure will be of great interest to all readers, but especially to those who are in search of perfection in the way of reproduction and to those who like to keep in close touch with the more technical improvements. We refer to automatic volume expansion, which is made possible in a very practical form by the introduction of two new valves (battery and mains types) by Hivac. These valves are known as the V.220 and the AC/V, and in general principle and construction they closely resemble class B valves, but with variable-mu characteristics.

Necessary Restrictions

It is well known by all "quality merchants" that the programmes transmitted by the B.B.C., despite their excellence from the technical point of view, are necessarily imperfect; the very same remarks apply to gramophone records. The point is that the range of volume is curtailed to a certain extent, with the result that the softer passages of music are made a little louder in the transmission or recording, whilst the louder passages are made rather quieter. For the average listener with the average receiver this is an advantage and generally results in more pleasing reproduction. But this is only because the average set is not capable of dealing adequately with the extremely wide variation in signal intensity which would be provided by the "perfect" transmission or recording of the wide variety of musical instruments, particularly when these are grouped in the form of a band or orchestra.

It is very largely because of the form of transmission referred to that a "straight-line" amplifier does not necessarily give truly realistic reproduction. This is particularly true when dealing with gramophone records because, with these, the restricted width of the needle groove precludes the possibility of obtaining a recording of extremely loud passages in the same proportion as of weaker ones, the amplitude of which may be considerably less.

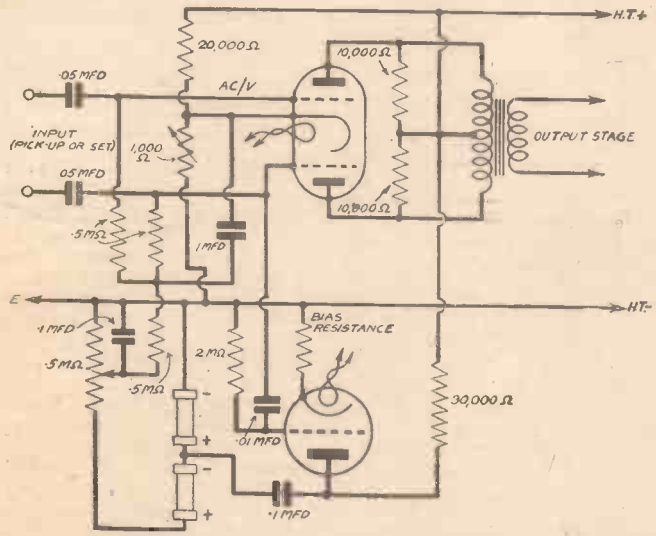


Fig. 1.—A circuit for automatic volume expansion, using the Hivac 220V variable-mu push-pull valve.

Automatic Signal-operated Bias Control

With the new valves the bias voltage is automatically varied by the signal voltages so that the bias is increased on quiet passages and reduced on loud ones. Thus, the amplification of loud notes is greater than that of passages of average intensity, whilst the amplification of soft notes is less. It is evident from this simple explanation that the output from the valve stage varies over a far greater decibel range than does the input to it, and thus the deficiencies of the original transmission are made good.

The method of using the Hivac 220V valve is shown in Fig. 1, where it will be seen that an auxiliary valve—in addition to the "automatic volume expander"—is used to provide the variable signal-controlled bias voltage. The grid of this valve, which should be of the high-amplification type, is virtually in parallel with the input to the push-pull valve, so that the same signal voltages are applied to both. The anode circuit of the valve contains an ordinary step-up L.F. transformer of good make, and the secondary of this feeds into a type W.6 "Westector." The latter is in series with a ½-megohm potentiometer and a 16½-volt G.B. battery, a lead being taken from the slider of the potentiometer through a decoupling resistance to the grid circuit of the special push-pull valve.

Component Values

The output from the double valve is shown as being applied to the following L.F. stage by means of a transformer with centre-tapped primary, and each half of the primary is shunted by a 10,000-ohm

(Continued on page 52)

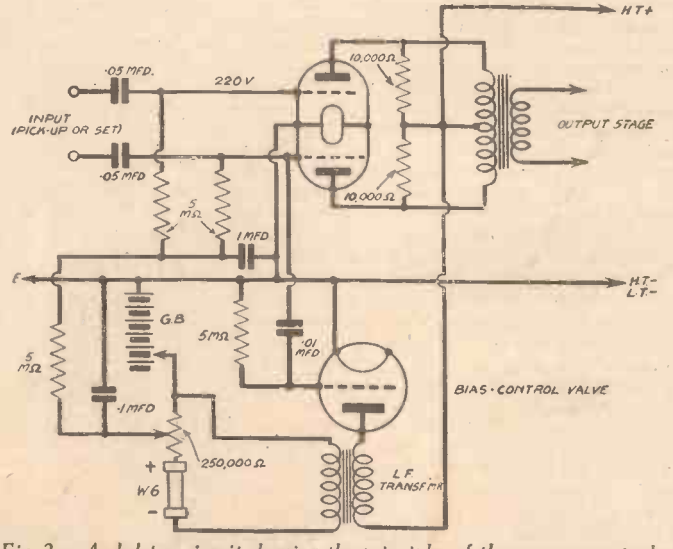


Fig. 2.—A skeleton circuit showing the principles of the arrangement when using the AC/V mains valve. In this case a slightly different variable biasing system is employed, this being an alternative to that shown on Fig. 1.

EARTHING SYSTEMS

The Essential Points to be Considered in Providing an Efficient Earth are Discussed in this Article

By G. V. COLLE

COMPARED to a modern transmitting aerial-earth system, the equivalent average receiving installation is often the antithesis of the former as regards efficiency. Engineers know that in order to obtain the maximum aerial radiation from a broadcasting station, careful attention both to the design and erection of the aerial and earth is essential. Many listeners, on the other hand, are apt to overlook the opposite fact, namely, that a good receiving aerial and an efficient earth will not only provide the maximum signal pick-up, but also allow for the reception of stations which might otherwise be considered below the usual geographical static level. In other words, the provision of an efficient aerial-earth installation will often allow sufficient aerial current to be passed to the set to overcome the local noise level and thereby increase the "log" of stations having entertainment value.

Listeners as a whole are inclined to rely too much on the reserve sensitivity of their sets to overcome, in many instances admitted deficiencies in their aerial-earth equipments. It is true that losses can be compensated in this manner, but what is not so clear is the action of the receiver in providing an inferior signal to noise ratio.

To understand the problem thoroughly, we will assume a listener possesses a moderately good horizontal outdoor aerial and an earth connection of doubtful merit. A system as described, well out in the country or on a quiet part of the coast, will prove quite satisfactory, due in the main to the low, local noise level, since turning up the volume control would not bring in an accompaniment of frying noises, as is usual in towns and congested areas. In this instance, however, owing to the earth connection having a comparatively high resistance, the selectivity may suffer, because the effect on the tuned aerial circuit in the set is equivalent to that of employing a coil with a high H.F. resistance and a low "Q" factor.

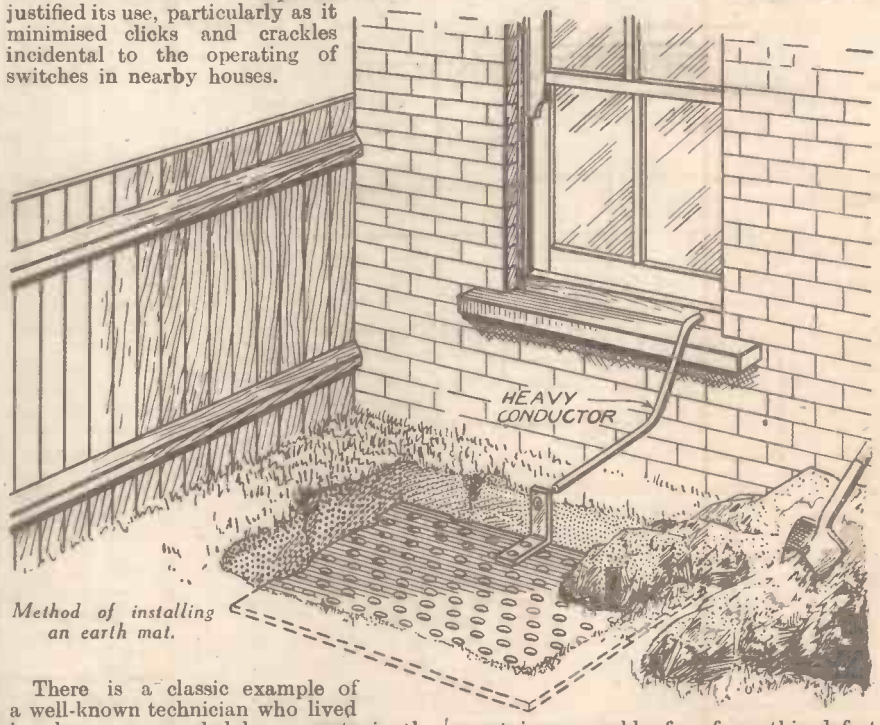
Town Conditions

Under town conditions, a similar installation has a more disastrous effect, quite apart from considerations of efficiency. A poor earth connection will exaggerate the noise level above that which undoubtedly exists. Selectivity will be impaired as described, but owing in the majority of cases to a powerful broadcasting station being in the vicinity, the "wipe out" effect assumes serious proportions.

It naturally follows that a reliable and efficient earth connection is a greater necessity in a congested area than in other localities. As proof of these statements, the writer can quote his own experiences in North Manchester. On taking up residence, a temporary earth connection was taken to the nearest earthing pin on a three-pin plug connected to the A.C. supply (the earth throughout the house was made with about a No. 14 S.W.G. bare copper conductor).

Results with an eight-valve radiogram on radio reception were quite good, as would be expected with the reserve of amplification available. When this earth connection was replaced with a flat copper strip about 16ft. long, ½in. wide by about 18 S.W.G., terminating in a perforated zinc plate 3ft. by 3ft. by 16 S.W.G., and buried 2ft. deep in a nearby flower bed, the increase of amplification on distant stations was estimated at about 150 per cent. Selectivity was also enhanced to an unbelievable degree. Readers who have, from these details, already formed the opinion that the improvements were due to better matching of the aerial tuned circuit should note that in both instances the trimmer condenser on the section of the gang unit employed was adjusted in conjunction with a visual tuning indicator for maximum response.

The installation in question is as perfect as one could hope to achieve, and it is, indeed, questionable whether an earth plate larger than 4 square feet (2ft. by 2ft.) would show a measurably greater efficiency. Nevertheless, in comparing the results there is no doubt the earth plate more than justified its use, particularly as it minimised clicks and crackles incidental to the operating of switches in nearby houses.



Method of installing an earth mat.

There is a classic example of a well-known technician who lived in a house surrounded by concrete in the heart of London. His reception, using a water pipe as an earth, was tolerably good on medium waves but hopeless on the long waveband. As a last desperate resort he drove a hole through about 6ins. of concrete in a basement room, inserted a heavy copper tube and "pile-drove" it home; but it overcame his difficulties.

Few listeners would attach such importance to reception, but the brief details given at least prove there are ways of overcoming what are considered insurmountable obstacles in providing an efficient earth.

Tubes versus Plates

Most technically-minded constructors visualize a radio-earth as a copper tube ¾ to 1in. diameter and 18 to 24ins. long, with a screw at the top end, and connected to a moderately heavy piece of rubber-covered wire or 7/22 aerial strand. On the assumption that a 1in. tube is buried to a depth of 18ins. and makes contact with the surrounding soil on the outside surface, the effective contact area will be 57 sq. ins. Comparing these details to a flat zinc plate 24ins. square, which provides 576 sq. ins., it will be appreciated that the latter has nearly twenty times greater contact area.

In terms of signal input the earth mat mentioned actually improves reception about 75-90 per cent. Tests on a standard aerial attached to a crystal set, with an energized carborundum detector and a sensitive microammeter in place of phones, have settled beyond doubt the relative merits of these earthing devices.

Resistance in the Earth Path

The ultimate aim in providing a reliable earth is to make the connection of as low an ohmic resistance as possible. Since resistance in the earth path increases the working H.F. resistance of the tuned aerial circuit, the selectivity of that circuit depends to some extent on the efficiency of the former.

A loose-coupled aerial tuning arrangement is reasonably free from this defect, although a poor earth will reduce efficiency. Therefore the earth wire between "E" on set and the buried tube or plate must also be of low resistance. Hence the conductor must have ample cross sectional area; for earth leads of, say, not more than 15ft. in length an insulated conductor of seven strands of .036in. diameter copper is advisable, and for longer leads preferably a copper strip (or one which is enamelled).

Many listeners, especially those living in flats well above ground level, find it quite impracticable to fit a direct earth connection. The nearest main water pipe or radiator must then be chosen, and while neither of these sources can be expected to prove as efficient as a direct earth, they are capable of giving reasonable satisfaction.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA

READERS WRINKLES

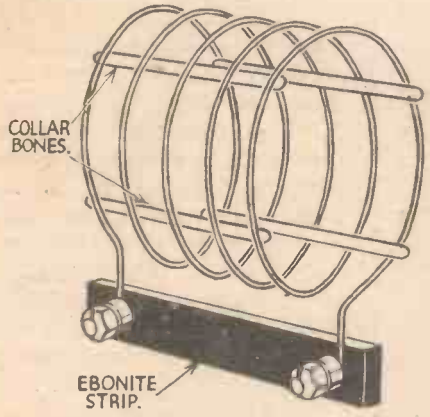
THE HALF-GUINEA PAGE

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

A Low-loss Short-wave Coil

THE parts required for making this coil are a 4oz. reel of wire 16 or 18 gauge, a tube of Durofix glue, 4 collar bones, 2 terminals, a strip of ebonite, and a piece of



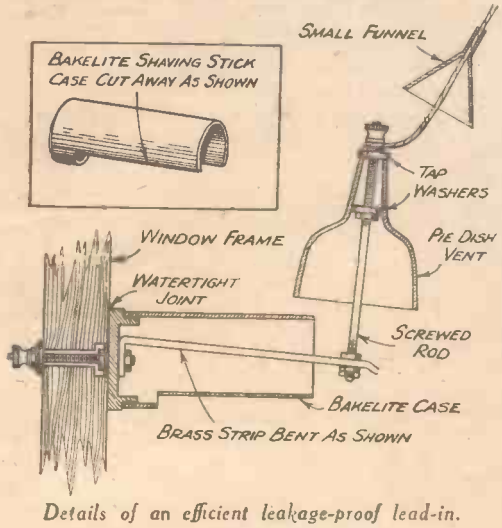
An inexpensive low-loss short-wave coil.

round wooden rod to wind the wire on, the diameter of which will depend on the size of the coil. If the coil is to be 2in. diameter the wooden rod should be 1¾in. diameter.

First measure the circumference of the rod, to find how many inches there are to each turn of wire. Do not forget to allow 2ins. each end of the coil, which will be needed to support it. Make a small loop in one end and screw this to the middle of the rod, fix the other end of the wire in a vice, pull it tight to straighten it and wind slowly, keeping the turns close together. Next unfasten the ends, and the coil will open about ¼in. and slip off easily. Pull it out gently until the desired spacing between the turns is obtained. Next bend the ends straight, and fasten them to the strip of ebonite with the terminals as shown in the sketch. Take a piece of cardboard ¼in. thick, cut it into strips 2½in. by ¼in., place one strip between each turn of the coil, and put a thick coating of Durofix on one side of the collar bones, which should be glued to the inside of the coil as shown. Do not remove the cardboard from between the turns until the glue has set hard.—T. F. W. BIGG (Gravesend).

A Leakage-proof Lead-in

THE lead-in arrangement shown in the accompanying sketches brings down surface leakage in wet and damp weather to a minimum. The materials required are as follow: 1 bakelite shaving-stick case, 1 china piedish vent, 1 small composition funnel, 2 stout rubber tap washers, and 1 strip of brass. All these parts can be purchased for a few pence, while the screwed rod, nuts, and washers can be obtained from the junk box. The sketch shows clearly how the parts are assembled. No sizes are given, as these will depend on the material at hand. Two important points to be borne in mind are the brass strip should be bent slightly downward, as shown, and the china vent should not touch the bakelite case, which should project as far under the vent as possible.—H. W. BRADLEY (South Chingford).



Details of an efficient leakage-proof lead-in.

Measuring A.C. Voltages

THE following method of measuring A.C. voltages depends on the principle of the potentiometer. A board one yard long and 4in. wide has brass blocks, C, D, E, and two terminals, A and B, screwed on it as shown. A D, D C, C E, and E B are lengths of No. 26 Eureka wire.

An electric iron is now connected in series with it, and it is necessary to compare the resistance, B, of the iron with that of the potentiometer, P. This is done with the ordinary Wheatstone bridge circuit. F H is a length of Eureka wire, and T is tapped along this until G registers no current (Fig. 2). Then $\frac{R}{P} = \frac{FT}{TH} = k$ (say).

The potentiometer is now connected as in Fig. 2, and T is tapped along the potentiometer A B (Fig. 3) until no hum is heard in the 'phones. Then, if the mains voltage is V and the unknown voltage V_1

$$V_1 = \frac{V \times AT}{[k-1]TB}$$

V can be found from the supply meter, A T and T B can be measured directly, and k is found as shown above. Thus V_1 can be found accurately. It is important to note that this method can only be used when the voltage to be measured is in the same phase as the mains voltage.—B. SKENFIELD (Merthyr Tydfil).

[*It should be unnecessary to mention that the usual precautions should be taken when making any tests or measurements of mains voltage. The arrangement has not been tested by us, but is published on account of the novelty of the scheme.*—ED.]

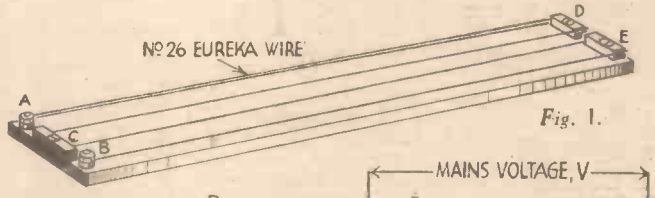


Fig. 1.

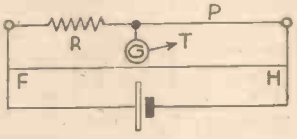


Fig. 2.

A method of measuring A.C. voltages on the potentiometer principle.

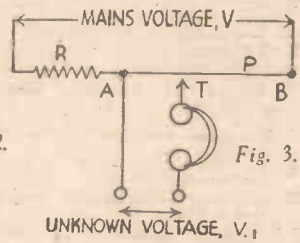


Fig. 3.

OUR RADIOLYMPIA COMPETITION RESULT

What Is Your Favourite Feature?

MANY thousands of entries were received in the great Competition which was published in our issue dated August 17th last. In this Competition, it will be remembered, readers were asked to forecast the order of popularity of certain of our regular features, and as a result of the entries these features have been classified as shown here.

The final results were obtained by adding up the numbers from 1 to 10, which were placed against each item by the entrants according to their selection, and obviously the item with the lowest score was the most popular one. As may be seen there was a very definite order, and each item is clearly defined, there being no ties.

No entrant succeeded in accurately placing the features, and the prizes are therefore awarded to those whose coupons were nearest.

The Fifty 1936 W/B Stentorian Loudspeakers will, therefore, be forwarded to the following fifty competitors, in accordance with the rules of the Competition:

FEATURE.	ORDER OF POPULARITY.	SCORE.
Set Construction	1	9,957
Short-wave Section	2	15,571
Readers' Wrinkles.....	3	17,312
Beginner's Supplement	4	18,642
Queries and Enquiries.....	5	20,538
On Your Wavelength	6	20,710
Letters from Readers.....	7	26,312
Round the World of Wireless	8	26,700
Facts and Figures.....	9	27,832
Reviews of Commercial Sets	10	33,281

C. H. Blakeman, 43, Norton Crescent, Birmingham, 9.
K. Firth, 2, Cromwell Crescent, Baghill, Pontefract.
F. E. Gloyne, 18, Westfield Terrace, Wakefield.
E. Nicholls, 56, New North Road, N.1.
A. Pesterfield, 4, Council Houses, Fishtoft, Boston, Lincs.
T. R. Silcox, 11, Broadway Road, Bishopston, Bristol.
O. H. Wheeler, 20, Testwood Road, Southampton.
E. Wilson, 13, Ulsterville Gardens, Belfast, N. Ireland.

The above readers had two mistakes each.

H. E. Begley, 42, Waltheof Gardens, Lordship Lane, Tottenham, N.17.
H. G. Conway, 78B, Cardigan Road, Winton, Bournemouth, Hants.
J. E. Davey, 47, Norbury Avenue, Thornton Heath.
L. Harding, 75, Grove Road, Shirley, Southampton.
R. Harvey, 31, Boswall Drive, Edinburgh, 5.
J. Penny, 4, Garland Road, Poole, Dorset.
S. Reader, 26, Mount Road, Hayes, Middsx.
T. Robertson, 17, Albany Street, Edinburgh, 6.
A. Secker, 20, Brook Street, Hellfield.
P. A. G. Smith, Windward, Gerrard's Cross, Bucks.
H. Spanner, 15, Davies Road, Woolston, Southampton.
A. Stanley, 38, Fray's Waye, Uxbridge, Middsx.
A. V. Stott, "Wincombe," White Lane, Ash Green, Surrey.
J. Sutton, 12, Denness Road, Ashford, Kent.
W. H. G. Swinson, 34, Brecon Road, Fulham, W.6.

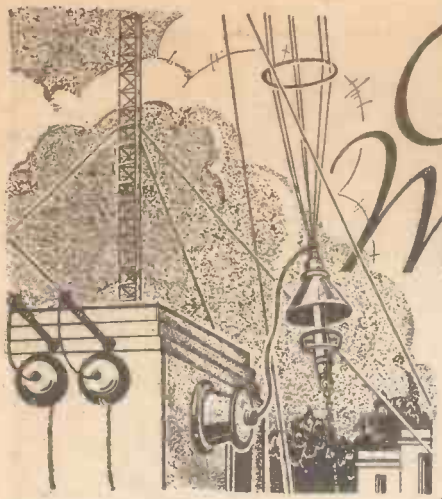
G. Taylor, 9, Haliburton Road. (*Address required.*)
J. Thomas, 480, Fairfax Drive, Westcliff-on-Sea.
A. C. Thomson, 19, Highbury Crescent, N.5.
F. Wallwork, 14, Central Avenue, Farnworth, Lancs.
E. F. Warren, 8, Station Road, Balham, S.W.12.
W. Ackroyd, 5, Harold Mount, Leeds, 6.
D. Alexander, 184, Lochee Road, Dundee.
E. E. Backhouse, 38, Nuthurst Road, Brighton, Sussex.
A. C. Baker, 109, Hough ton Road, Grantham.
A. H. Cast, 18, Staines Road, Ilford, Essex.
J. Chatterton, 2, Hukin Lane, Sheffield, 5.
J. B. Chorlton, 10, Wilne Street, Leicester.
F. Dewar, 57, King Street, Perth, Scotland.
W. J. Dickinson, Oak Lea Cottage, Barrow-in-Furness.
A. Edginton, Barcote Cotts., Faringdon, Berks.
W. G. Elmer, 146, Manor Lane, Sheffield.
R. S. French, 28, Conway Road, Shirley, Birmingham.
R. E. Garbett, London Road, Holmes Chapel, Ches.
G. E. Gilbert, 19D, Errol Street, London, E.C.1.
W. Goodhew, 14, Hudson's Road E.16.
M. Halfyard, 76, Fairfield Street, S.W.18.
N. Lawrenson, 8, Vernon Street, Macclesfield.
R. C. Machin, 6, Gordon Terrace, Rochester, Kent.
W. Pearson, 136, Arnold Road, N.15.
E. Russell, 14, Toll Bar Road, Wickersley, Rotherham.
A. Shaw, 10, Every Street, Wigan.
J. Watters, 117, Ratcliffe Road, Loughborough.

The above readers had three mistakes each.

Consolation Prize Winners

The following 73 readers had four mistakes each.

L. D. Austin, 30, Rowan Road, Streatham, S.W.16.
H. Bannard, 51, Trafalgar Street, Portsmouth.
W. Barnard, 57, Blackboro' Road, Reigate, Surrey.
A. G. Bartram, 2, Bell Cotts., Gt. Yeldham, Essex.
J. Beckett, Heath Hey, Hooton, Cheshire.
W. Beckingham, Ramalley, Hursley Road, Chandlersford, Hants.
A. C. Bower, 78, Copenhagen Road, Gillingham, Kent.
H. Bracegirdle, 20, Maple Avenue, Haydock, Lancs.
S. Braddon, 27, Ruthergien Road, Plumstead.
J. Brickland, 39, Aubrey Avenue, London Colney, Herts.
J. Bridgett, 8, Sandymount Street, Belfast, Ireland.
J. Briggs, c/o. Miller, 3/R, 72, Napiershall Street, Glasgow, N.W.
M. Burbanks, 15, Abbott Street, Awsworth, Notts.
Cpl. S. Burton, R.A.F., 15, M.Q., Boscombe Down; Amesbury, Wilts.
G. Busby, 14, Woodfield Crescent, Woodfield Road, Birmingham, 12.
B. J. Butt, Les Camps Collette, Nicolle, St. Peters Port, Guernsey.
T. D. Byrne, 33, Kevin Street, Lr. Dublin, C.7, L.F.S.
J. S. Cairns, 18, Vermont Avenue, Liverpool, 23.
A. Cannings, 32, Temple Road, Windsor, Berks.
A. G. Christopher, 97, Second Avenue, Manor Park, E.12.
R. A. Claysmith, Tinsbury, Nr. Romsey, Hants.
— Darbyshire, Darlington.
C. G. English, 61, Sherwood Gardens, Barking, Essex.
H. Evans, 1, Seafield Terrace, Collemore Road, Dalkey.
G. E. Ford, 23, Spur Road, Orpington, Kent.
R. G. Grant, 1017, Crow Road, Glasgow, W.3.
J. Gray, c/o Willox, 12, Tollcross Road, Glasgow, E.1.
J. Griffin, Mountain View, Castlebar, Co. Mayo.
F. Gulliver, 14, Model Village, Long Itchington, Nr. Rugby.
H. Gunn, Brickfield Cottages, Smallfield, Horley, Surrey.
C. Hawkins, 13, Brook Road, Bath.
J. Hinks, 188, Heneage Street, Birmingham, 7.
J. W. Histed, 262, Davidson Road, Croydon.
A. Hogarth, 37, Glanton Street, Sc. Byker, Newcastle-on-Tyne.
E. Hollender, 12, Hopton Street, Stafford.
J. S. Hooton, 173, Malefant Street, Cardiff.
A. Hunter, 25, Omar Crescent, Buckhaven, Fife.
J. Irwin, 85, Stansfeld Street, Blackburn, Lancs.
W. Isaacs, 29, Median Road, Clapton, E.5.
F. Jackson, The Cottage, Crookhill Hall, Maltby, Rotherham.
G. A. James, 19, Dorchester Avenue, Cardiff.
T. J. Jones, 56, James Street, Pontardawe, Glam.
P. T. Jones, 37, Penrhiwfer Road, Tonyrefail, Glam.
C. Jones, 12, The Drive, Gilfach, Bargoed.
J. G. Knight, 42, Leominster Road, Hall Green, Birmingham, 11.
A. Knights, 93, Hutcheon Street, Aberdeen.
A. W. Ledgley, 14, St. Mark's Place, Windsor.
G. R. Lockwood, 16, Holmewood Gardens, S.W.2.
N. MacCallum, 49, Auchentoshan Avenue, Duntocher, Glasgow.
P. Maloney, 59, Hartley Road, Portsmouth.
F. Marsh, 8, Dagmar Street, Walkden, Nr. Manchester.
R. McMurray, 172, Ligoniel, Belfast.
G. Mercer, 13, Birnam Green, Fleetwood.
D. I. Morris, The Garth, Middleton-one-Row, Co. Durham.
A. C. Morrison, 32B, Foxgrove Road, Beckenham.
A. H. Newcombe, 43, Cardiff Road, Aberdare.
H. R. Nutt, 78, Swinley Road, Wigan.
J. Padbury, Oak Bungalow, Colney Heath Road, St. Albans.
E. H. Peters, 55, Atheldene Road, Liverpool.
G. W. T. Pirie, 231, Breck Road, Liverpool, 5.
W. Pratten, 24, Margravine Road, W.6.
A. Reeve, 38, Almey's Lane, Earlshilton.
A. Roberts, 31, Glendish Road, Tottenham, N.17.
N. Simmonite, 5, Washington Street, Bradford, Yorks.
G. R. Smith, 86, Sandwich House, Sandwich Street, London, W.C.
G. E. Smith, The Oaks, Hadlow Down, Sussex.
T. W. Sorley, 64, Kennedy Drive, Airdrie.
A. Stewart, 17, Harley Street, Glasgow, S.W.1.
M. O. Sullivan, 4, St. Patrick's Square, Bray, Co. Wicklow.
A. B. Tollerton, 1, Nevill Road, Crowborough, Sussex.
S. West, 35, Brandon Road. (*Address required.*)
A. B. Whale, Blisland, Bodmin.
W. W. Wright, 52, Kingslake Street, Edge Hill, Liverpool, 7.



On Your Wavelength

By Thermion

House Building Up to Date

I LEARN that a firm of Balham builders offers, as an added advantage to purchasers of their desirable residences with H. and C., room for garage, and cavity walls, a complete radio installation. I understand that points are fitted in every room so that you can just plug the radio in. This strikes me as being very enterprising of them, and will rid tenants of installation problems. I hope the system is crackle free, although I am sure that they will look for tenants in vain amongst home constructors.

Pylons and Crackles

A FRIENDLY Post Office official rang me up concerning my recent paragraph about pylons, crackles, and the danger of the pylon to aircraft. The point he wishes to make is that in time of war a few bombs dropped on the Battersea Power Station would be far more disastrous than any damage an equivalent number of bombs could do to the grid system. He tells me that it was really as a result of the war that the grid system was brought into being, since any damage could swiftly be repaired and would not be of such a far-reaching character as under the old local system. He also thinks that there is little danger to aircraft occasioned by the pylons and cables. Regarding crackles, he says that the Post Office is ready and willing to investigate any complaint on this score which listeners care to make. I quite agree with this; the Post Office has been most co-operative, rather more I should think than they need be, bearing in mind that they get only a shilling out of the licence fee. The grid system, of course, is really a wonderful piece of engineering, and required extreme ability to link up the whole country in the way they have done. All the same, I feel a little uneasy about the aircraft point of view.

Junk Shops

HAVE you ever taken the trouble to browse over a junk store? Radio history is writ large upon its wares. You are able almost to trace the history and development of wireless receivers therein. Multi-knob receivers with swinging reaction coils, bright emitter valves consuming about 1 ampere, amazing crystals, gargantuan tuning devices, wonderful slow motion drives, variable condensers with semi-circular plates—all are still on sale. I wonder who buys them? I suppose the impecunious schoolboy gains his fundamentals by purchasing them—in many ways an excellent method of learning underlying principles. My first three-valver had oodles of knobs, but I had hours and hours of amusement from it. The crime of it is that it is still working. I gave it away many years ago to someone who was content to receive London and what was then Daventry. I heard it the other evening and was amazed at the quality it still yields. The same speaker is in use—an old reed type made by Sterling—the Mellovox. Remember the weird and wonderful aerials we used to erect in those days? Do you remember the number of times we used to pull them down to try a different arrangement? We used really to enjoy our week-ends in those days!

Junk shops.

Enough, Enough!

THE pro-crooners continue to write to me. I have had my say, and they have had theirs. Let us admit that some like crooning, and some do not. Just in parting and in conclusion, may I recommend readers to read an article on Crooners written by that famous humorist, F. W. Thomas, in the *Star* for Saturday, September 14th. I hope the Editor will not administer one of his metaphorical kicks in the pants of the special brand he reserves for recalcitrant contributors, for referring in my notes to a daily contemporary. The pro-crooners have called me all of the assorted sorts of fool. The anti's send me eulogiums of praise; let us write finality to this painful correspondence on an even more painful aspect of modern radio.

The First 3-valver.

Wireless Classes

I HAVE previously commented in these notes on the general lack of knowledge of fundamental principles possessed by many of those people who are employed as shop assistants and service engineers by wireless dealers. In the past many of the people concerned have offered the excuse that they have been unable to gain the grounding which was necessary, due to the fact that evening schools and similar institutions did not cater for them. I do not agree that this excuse is a good one, for the regular reader of PRACTICAL AND AMATEUR WIRELESS cannot fail to obtain a complete knowledge of fundamentals as well as of the practical side. In addition to this service, however, I am pleased to observe that the Regent Street Polytechnic in London and University College in Nottingham have organised a full series of lectures for the present season. The Polytechnic courses are very comprehensive and are designed to cover a total period of five years, whilst those in Nottingham can be attended for one half-day and one evening per week, or for a full day in each week. These are not the only classes of their kind, although they are probably the best known, but many other similar courses are being run by local Education Authorities in most parts of the country. For those who wish to become fully competent, and who would like to take a diploma in radio and high-frequency engineering, the courses present an excellent opportunity.

Multiple Valves

WHETHER we like it or not, the idea of combining several valves in a single glass bulb is growing, and although this does make it possible to have far more stages than valves, it also adds to the difficulty of tracing faults when they develop. But since the multiple valve is being used in increasing numbers we might as well make the best of it when designing new sets. Thinking of this subject the other day, I wondered whether it would not be possible to make a "three-valve" receiver with high-frequency, detector, and L.F. stages by using only a single "bottle." The idea that came to my mind was that of taking a pentagrid, using the pentode portion as an H.F. amplifier, the triode section as a leaky-grid detector, and feeding the output from this through an L.F. transformer back to the grid circuit of the pentode. This arrangement would appear to be satisfactory in practice, but I must confess that I have not tried it. You might argue that there would be far too much interference between the two sections of the valve, but the screening grids should overcome this to a large degree. Anyhow, that's the idea—you can try it if you will, but don't blame me if it does not give world-wide reception.

Wireless!

I OFTEN think it rather a pity that our nomenclature is so inaptly chosen. For instance, we are still using the term "wireless" to refer to radio apparatus.

(*Continued overleaf*)

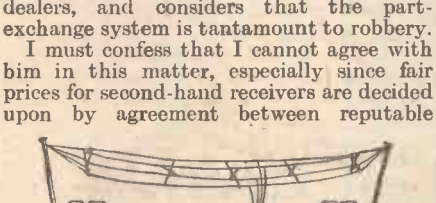
(Continued from previous page)

whereas the term was, of course, originally chosen to indicate that communication was possible between two places without the intervention of wires. The average broadcast receiver employs many miles of wire in its construction (taking into account the transformers, coils, etc.), and it is, of course, a receiver of radio frequency signals or, as our American friends call it, a "radio receiver." Similarly, we refer to "high-frequency" and "low-frequency" components and circuits, whereas the correct terms are radio and audio-frequency. The terms high and low are purely relative and do not indicate the functions of these parts of the circuit in any way. A reader some time ago decided to try and make an "all-wire" receiver, and he made a very creditable effort. Nothing but wire was used in it, the chassis, control knobs and even the condensers being made from wire. I must admit it looked rather formidable, but nevertheless it was "wireless."

Part Exchange

I RECENTLY received a letter from a reader who, although an enthusiastic constructor in the early days of wireless, bought a complete receiver a couple of years ago. He has no fault to find with the set, which has apparently served him very well, but he considers that it is now old-fashioned and proposes to buy a new one of 1936 vintage. On approaching a dealer with the intention of negotiating a part-exchange transaction, however, he was horrified to find that he could only get an allowance of about fifty shillings for his old set—which cost him sixteen guineas. He has some very nasty things to say about dealers, and considers that the part-exchange system is tantamount to robbery.

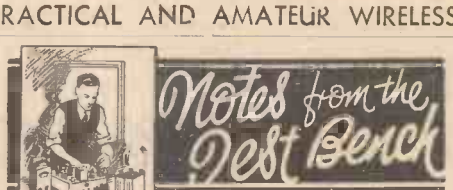
I must confess that I cannot agree with him in this matter, especially since fair prices for second-hand receivers are decided upon by agreement between reputable



Wonderful aerials.

members of the industry and are standardised. After all, this reader should ask himself what the dealer will do with his old set when he gets it; there is probably no market for it; it would be an expensive matter to attempt to modernise it; the components would not be worth very much if the set were dismantled, and even then a good deal of time would be taken up in removing the parts. I consider the system at present in operation as quite fair, and as good as any that could be adopted. Consequently, the user of a ready-made set must be prepared to loose a certain amount of capital due to depreciation.

After I had explained the position to my correspondent I believe he saw the point, but he decided at once that he would return to the ranks of the home constructor. I certainly advise him to do so, for by spending about two-thirds of the cost of a complete set he can build one of his own which would be of equal quality, and spend the extra one-third on buying additional components for modernising as and when they are available. By following this idea he may have an up-to-date and thoroughly reliable receiver for several years, so that the cost per year will be very much less than when employing a commercial instrument.



Trickle Charging

WE are often asked by our readers whether their H.T. battery eliminators can be satisfactorily used for charging L.T. accumulators. Our answer is, of course, in the negative, because the maximum current output obtainable from the average battery eliminator is in the region of 30 m/A. The connection of a 2-volt accumulator across the output terminals of an H.T. unit would practically constitute a dead short-circuit, and, therefore, the unit would be damaged if used for home-charging the L.T. accumulator. If it is desired to trickle charge at home, this can be cheaply done if the supply is A.C., but it is an expensive procedure if D.C. is installed.

D.C. Charging

TO charge from D.C., the positive mains lead must be connected through a resistance of suitable value to the positive terminal of the accumulator, and the negative terminal of the latter must be joined to the negative main. If a lamp is used in place of the resistance, however, and charging is only effected when the light is required, charging cost will be negligible. To charge from an A.C. supply, a mains transformer and an L.T. rectifier will be necessary. A metal rectifier of the L.T.4 type is suitable for this purpose, and charging can be effected quite inexpensively as the current taken from the mains will be governed by the actual current used for charging, and the loss in the dropping resistance in the case of D.C. charger does not occur.

H.F. Instability

IT is often found that H.F. instability occurs when a modern S.G. or H.F. pentode valve is substituted for an old model in receivers designed two or three years ago. This is due to the higher efficiency of modern valves, as compared with modern types. There are several methods of remedying this trouble, the best being to screen the H.F. coils, tuning condensers, H.F. choke, and the wiring more effectively. It is sometimes found, however, that the coils and condensers are already effectively screened, and excessive screening of the wiring causes loss of efficiency. In such cases it is advisable to substitute an H.F. transformer for the existing H.F. coupler, or, if this cannot easily be effected, the H.F. valve may be negatively biased.

Variable-mu Bias

THIS may be done by connecting a .0005 mfd. fixed condenser between the grid lead of the H.F. valve and the grid terminal of the valveholder, and then connecting a one-megohm resistance between the grid terminal of the valve-holder and the —1.5-volt socket of the grid-bias battery. If the valve is of the variable-mu type the one-megohm resistance may be joined to the centre terminal of a 50,000 ohms variable potentiometer, the end terminals of which should be connected to grid-bias battery + and — 9-volt sockets respectively. The latter is the better method of the two if a variable-mu valve is available, as volume, stability, and selectivity may be controlled by means of the variable potentiometer.

Loud-speaker Design

SOON after the Radio exhibition I took the opportunity of interviewing an expert who was concentrating on loud-speaker design, and some very interesting facts were forthcoming. It would appear quite definite that there is much to be desired in the speaker as we know it to-day. The cone is all wrong; the method of transferring the speech energy from the valve to the speaker is wrong; and, in fact, there is nothing right about the art as it is now practised. I was shown apparatus which "proved" that the speaker is definitely the weakest link in the chain, and some novel developments were demonstrated. Unfortunately, in order to reap the full benefit from the new ideas an output of about 20 watts is required—when it is quite evident that the reproduction comes up to a very high standard. All this is, however, what might be called "academic," as for ordinary home entertainment a really good moving-coil speaker delivers an output which is satisfactory for normal requirements. Even if these improved schemes were adopted generally, the output from a home receiver would not enable the full advantages to be obtained. No doubt in time we shall see these new ideas at the cinema, and at other places where hefty outputs are dealt with, and gradually small models will appear for the ordinary listener, when the amplifier and other equipment will be modified to suit them, and so the game will go on.

Diode Detectors

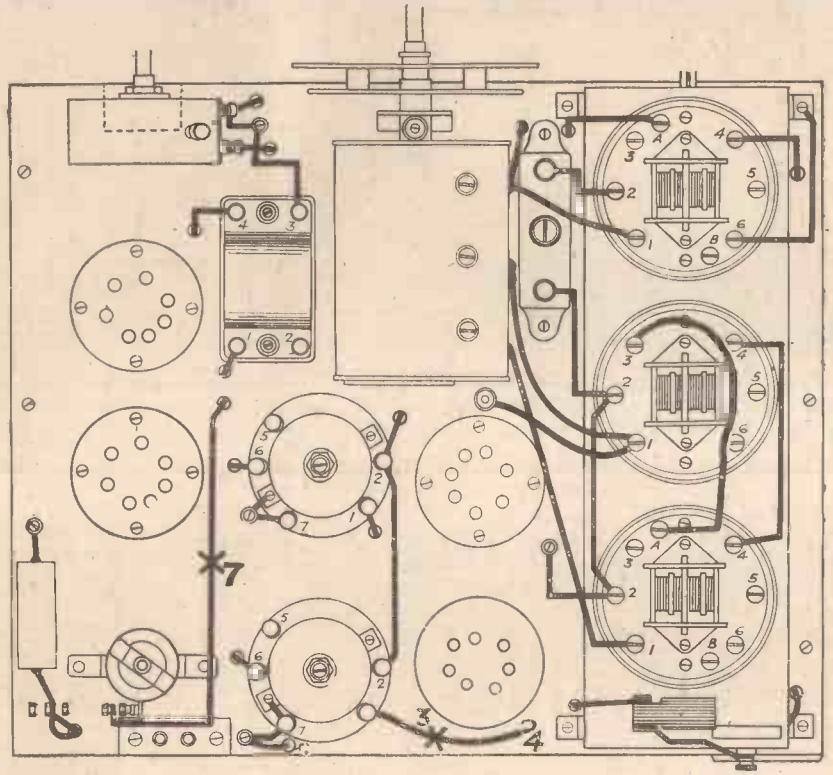
IT is not sufficiently widely known that modern diode detectors can handle very powerful high-frequency signals without appreciable distortion. It is, nevertheless, a fact that if the incoming signals are built up to a sufficiently high level by radio-frequency amplification, a diode detector

Kick in the pants.

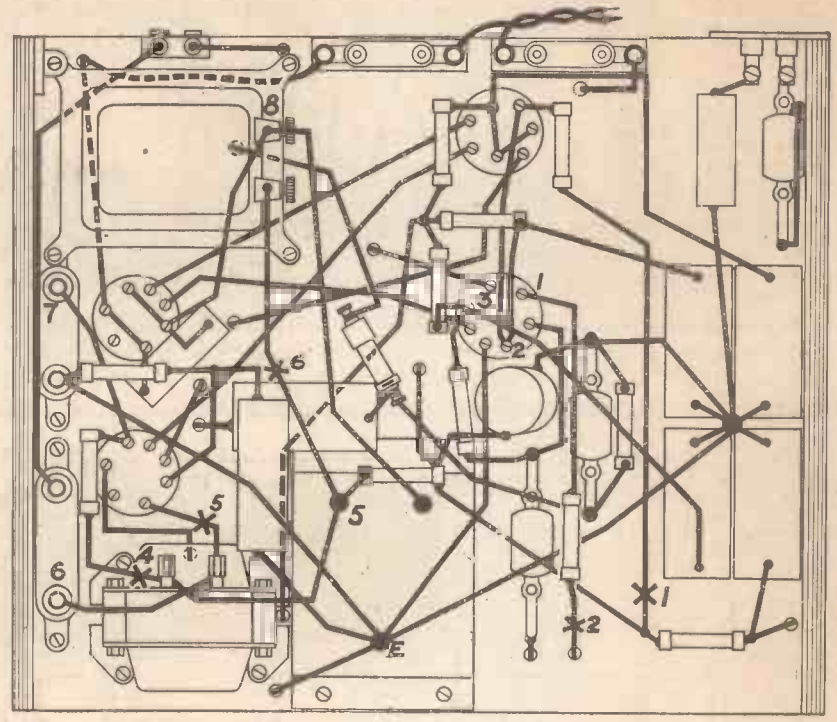
can be made to give an audio-frequency voltage great enough to load fully a large output valve of the 2½-watt or even the 5-watt output type. In the design of quality receivers the diode detector should feed direct to the output stage, all the voltage amplification being provided by the high-frequency stages. In one or two special cases a low-frequency amplifier could be interposed between the diode detector and the output valve, and even then the gain is kept to a comparatively low value, and the associated circuits very conservatively designed to reduce the risk of distortion.

The question of diode detection is of such great importance that it will be discussed at greater length in the next article.

Practical and Amateur Wireless SERVICE DATA SHEET No. 3 FOR THE UNIVERSAL 3-valve SUPERHET



Top of Chassis View.



Underside of Chassis.

Approximate Voltage Readings

With Mains Supply Voltage of 230 A.C. or 240-250 D.C.

Voltmeter — to E

" + to 1=100 volts.
" + to 2= 60 volts.
" + to 3=165 volts.
" + to 4=165 volts.
" + to 5=195 volts.
" + to 6=180 volts.
" + to 7=180 volts.
" + to 8=230 volts.

Approximate Resistance Readings

Coils GIC5 and GIC6.
Ohmmeter across terminals 1 and 2 (med. wave)=1.2 ohms.
" " " 1 and 2 (long wave)=7.5 ohms.

Coil GIC5.
Ohmmeter across terminals A and 4=.7 ohm.

Coil GIC6.
Ohmmeter across terminals 3 and 4 =.7 ohm.

Coil GIC7.
Ohmmeter across terminals 1 and 5= .9 ohm
" " " 1 and 2=5 ohms.
" " " A and 4=1.9 ohms.

I.F. Transformers.
Ohmmeter across terminals 1 and 2=43 ohms.
" " " 5 and 7=43 ohms.
" " " 6 and 7=26 ohms

L.F. Transformer.
Ohmmeter across terminals 1 and 3=400 ohms.
" " " 1 and 4=1,500 ohms

Approximate Current Readings

Milliammeter connected at ×1=7 m.a.
" " " ×2=3 m.a.
" " " ×3=5 m.a.
" " " ×4=6 m.a.
" " " ×5=34 m.a.
" " " ×6=55 m.a.
" " " ×7=180 m.a.

SOLVING INTERFERENCE PROBLEMS

DIRECT AND RE-RADIATED STATIC

This Article, which is Part of a Series, Deals with Static in Congested Areas and How it Can Be Minimised

IN order to lend clarity to the subject, the original discussions on interference problems in the first of this series of articles assumed that direct and similar electrical radiated interferences were non-existent. In the majority of cases, however, this is far from being the truth, as these latter sources of static are created by appliances and vehicles which are not very far removed from congested receiving areas. The city dweller is more than likely to be affected by static from such sources as trams with overhead feeder wires, trackless trolley buses, overhead power cables, and telephone wires, neon signs, etc.

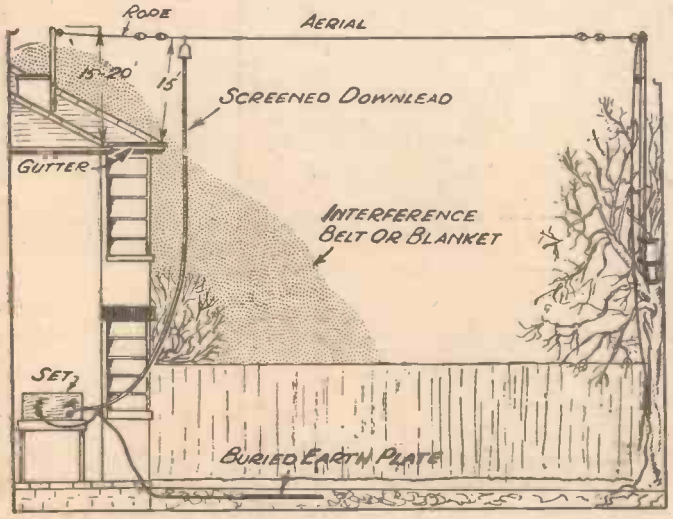


Fig. 1.—A simple aerial system which illustrates most of the desirable features required for noise-free reception where direct radiation is occurring. Some screened downleads require bracket supports to remove the major portion of their weight from the horizontal aerial.

These vehicles and devices between them create unbearable noises in the receiver, and the interfering waves which are responsible for the noises generally impinge on the aerial system. It is also possible for the same static to induce currents in nearby isolated metal objects, such as gutters, drain pipes, and overhead cables not necessarily feeding the devices which produce the interference. The isolated metal house fitments mentioned will in turn re-radiate into the aerial circuit or even into the electric cables constituting the lighting installation in the listener's premises.

Several interesting possibilities arise from the conditions outlined; the electrical wiring of the house will conduct the interference to the set *via* the mains connections, and will additionally propagate the interfering currents into all vulnerable aerial and earth receiving points. It will be noted that these interferences are additional to those already experienced by direct pick-up of electrical static in the aerial, and similar conducted interference from the mains input and from outside sources. The cure is threefold, and can be briefly summarised as follows: (1) the horizontal section of the aerial nearest the house must be at least 15 to 20ft. from adjacent metallic objects; (2) the horizontal aerial must be erected as high as possible and advisedly a similar distance above the level of the roof, the down lead being screened for its entire length; (3) a condenser filter, augmented where necessary with heavy-current H.F. chokes, must be connected across the output of the master fuse-box close to the point where the mains cable enters the premises.

Local Mains Filter

It is fairly certain that where the majority of the house-wiring is run through metallic conduit well bonded together little interference will be experienced from this source. The reader should note that where the normal unscreened electric house-wiring exists, the further precautions in the way of a local mains filter as indicated in the second of these articles, often provides a useful addition to a noise-free installation. It sometimes happens that removing the aerial from the receiver entirely removes the interference, but it does not necessarily follow that the latter is due to direct pick-up. The mains radiated interference can induce the currents into an unscreened aerial downlead, and it will be seen that the mains filter as described will suppress the noises.

From these facts we can deduce that the mains filter is of primary importance, and that an efficient screened down lead need only be added later, if necessary. Mains filters, by the way, while not always showing a direct improvement in static suppression, will nevertheless cut down the noises caused by trams and buses from minutes to seconds with regard to their duration. A screened aerial down lead, on the other hand, will lessen the directly-radiated component of interference, and will often entirely remove it, especially if the horizontal aerial is not affected. On the other hand, where the direct radiation is received on the horizontal aerial as well as on the downlead, screening the latter can only partially cure the noise. The necessity for erecting the receiving portion of the aerial outside the zone of interference now becomes apparent.

Interference in Flats

Interferences which completely spoil even local station reception can often be minimised although rarely completely eliminated in the ways described. However, the listener who is so unfortunately placed can invoke the aid of the Post Office engineers. It is possible, although by no means certain, that many prospective radio listeners living in flats in densely populated areas would be the chief sufferers. The possibility of static arising from the operation of lifts, automatic oil-fired stokers of central heating plants, and miscellaneous electrical devices, such as refrigerators, vacuum cleaners, etc., cannot be overlooked.

In view of the possibilities mentioned, prospective users of radio sets in flats are advised first to hear their sets under operating conditions in their own homes before finally making their choice. If it is found that the static level is high, and the noises are sufficiently intolerable to make distant reception hopeless, then the choice of a less sensitive receiver and the reception of nearby powerful stations is the only alternative. Of course, the appliances mentioned can be electrically silenced, but this depends on what value the listener

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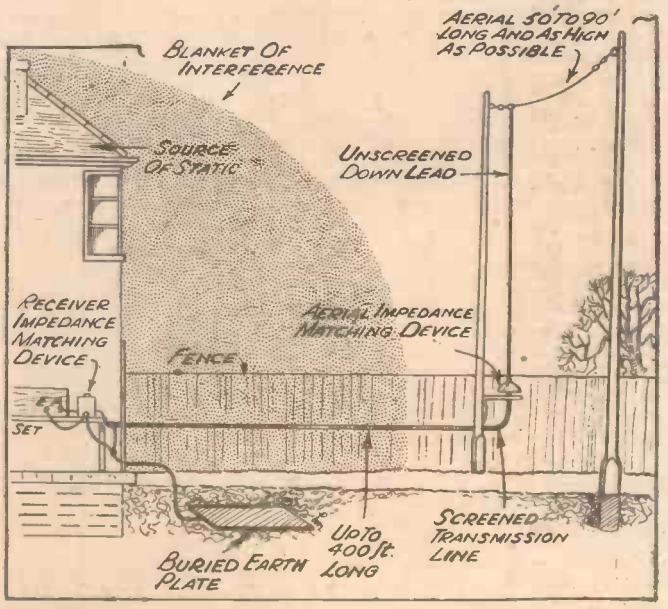


Fig. 2.—An alternative aerial system which allows for a "staggered" aerial; especially valuable in minimising intense local interferences. The receiver impedance matching device is not always essential, depending on the input circuit of the set and the length of the transmission line. It is possible to mount the aerial unit closer to the horizontal wire.

SOLVING INTERFERENCE PROBLEMS

(Continued from previous page)

attaches to his reception, and also whether he is prepared to defray the expense of static suppression devices.

Sometimes the owners of the flats can be prevailed upon to meet the cost or it can be defrayed jointly with the other residents. A further arrangement which is now adopted, and particularly in large multiple flats where the erection of an outdoor aerial is either impossible or restricted by agreements, is for each listener to bear the cost either by the payment of a weekly sum or by a charge in the rent towards the cost of maintaining a central aerial system, operating in conjunction with master receiver and boosting amplifier, feeding as many receiving points as desired. This arrangement is not a relay scheme in the true sense of the word because each receiver is capable of operating in the usual manner.

As many as 120 flats in a single block are sometimes provided with multi-receiving points for radio reception. Where the flats have been six to seven stories high it is obviously impossible to advise the erection of independent aerial and earth systems even when knowing that suppression devices will be fitted as a matter of course across all electrical devices common to these huge buildings. Special research has been made necessary into such problems, and the result is to provide an arrangement as already outlined, a relay scheme to a nearby relay station or a similar relay station fitted at the top of the building, providing several programme points, as mentioned above. He is indeed an optimist who, living in such surroundings, expects an all-mains receiver to provide even reasonably decent reception from a mains aerial.

There are many flats, of course, to which these notes do not apply, and where perhaps four to six residents require radio reception. In this case there are available on the market aerial impedance matching devices for use with a transmission line, and where one aerial erected clear of all interfering sources can be made to feed four to six receiving points. Such systems are quite inexpensive, but usually only operate on the medium wave-band, as the impedance devices are adjusted to give the maximum signal transference at about 350 metres. Reception is then possible between 200 and 550 metres, and with negligible mutual interference. As compared with individual indoor or mains aerials, a small communal aerial system of this nature is more than likely to provide greater individual enjoyment of radio reception.

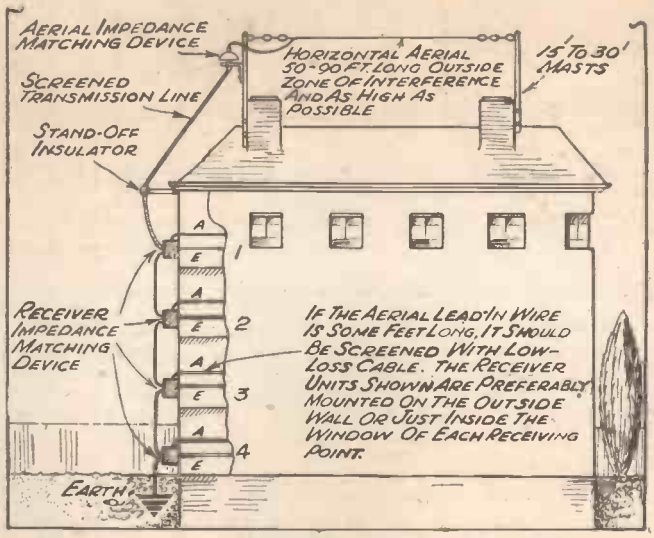


Fig. 3.—A master aerial for one to four receiving points in a small block of flats or apartment house. The possibility of good reception (usually on the medium waves) is far greater than with separate mains or indoor aerials.

Broadcast Items

"The Night Life of Budapest"

ARISING from the visit of the Variety Director to Budapest in the early part of the year, listeners will hear on September 24th, 25th, 27th and 28th at 10.10 p.m. four relays from Budapest. The Variety Director is proceeding there on September 13th to collaborate with the Hungarian Broadcasting Authorities in the writing of scripts for these programmes, representative of the night life of Budapest. The name at present given to the programmes is, in fact, "The Night Life of Budapest."

As at present sketched out these broadcasts will necessitate the use of forty microphones in various parts of the city. Budapest is justly famed for its blue Danube, dividing Buda from Pesta, its palaces, thermal springs, and perfect climate. All these attributes have combined to produce an atmosphere inducive to the growth of possibly the most entertaining and artistic night life in Europe. Here is the home of Hungarian tzigane bands. Budapest's opera and cafés are unique, while the historic ceremonials supply many opportunities for entertaining and melodious broadcasts. It is the intention of the Variety Director to frame scripts which will include the majority of the city's entertainments and ceremonies. At the moment he is planning a description based on a visit of two Englishmen to Budapest, guided by two Hungarian friends. Those listeners who like broadcasts of mythical cafés, such as "The Café Colette" and "The Red Sarafan" will have an opportunity of hearing the actual life of Budapest's cafés and restaurants.

Captain Blood

SOME further adventures of Captain Blood, by Rafael Sabatini, will be heard by Western listeners in a radio play adapted from the Chronicles of Captain Blood by Froom Tyler, to be produced by Cyril Wood on October 1st. Listeners were first introduced to "Captain Blood" on December 31st of last year. On that occasion the story of Captain Blood was told from his early days in Somerset to the time of his falling in love and (presumably) settling down to an uneventful life of living happily ever after. Realising that he could not continue the story of Captain Blood where it ended in the last broadcast, Froom Tyler has returned for his material in this play, entitled "Gallows Key," to the earlier part of Blood's life, before the famous buccaneer found love and respectability.

Autumn Programme of Broadcast Dramas

AUTUMN plans of the Drama Department of the B.B.C. include productions designed to cater for listeners of widely differing tastes. Adaptations are to be given of many famous plays, ranging from Edgar Wallace's "On the Spot" to "Uncle Vanya" by Tchehov. A specially written version of Sapper's "Bulldog Drummond" is promised for early October; in November Eden Phillpott's "Devonshire Cream" will be produced, while Margaret Kennedy's "The Constant Nymph" is in the December schedule. From October to December Shakespeare is represented, on the first Sunday of each month, by performances of "Macbeth," "Richard II," and "Romeo and Juliet" respectively.

Among original plays specially written for the microphone which listeners will hear will be "Congo Landing," by Horton Giddy, author of the naval thriller, "In the Shadow." This time the dramatist turns to the air, and will tell the story of a record-breaking flight which ends in a forced landing in the jungle. A play of the French Revolution, entitled "Brumaire," by Anthony Ellis, will be produced by Robin Whitworth early in October, while another unusual play will be an English version of "In Small Print" by the Polish writer, Madame Kolkowska. Lance Sieveking has collaborated with M. Joseph Renaud, French radio-dramatist, in a new work which he has called "The Boomerang Bet." It concerns a fantastic wager made by a millionaire and the curious way in which the bet is eventually won. The only revival on the list is also by Lance Sieveking, whose "Wings of the Morning"—a fantastic experiment with time—will be heard in December.

"Véronique"

THE B.B.C. production of André Messager's charming light operetta, "Véronique," will be heard by National listeners on October 3rd and will be repeated in the Regional programme the following evening. The early scenes of the show, which is set in Paris in 1840, take place in the fashionable flower shop of Monsieur and Madame Coquenard. That inimitable veteran, George Graves, will play his original part of the proprietor of the shop, and his flighty wife will, on this occasion, be Janet Lind. The heiress-heroine who masquerades as the shop-girl, Véronique, will be played by Betty Huntley-Wright, whom listeners will remember as Manon, the diseuse in "Bitter Sweet." Esther Coleman will appear in the rôle of Véronique's aunt, who is induced by her niece also to disguise herself as a flower-girl. The plot of the play is gloriously complicated and provides a continuously entertaining setting for Messager's many delightful melodies.

SHORT WAVE SECTION

Mains Operation for the Short-waver

The Mains-operated Short-wave Receiver is Perfectly Satisfactory if the Points Dealt With in this Article are Carefully Observed

IT appears to be rather generally understood that all-mains operation is unsuitable in the case of a short-wave receiver, or that the use of the mains for power supply necessarily introduces trouble in the form of hum. This is not the case, and in most instances there is no objection whatever to the mains-operated short-wave set. Although a highly-efficient receiver designed to receive on the high frequencies is more sensitive to bad connections and the like, it is probably less responsive to mains hum than is a receiver designed for normal broadcast reception. One reason for this is that extreme quality of reproduction is seldom sought after, with the result that the L.F. amplifier is less sensitive to frequencies of 100 or 50 cycles (the frequency of the hum, according to whether full-wave or half-wave rectification is employed) than is usual with other types of receiver.

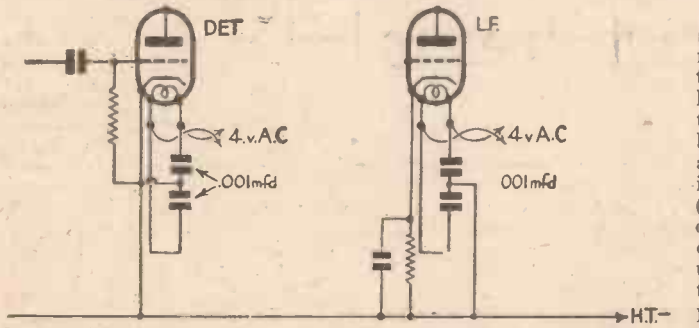


Fig. 1.—Mains hum in the short-waver can generally be reduced by connecting fixed condensers in the heater circuits of the valves as shown here.

A Refinement

It may be that the fallacy was established due to the fact that 'phones are often used for short-wave reception, whereas they are seldom worn when listening to B.B.C. stations. It is principally for this reason that it is desirable to take very special precautions to "silence" the instrument as effectively as possible, since it is often desired to use 'phones, even though the L.F. amplifier is sufficiently powerful to ensure full loud-speaker volume. In this respect it is wise to pay particular attention to all the points which are normally observed when designing a receiver for the medium- and long-wave bands, as well as to one or two other items which will be dealt with. One refinement which is especially valuable when using indirectly-heated valves is the provision of two series-connected fixed condensers across the heater terminals of the detector valve, as shown in Fig. 1. The value of the condensers is not critical, but .001 mfd. is a good average figure. As will be seen, the series connection between the two condensers is connected to earth and also to the cathode. The two condensers may be of any good type—tubular or otherwise—and it is desirable that they should be mounted as closely as possible to the valve-holder terminals to which they are connected.

The same arrangement is worth while in the case of the L.F. valve, especially if this is a high-amplification triode or a pentode, but in this case the junction of the condensers should not be connected to the cathode, but directly to earth, since the bias resistor is included in the cathode circuit.

The Earth-lead Condenser

When there is a slight trace of mains hum, after all the usual points have been attended to, it is often found beneficial to include a fixed condenser in the earth lead (this is generally done as a matter of course in D.C. or universal receivers to prevent any possibility of a short due to the positive main being earthed), and the capacity of this condenser is not unimportant. It might sometimes be found, for example, that the inclusion of the condenser intensifies rather than removes the hum, and this generally indicates that the value is unsuitable. It will be appreciated that a certain value of condenser, in combination with the natural inductance of the earth lead and other connections, might be roughly "tuned" to the hum frequency, in which case conditions are ideal for "reception" of the interference. To avoid such a possibility it is nearly always best to use a condenser of either very high or comparatively low capacity; thus it should be either greater than 1 mfd. or less than about 1 mfd. A condenser having a value between .001 mfd. and .01 mfd. is generally most satisfactory.

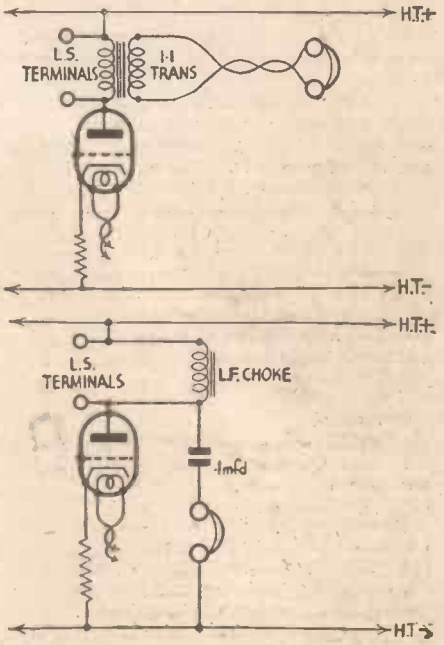


Fig. 2.—To ensure freedom from shock when using 'phones with a mains set, they should be connected through a 1:1 transformer or a choke-capacity circuit as shown here.

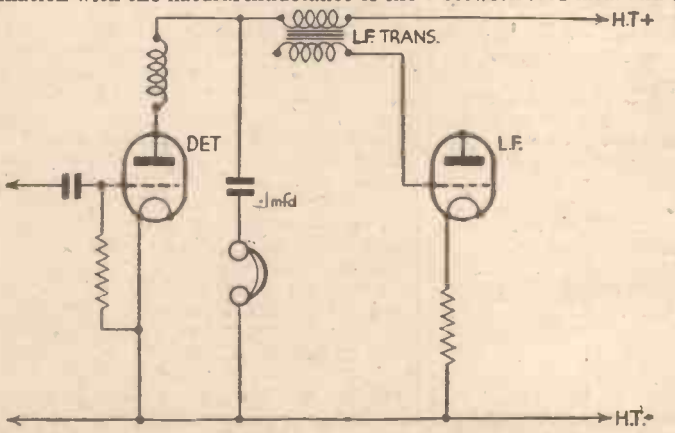


Fig. 3.—'Phones can simply and safely be connected after the detector valve by the addition of a 1 mfd. fixed condenser, as shown here.

Safety With 'Phones

The method of connecting 'phones to a mains-operated receiver is different from that generally adopted in the case of a battery set, since it is desirable that they should be isolated from the H.T supply in order to avoid the possibility of receiving a shock. The simplest method of connection is that

shown in Fig. 2 where a 1 : 1 transformer is inserted between the 'phone terminal on the set and the 'phone tags. This has the disadvantage of being rather expensive, however, and it is generally rather less costly to use a standard choke capacity output circuit, as also shown in Fig. 2. When the output valve is of the super-power type, and one is prepared to sacrifice a little in the way of volume, the choke can be replaced by a 5,000-ohm fixed resistance, but this is not a satisfactory arrangement when a pentode is used in the output stage.

Generally, however, when using 'phones, it is not necessary to use the L.F. valves; in fact, more pleasing reception, free from background noises, can be obtained by connecting the 'phones in the output circuit of the detector valve. This can be done very easily, and by the use of only a single .1 mfd. fixed condenser, as shown in Fig. 3. One telephone terminal is connected to earth, and the other is joined to one terminal of the fixed condenser, of which the other terminal is connected to the anode end of the L.F. transformer or coupling resistance, whichever is used. By following this arrangement all switching is avoided and the correct matching of the inter-valve coupling circuit is not impaired.

Do Not Switch Valves Out of Circuit

Incidentally, it should be mentioned that it is important that none of the valves in a mains-operated receiver should be switched out of circuit. If they were, the others would probably receive too high a heater and/or high-tension current and would be damaged. In any case there is no worth-while advantage to be gained by disconnecting one or more valves, because the cost of current is infinitesimal and the life of modern valves is so long that the saving of an hour or two is negligible.

Although pentode-output valves are often used with apparent success in short-wave receivers, the writer has always found it better to avoid this type of valve where possible. It has been found that the pentode introduces rather more background noise and cannot be made completely stable with the same ease as a triode. For this reason it is recommended that a resistance-capacity-coupled L.F. valve followed by a transformer-coupled triode power valve should be used when good loud-speaker volume is required. The two valves give at least as much amplification as a single pentode, the quality is better, and there is less likelihood of mains hum and background noise.

There is another point which is worthy of mention in regard to the prevention of mains hum, which is that the 'phone or speaker leads should, for preference, be screened and the screening well earthed. Ordinary braided aluminium is fairly suitable for the purpose, but it is even better to pass the end of leads nearest the set through an iron tube about 12in. long; this ensures that the most important portion is screened from mains interference. It is also wise to connect a .001 mfd. fixed condenser between the 'phone terminals, or from the anode of the output valve to earth, or both. The condenser serves to by-pass any high-frequency current which may be picked up by the leads.

British Rola Speakers

In the British Rola Company's advertisement which appeared in our issue for September 21st, it is stated that over 1,000,000 Rola speakers are in use.

Will readers please note that the correct figure should be 6,000,000.

Leaves from a Short-wave Log

RECEPTION of DX transmissions during the past fortnight has been generally fair to good, and prospects for the autumn seem distinctly promising. Judging from the results obtained during the last nine months, in view of the additional stations coming on the air and the increased power of the existing plant, our log by the end of the year should beat all previous ones. There are transmissions to be found in every band, and it is impossible to-day to scour the ether for even as short a period as an hour without finding some interesting broadcast.

Italian Transmission

The news that the Italians have now opened a radio telephony service between Asmara (Eritrea) and Rome leads me to point out that for some months it has been possible to pick up now and again two-way communications between ICK, Tripoli and Coltano (Italy); the former station is to be heard on 51.5 metres (5,825 kc/s), the latter on 47.2 metres (6,355 kc/s), 45.11 metres (6,650 kc/s) or 35.23 metres (8,575 kc/s). And, by the way, if you want special English news bulletins relating to the Italian-Abyssinian business, you may now tune in Rome I2RO nightly on 31.13 metres between B.S.T. 22.00-00.00.

CT1AA, Lisbon, usually logged on 31.28 metres (9,590 kc/s), seems to have again carried out experimental broadcasts on 25.36 metres (11,830 kc/s), but I cannot yet say whether both channels are to be used in future. As a rule, main items of transmission are relayed on Tuesdays, Thursdays, and Saturdays from the national medium-wave station. The announcer when closing down bids "all our foreign listeners, good night, good evening, and good morning." The cuckoo signal is being retained during the intervals.

In the 7-megacycle amateur band, HB9B, Radio Club of Basle (Switzerland) is still continuing the tri-weekly broadcasts on 42.14 metres (7,118 kc/s). Although the advertised power is only 50 watts, signals are well received. You may hear them on Mondays, Thursdays, and Fridays between B.S.T. 22.00 and midnight. It is just above this Swiss station you may pick up a Dordrecht (Holland) transmitter, PI1J, on 42.3 metres (7,082 kc/s). Transmissions, which consist of gramophone records or relays of the Hilversum programmes, are given out every Saturday at B.S.T. 16.10-17.10.

Radio Invicta (Oporto)

In some recent notes I mentioned a Portuguese short-wave transmission on 51.79 metres (5,790 kc/s) of which the call letters were not clearly heard. It has been received again, and I am now able to state definitely that the broadcast emanates from the short-wave station of *Radio Invicta*, Oporto, which also broadcasts on a medium channel.

As it is seldom we get an opportunity of picking up a transmission from China, it is interesting to learn that ZBW, Hong Kong, is now simultaneously broadcasting its programmes on a short wavelength. The station is ZCK, on 34.29 metres (8,750 kc/s), and it operates daily from B.S.T. 10.00-16.00 or 17.00. A news bulletin in English has been logged by a correspondent at B.S.T. 13.50, as well as an appeal for reports. These should be addressed, for verification, to The Secretary, Broadcasting Committee, ZBW, P.O. Box 200, Hong Kong, China. Most certainly a worth-while search, and possibly eventual catch.

Another Far Eastern transmission for which I intend to try is that put out daily by ZHJ, Penang (Straits Settlements), on 39.3 metres (7,630 kc/s). The station was opened in December, 1934, by the Penang Wireless Society, which, since that date, has broadcast programmes every weekday between B.S.T. 13.00-15.00.

I understand that for the present it is useless to try for Rabat CNR, on 23.39 metres (12,830 kc/s) and 37.33 metres (8,035 kc/s), the channels of the Radio Maroc programmes, as the station has been compelled to close down pending repairs to the landline. Occasionally, on 23.39 metres, you will find Rabat calling Paris for private telephony, usually towards B.S.T. 10.00.

Listeners who favour the 14-megacycle amateur band would do well to look out for W1OXFP, on 21.124 metres (14,203 kc/s); it is the call of the experimental schooner *Effie M. Morrissey*, which is on its way to the Arctic. Messages were heard by European "fans" some twelve months or more ago, and I understand that the radio equipment on this occasion is a more powerful one.

X2AH (Mexico)

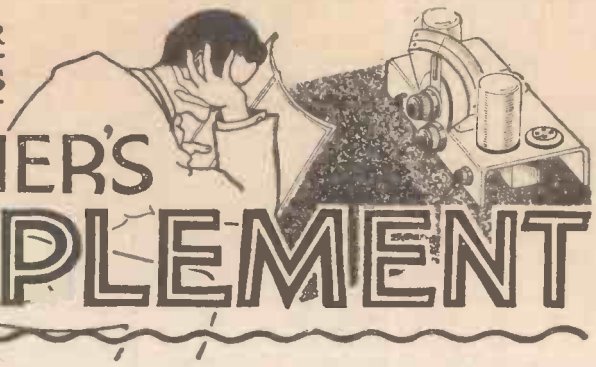
Slightly above this channel—namely, on 21.42 metres (14,000 kc/s)—I am informed there is a new-comer, X2AH, Tijuana, Mexico, a 500-watter, which daily relays the programmes of XEMO, San Diego (865 kc/s), between B.S.T. 23.00-02.00. This brings us to TFL, Reykjavik, 21.48 metres (13,965 kc/s), the new short-wave beam transmitter which I understand was recently used for the transmission of the first Icelandic programme broadcast in the United States. Alternative wavelengths, as previously reported in these columns, are 24.52 metres (2,235 kc/s) and 33.11 metres (9,060 kc/s).

During the period under review, PMN and PLP, Bandoeng (Java), on respectively 29.24 metres (10,260 kc/s) and 27.27 metres (11,000 kc/s), have been logged twice on Sundays between B.S.T. 15.00-16.00; both would appear to close down with an English gramophone record: *It's time to say good night*, which is appropriate in view of the fact that as the stations sign off, the local time would be roughly six hours ahead of B.S.T., or 10.20 p.m. (22.20).

Although it is an easy matter to log ORK, Ruysselede, 29.04 metres (10,330 kc/s), passing on its special Brussels programmes to the Belgian Congo, it is a rare event to learn that the other end of the line has been picked up. A correspondent now tells me that he has definitely identified Leopoldville OPM on 29.59 metres (10,140 kc/s), and at the time (B.S.T. 07.30-09.00), the station was in communication with Brussels, and played a record in which native singing and tomtoms were the main feature.

TESTING YOUR OWN VALVES

BEGINNER'S SUPPLEMENT



How to Measure or Calculate the Undistorted Output, and the Method of Calculating the Degree of Distortion Which is Present. By W. J. DELANEY.

WE have seen how the actual characteristics of all our valves may be checked, and the information which has been given should enable everyone to ascertain whether or not there is a necessity for replacement in any stage of the receiver. In addition

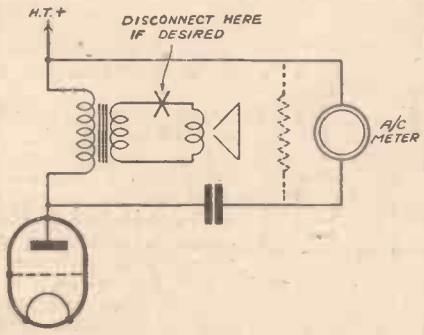


Fig. 1.—Method of measuring the A.C. output of a valve. The broken line indicates a load resistance which may be fitted if it is desired to silence the loud-speaker.

to the normal characteristics which have been dealt with, however, there is a very important factor regarding the output valve of a receiver, and although the majority of valve manufacturers quote this factor on their valve lists, it is often lost sight of by the user. I refer to the actual undistorted A.C. power output which the valve will give, and obviously this figure is of great importance to the user, as it denotes the power of the actual receiver. No matter how many valves are employed in a given receiver, the output is governed by the last valve, and if this is of the type which, for instance, will only deliver an output of a quarter of a watt, it will not matter whether there are twenty valves in front of it—it will produce a signal no louder than a receiver employing a similar valve preceded by only one valve. This assumes, of course, that in each case the output valve is fully loaded.

Measuring the Output

It has already been stated that the figure referred to as "anode dissipation" is nothing whatever to do with the actual output. Anode dissipation is the product of anode current and anode volts, and is, of course, quoted in watts. The undistorted output is also quoted in watts, but it is an A.C. value. The former figure will be referred to later, but for the time being we will deal with the measurement of output, such as may be obtained with an A.C. meter. If such a meter is available, this may be connected direct in the anode circuit of the last valve, and the actual wattage output may be read off direct from the scale. To do this, it will be necessary to calibrate the meter, or to produce a table showing the relation between the meter readings and wattage output.

The actual energy from the last valve is developed across the loud-speaker, and this is, of course, the valve load. Consequently, to measure the output, a meter must be joined across this load, and the diagram Fig. 1 shows the arrangement. The capacity of the condenser is of some importance and will depend upon the valve impedance. A value of 4 mfd. will be found satisfactory with a normal

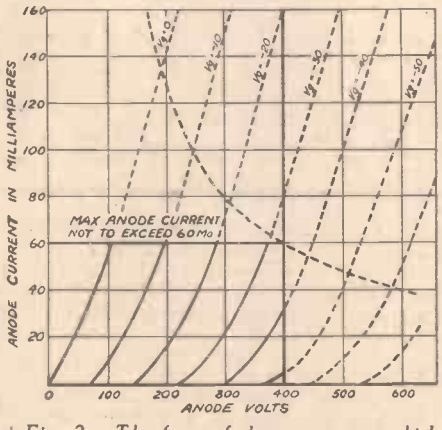


Fig. 2.—The form of dynamic curve which has to be plotted in order to calculate the undistorted output.

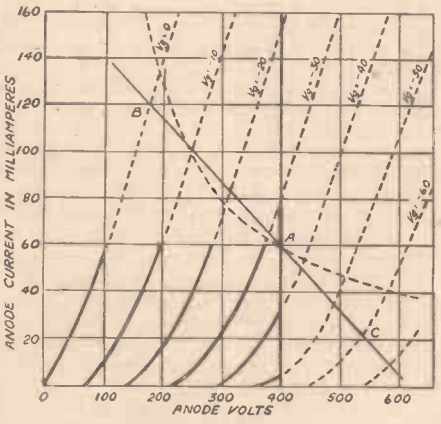


Fig. 3.—This shows how the load line is plotted preparatory to working out the output wattage. It will be fully explained in the next article.

impedance of 5,000 ohms, and the capacity should be increased with valves of lower impedance. The actual voltage range which is used on the A.C. voltmeter will, of course, depend upon the type of valve and the output which is obtained, but a rough calculation should enable the approximate range to be ascertained before the meter is connected.

An Artificial Load

If a constant frequency record or signal generator is being used for the test it will be advisable to silence the speaker to avoid the disturbance created by the powerful note (remembering that the valve will be worked at full power for this test). Therefore, the speaker may be disconnected as shown, and a resistance of equivalent value connected in its place as shown by the broken lines in Fig. 1. The resistance should, of course, be of the value recommended by the valve-makers as the "optimum load," or where this figure is unknown, a value of twice the impedance of the valve may be used. When the valve is switched on and fully loaded, the needle of the A.C. meter will rise to a value on the scale representing a certain voltage, and the undistorted output may be calculated by squaring the figure indicated and dividing it by the resistance of the load in ohms. Thus, supposing the valve in question requires an optimum load of 5,000 ohms (or a 5,000-ohms resistance is used in the diagram Fig. 1) and the meter shows a reading of 100 volts, the undistorted output would be 100 x 100 ÷ 5,000, or 2 watts.

The shape of a scale for use as an output meter is what is known as "square law," and thus it is a simple matter to calibrate any existing A.C. meter. It might be mentioned in passing that where such a meter is not in use a standard low-reading

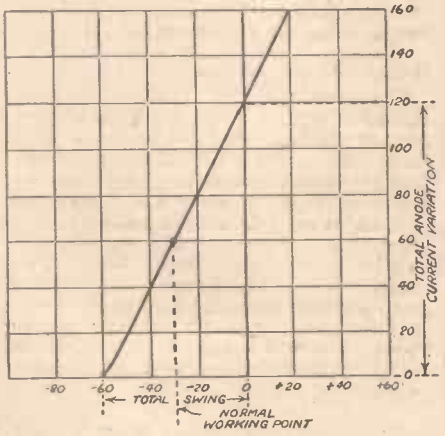


Fig. 4.—The main working characteristics indicated on the usual type of static curve.

milliammeter (say, of the .5 or 1 milliamp. type) may be converted by connecting across it one of the special small metal rectifiers designed for the purpose.

Preparing Dynamic Curves

If a meter is not to be used for measuring the output, special curves must be drawn up for the purpose. Squared paper is necessary, and the co-ordinates are marked off in milliamps. whilst the ordinates are marked off in volts. It should be noted, however, that in both cases the range of readings must be at least twice those of the normal working

(Continued on page 52)

LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.

All letters must be accompanied by the name and address of the sender (not necessarily for publication).

A Universal Sonotone

SIR,—Having taken a great interest in your paper for the past two and a half years, I feel it my duty to write to you in appreciation of the fine articles and features which appear in this paper every week. I also feel that in suggesting a Universal Mains version of your latest set the 1936 Sonotone 3-4, I am expressing the needs of a large proportion of your set-constructing readers, as well as those of myself and two of my friends.

This set to suit me could use 5 Osram universal valves, consisting of two H.F. pentodes, controlled by a double diode-triode valve as A.V.C. and detector, followed by an L.F. stage feeding a power pentode output stage, with H.T. supplied by a half-wave rectifier.—I. BURNS (Holland Park).

The "P. and A. W." Banquet!

SIR,—I consider the question you raised in a recent issue of PRACTICAL AND AMATEUR WIRELESS as to holding a Radiolympia Dinner a very good one. If this was held at about eight o'clock on the first evening of the show, it should be quite easy for London and provincial readers to attend. The personal contact so obtained between the staff of PRACTICAL AND AMATEUR WIRELESS and what would, no doubt, be a very representative section of your readers would tend to create a far more definite understanding than that obtained from letters or short chats on the stand.

The opportunity would be excellent for suggestions as to the policy of PRACTICAL AND AMATEUR WIRELESS, and the direct opinions of readers on these would be far more effective than a postal ballot. To sum up: a meeting of the contributors to PRACTICAL AND AMATEUR WIRELESS with many of the subscribers at a function of the kind suggested would induce a mutual feeling which would improve, even more than at present, your already excellent paper.—DENIS L. JOHNSTON (Cambridge).

A Book for Amateur Transmitters

SIR,—Having been a reader of your paper for some years, I am writing to express my thanks for such a magnificent publication. I would also like to say that any readers who are interested in short-wave transmitting should obtain a copy of the excellent book published by the R.S.G.B, entitled, "A Guide to Amateur Radio" (price 6d.). This contains practically everything the amateur transmitter will want to know.

By the way, could you put me in touch with a young fellow (about seventeen) interested in short-wave work and transmitting who lives in the Chadwell Heath district?—R. FROST (60, Eric Road, Chadwell Heath, Essex).

Transmitting Data

SIR,—With reference to Mr. J. C. Johnson's letter in a recent issue on the above subject, I should certainly like to see some articles on this sadly-neglected side of wireless. I am one of those many enthusiasts who hope to own a transmitter some time in the near future, but I find that little or no information is given as to the standard of knowledge required to pass the P.M.G.'s test. Could you not devote a little of your valuable space to articles on transmission, or at least to a brief survey with a list of selected references?

I should also like to take the opportunity of congratulating you on your fine paper, especially the short-wave section.—E. R. GREGORY (Wolverhampton).

A S.W. Log from Coulsdon

SIR,—Having read at various times the very interesting reports of amateur short-wave stations, and having never read of a report from this district, I thought the following list of amateur short-wave stations on 80 metres, 40 metres, and 20 metres might prove of interest to other DX listeners of your very interesting and instructive weekly. My receiver is an S.G. det. output, using an 80ft. outdoor aerial.

Eighty-metre stations: W3XAI, W1AXJ, W3CWS, W4ABC, W4BYY, W9API, W1GNI, W4GBC, W4ACZ.

Forty-metre stations: G5ZJ, G2AV, G5AU, G5PP, G6SR, G2XT, G2MV, G6CW, G2PM, G2QA, G6WR, G2RQ, G6IA, G5US, G5DK, G5YU, G6MF, G5LC, G5BY, G2NM, G2AV, G5JW, G5RD, G5TZ, G6BY, G5VL, G6SS, G5BP, G2XO, G2ZX, G5NW, G6BK, G5CB, ON4MY, ON4RA, ON4NW, ON4BC, PAOWJ, PAONW, PAOFB, F8VM, F8WZ I1KD.

Twenty-metre stations: VE2BG, VE2AC, VE1CR, VE2CA, W6ABJ, W1GML, W2HFS, W8LUQ, VE4GC, W3BFH, W2AMD, W2HHG, W2ABF, W4AHH, W1DVU, W3DQ, EA4AO, G2MV, G6FS, HB9Z, G5NI, LA1G.—L. C. B. BLANCHARD (Coulsdon, Surrey).

Schoolboy Wireless Enthusiasts

DEAR THERMION,—Many thanks for the hours of pleasure your paper has given me. Mr. Donald W. Tomlin, of Sheffield, your youthful correspondent, gave his opinion on the subject of schoolboy wireless enthusiasts. I thoroughly agree with him. Only thirteen years of age myself, I began my hobby when eleven years old by making a simple crystal set; two weeks ago I proudly switched my first five-valve set (2 SG., detector, L.F., and pentode). This should show what perseverance can do. I have also made a short-wave adaptor described in your pages, with which I have logged many stations.

Mr. Thermion, I agree with you as regards jazz, but I think that yourself and your many correspondents are too hard on the crooners.

With the exception of, perhaps, two, I think there are not any crooners to be heard. The dance band singers are definitely *not* crooners, so do not judge *real* crooners by them.—G. E. HOFFMAN, JNR. (Manor Park).

The Public and Radio Component Supplies

SIR,—As an amateur constructor, please allow me a hearty grouse against makers who widely advertise component parts for which they are unable to give even moderately prompt delivery. It would appear as if such makers were desirous of creating a demand for the article before embarking on the manufacture of more than one or two decoy samples. I have several times experienced this kind of delay and know it to be not uncommon with others.

During the first week of Radiolympia I was recommended a component advertised and listed by an exhibiting firm. It was shown to me at their stand, and purchased for cash (17s. 6d.) under promise of immediate postal delivery. It did not arrive. Some days later I again visited the firm's stand, but learned that none of the articles was in stock, only one or two having been made for Show and Press purposes.

Tolerance was asked on the ground of inability to obtain delivery of parts from other makers for the trade; as if neglect to ensure supply of basic material beforehand were a valid excuse.

One cannot wonder that American goods—radio and other—find a ready market here; not alone from their excellence but by reason of their availability at the time of purchase.—"DISGRUNTLED" (Croydon).

A Good S.-W. Log from Kent.

SIR,—Below are a few of my outstanding captures on the short waves during August which may interest other short-wave fans. My receiver is an o-v-2, working off a D.C. mains unit. Also a separate reactor valve is used, with great success.

On the 20-metre band: W1KJ, W2DVU, W2FLO, W3DQ, W3CT, W3DSH, W8IM, W8LPI, W1DNL, W4KH, W1CJV, W1GED, W3LP, W2DNG, W5LA, PAORP, G6WR, G5NI, and G2PN.

On the 40-metre band: EA1AC, OZ4Q, G6UI, G5YY, G6SR, G5GI, PAOMK, PAOWJ, and PAODK.

On the 80-metre band: PAOZZ, PAOFR, PAOPL, PAOAP, PAOWV, PAOLW, G6US OZ1K. PAOOE, PAORS, PAOAU, ON4UF, and F8BM.—W. F. JENKINS (Canterbury).

(Continued on facing page)

CUT THIS OUT EACH WEEK

Do you know

—THAT special circuits have now been developed which pull into resonance when a signal is received, thus enabling tuning to be carried out "automatically."

—THAT a double-diode-triode may be used in the majority of receivers to replace an existing detector valve, and will give the advantage of better quality and increased amplification.

—THAT when the above modification is adopted, the receiver will have to be used without the usual reaction circuit.

—THAT a milliammeter may easily be converted into a voltmeter for testing both D.C. and A.C. voltages.

—THAT when making up a multi-purpose meter on the above lines a fuse should definitely be incorporated in view of the risk of damage.

—THAT when using two loud-speakers to improve the quality of the output, it is often worth while to include also a special filter circuit so as to enable each loud-speaker to handle a separate band of frequencies.

—THAT when the markings on a colour-coded resistor have become defaced, a simple bridge may be constructed for the purpose of testing the value.

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

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

LETTERS FROM READERS

(Continued from previous page)

Transmitting Data

SIR,—As an amateur awaiting the allocation of a transmitting licence, I should like to express my views regarding the publication of transmitting data in PRACTICAL AND AMATEUR WIRELESS.

If the would-be transmitter is seriously interested in his subject, I can assure him that his yearly subscription for membership of the Radio Society of Great Britain will be amply repaid, and he will receive all the data he requires, both for satisfying the requirements of the Postmaster-General as to his qualifications, and obtaining circuits suitable to the licence conditions.

I fear that, if transmitting details were published in a paper such as yours with such a wide circulation, the information would reach some persons who might be tempted to erect a transmitter "just for the fun of it," and with no intention of "conducting experiments of public utility or scientific value" as laid down as one of the terms of the licence.—R. M. OWEN (BRS 1970) (London, S.E.).

Tropical Receivers

SIR,—While looking through your excellent paper, PRACTICAL AND AMATEUR WIRELESS, for August 17th, I noticed an article by Mr. R. G. Lush, of Bloemfontein, S. Africa.

We have been engaged for some three years perfecting a receiver for tropical and sub-tropical use, and as this design is almost ready for production, we would welcome any suggestions from residents in the areas concerned, regarding any special difficulties experienced in their districts.

We have, we believe, overcome such problems as ants getting in the apparatus, and the effects of the climate, etc., and the whole receiver, circuit, components, and cabinets are somewhat unorthodox.—THE COMMERCIAL ENG. CO., LTD. (Nelson, Lanes).

All Mains £5 Superhet

SIR,—With reference to your All Mains £5 Superhet, I am thinking of building the receiver for myself, and would be pleased to know if it would be possible for me to hear the receiver in the locality.—G. G. B. (Wimbledon, S.W.9).

[*Perhaps a reader living in Wimbledon will be able to oblige this reader, and the Editor would be pleased to arrange matters.*—ED.]

Verification Card from Japan

SIR,—I have to-day received a verification card from JVH, Japan, for my report on their special broadcast of June 23rd last, also the following letter, which may interest your short-wave readers:—

"We have the pleasure of informing you that we are intending to commence overseas broadcasting test for Europe from September 1st between 19.00 and 20.00 G.M.T on JVH, 14,600 kc/s, and JVM, 10,740 kc/s, every Wednesday, and on JVM, 10,740 kc/s, every Friday.

"We shall be much obliged to you if you will kindly receive this broadcast, and write us your receiving conditions and other comments which will serve as the good reference for our operation.—(Signed) S. KURAMOCHI, Chief of Engineering Department."

Reports should be addressed to:—

Kokusai-Denwa Kaisha, Ltd., No. 3 1-Chome, Uchisaiwaicho, Kojimachiku, Tokyo, Japan.—ERNEST J. LOGAN (Hertford).

Notes and News

A Remote Control Relay

IT is frequently found convenient to be able to switch radio or other apparatus from a distance. Many attempts have been made to do this, but they have been generally unsatisfactory owing to troublesome contacts.

The Type X Mercury Switch Relay solves this vexed problem in a most convincing way. The contacts are enclosed in an exhausted vessel, and are therefore prevented from being subjected to deterioration due to atmospheric conditions. The switch can thus operate indefinitely without the necessity to clean contacts, or to adjust them.

The new relay provides an ingenious and simple means of achieving the above purpose in an absolutely reliable and inexpensive way. It consists of a twin tube, one side of which is the contact position and the other side the "off" position. A small rod of special magnetic material is operated by means of a solenoid wound about the tube in such a way that, when the solenoid is operated from a distance, the small iron rod is made to move to one side or the other of the twin tube, "making" the circuit on one side and "breaking" it on the other. The switch is capable of a maximum load of 400 watts, which is ample for all such purposes, and can be operated by either A.C. or D.C. Solenoid consumption is 0.35 watts. It can be used as a "master" relay for heavier current circuits in connection with other electrical work, and it can be made in larger sizes where conditions require it.

Known as the Type X Remote Control Relay, it is priced at 8s. (without cover), and is made by the Dubilier Condenser Company (1925), Limited, Ducon Works, Victoria Road, North Acton, London, W.3.

Facts About Plug Suppressors

OUTSTANDING advances in car and coach radio reception are claimed for the new Philco British-made dual-wave superhet receiver which has just undergone final test on a 20 h.p. Hillman by Mr. A. F. D. Knight, manager of the Philco car radio department.

"Throughout an exhaustive trial, the set was notably silent between stations on both the long and medium wave bands, and absolutely free from engine interference," said Mr. Knight in an interview. "Reception was perfect, yet the suppression system consisted of only a condenser on the coil and another on the dynamo. No plug suppressors, no suppressor on the distributor head, and no bonding of any kind was used, which strikingly demonstrates the silent nature of the circuit of this latest set, which will shortly be available to the motoring public."

Mr. Knight declared that much misunderstanding existed among car radio users on the question of plug suppressors, claims frequently being made that they were not necessary.

"The fact is," he said, "most of the newer cars will operate satisfactorily without spark plug suppressors, but neither we nor any other manufacturer can at the factory eliminate the pick-up by the car aerial of the leakage of H.T. current playfully scampering around some cars; so we furnish suppressors with every set, in order to make sure of an easy, clean installation by any dealer."

Realistic Reproduction

Some Details Regarding Quality Transmission

FORTUNATELY for the designer and for the listener, one large block of problems is taken right out of their hands and is dealt with in a highly satisfactory way by the broadcasting authorities. We refer to the technical problems relating to high-quality *transmission*. It is universally agreed that the programmes radiated by the British Broadcasting Corporation are about as perfect as they can be, and that if it were possible to reproduce exactly what leaves their transmitting aerials no one would have the slightest cause for complaint on the score of quality.

But once the programme has gone out "on the air," it is subject to all sorts of influences, some beyond our control and others which it is the designer's task to eliminate, or, at any rate, to minimise, and all of which tend to introduce distortion of one sort or another, and to render realistic reproduction difficult.

The first of these difficulties is the selectivity problem. Each transmitting station sends out a radio carrier wave of a special frequency, and it is by tuning in to that frequency that listeners are able to receive that particular station and to eliminate all others. This, of course, is known to all listeners. It is also common knowledge that upon the carrier frequency is superimposed the audio-frequency programme, which, as has been shown, consists of a complicated and ever-changing jumble of frequencies ranging between, say, fifty and 15,000 per second.

Carrier Frequencies

The effect of modulating the carrier with the programme is to create a set of new vibrations on either side of the carrier covering a range equal to the frequency of the carrier plus and minus the highest programme frequency.

For example, if the carrier frequency is 1,000,000, corresponding to a wave-length of 300 metres, the side-bands will extend from 985,000 to 1,015,000 per second, while a station having a carrier frequency of, say, 990,000 will spread from 975,000 to 1,050,000 per second.

Now, in order to accommodate all the stations in Europe, the carrier frequencies of the different stations have been distributed at intervals of only 9,000 (9 kilocycles) apart, so that the side-bands corresponding to the higher notes of each programme overlap the bands occupied by their neighbouring stations in the wavelength scale.

Cutting the Side-bands

In order to receive a large number of stations, as is demanded from a general-purpose receiver, it is necessary to design the tuning systems of receivers so that they accept a band of frequencies of about 9 kilocycles, with the result that when tuned to the carrier frequency of the wanted station all side-bands beyond 4½ kilocycles on each side of the carrier frequency are cut off. This means that the set can only reproduce with any degree of fidelity the audible frequencies up to about 4,500. Most of the all-important overtones are cut off or so badly "attenuated" or weakened, that the music loses much of its natural, characteristic tone. It is still music, of course, and long custom has taught us to recognise the different instruments—to know whether we are listening to a military band or to an orchestra. But much is lost or terribly mutilated.

This may not be of much consequence if the music is required only as an accompaniment to dancing, but for serious listening, and for making the glorious colouration of good music come to life again in the speaker, it is essential to have those overtones in due proportion. And that is the first big problem in quality reception.

The only successful method of ensuring that all the essential overtones shall at any rate reach the receiver is the use of a flatly tuned circuit which will pass not merely 9 kilocycles, but something very like 20 to 30 kilocycles or even more.

This will, of course, mean poor selectivity, which is part of the price you have to pay for realistic reproduction. You will not be able to receive a large number of stations free from interference by other stations, and you will be compelled to limit your listening to a few of the more powerful transmissions whose field strengths at your aerial are large compared with the strengths of their neighbours on the wave-band.

Having got a fairly pure and unadulterated signal into the receiver, you must then take steps to see that no distortion creeps in as the signal proceeds from one stage to another to the ear.

THE EXPERIMENTERS EXPLAIN

(*Continued from page 33*)

resistance, the purpose of which is to "even-up" the impedance of the anode circuit at various frequencies. Values of the principal components are indicated in Fig. 1, the figures given being approximate only; it is best to experiment to a certain extent to find the optimum values for these, especially of the G.B. decoupling resistance and the two by-pass condensers connected between the bias supply and the earth line, and between the junction of the two grid leaks and the filament of the special push-pull valve. The method recommended for obtaining the correct adjustment of the ½-megohm potentiometer is to insert a milliammeter in the H.T. lead to the centre-tapped transformer and to set the bias potentiometer until a reading of .2 milliamp is obtained when no signals are being handled.

For A.C. or Battery Use

Unlike the ordinary type of push-pull valve the A.V.E. component is equally suitable for mains and battery use, and a circuit for the mains valve is shown in Fig. 2, where approximate component values are also indicated. In this case it will be seen that the bias battery is dispensed with, two "Westectors" being used in a "full-wave" circuit, which is an alternative method. Both of the circuits shown may be modified in several respects, but it is considered sufficient to show the fundamental connections—which are perfectly practicable—rather than to overburden the average reader with a multiplicity of alternatives. It should just be added that neither the battery nor A.C. model of the valve under consideration is intended for use in the output stage, but only as an intermediate L.F. amplifier to follow either the detector or first L.F. stage. Either valve may be followed by either a push-pull stage or by one or more power valves.

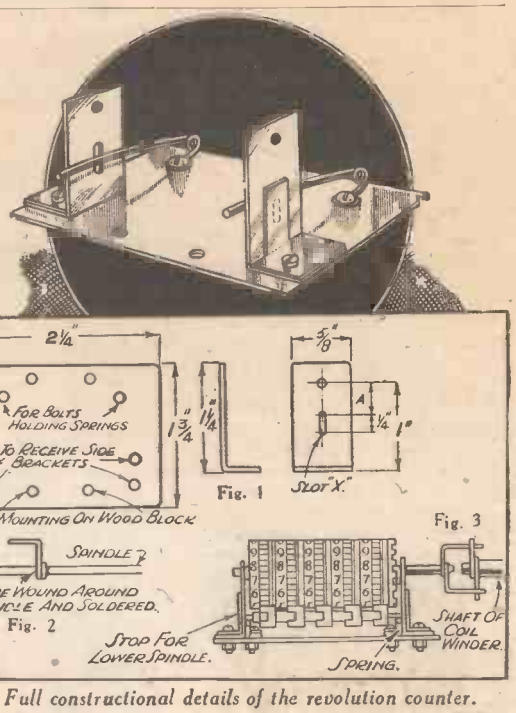
It is interesting to note in conclusion that when the "automatic volume expander" is correctly used it is capable of increasing the volume range up to about ten times; the remarkable effect of this has to be experienced to be fully appreciated.

BEGINNER'S SUPPLEMENT

(*Continued from page 47*)

characteristics. Thus, if you are dealing with a valve delivering a normal anode current of 50 mA at 200 volts, the graph must be marked off up to 100 mA and 400 volts in each case. From the ordinary anode-current grid-volts curves already produced, we can now plot the anode-volts anode-current curves in the form shown in Fig. 2, which is an actual reproduction of the dynamic curves of a very well-known valve. It will be seen that certain parts of these curves are shown in broken lines, and these represent values which are not measurable, but are representative of the effects which take place owing to the change in voltage on the anode due to the application of a signal at the grid. (This is equivalent, of course, to a modification of grid bias.) It will be seen that the maximum anode dissipation is marked on these curves, and an indication of the maximum anode voltage is also shown. Now from the makers' data a point is marked on this graph corresponding to the normal working values—that is, normal grid bias, normal anode current, and normal anode volts. Through this point a line is drawn which denotes the instantaneous values of current and voltage, and the maximum change which will take place with the valve fully loaded, and with the correct anode load. Fig. 3 shows a curve plotted and the point A represents the normal working point, whilst the points B and C represent the maximum and minimum extremes of anode current when the valve is fully loaded, or, in other words, when the grid voltage is varied from zero to just twice the normal value. It should not be necessary to explain at this point that the value of grid bias represents one half of the total grid swing, as the valve may then receive a positive impulse to bring the bias to zero (it must not enter the positive half-cycle if distortion is to be avoided) and to preserve a balance the negative impulse may be an equal value on the other side of the normal grid voltage figure. These values are made clear from the diagram Fig. 4, which is a single curve reproduced from the normal anode-current grid-volts curve.

An Efficient Revolution Counter



Full constructional details of the revolution counter.

GOOD revolution counters for use with coil winders, such as that recently described in PRACTICAL AND AMATEUR WIRELESS, are usually rather expensive. An ordinary cyclometer can, however, be obtained for about 2s., and can easily be adapted for use as a revolution counter. The cyclometer must be of the type in which a row of gear teeth and a small gap can be seen between the figures.

The instrument is first taken to pieces. When the cover has been removed it will be seen that there are five drums carrying the figures, and on the right a sixth drum, mechanically similar to the others but carrying no figures. This sixth drum is driven from the spindle on which the drums rest through a cam device, or some other reduction gear. It is necessary to remove this reduction gear and drive the sixth drum direct from the spindle.

It will also be seen that below the six drums there is a second smaller spindle carrying five small gears which communicate the drive from each drum to the next. Before these are removed they should be examined carefully and their method of engagement with drums noted, as if they are wrongly fitted in reassembling, the instrument will jam. The distance between the centre of the two spindles is measured, and will be referred to as measurement A.

Having completely dismantled the instrument, the working parts must be remounted in new supports. If it is found that the cam reduction gear referred to above cannot be removed from the spindle, a new spindle must be cut from iron wire of the right gauge. The new base plate and side brackets can be cut from sheet brass or aluminium to the shape shown in Fig. 1. The exact measurements must be decided on by the reader as the instrument is constructed.

Arranging the Drive

The next step is to arrange the drive from the spindle to the sixth drum. It will probably be found that there is a hole in the drum between the centre and the rim. If there is not, one must be drilled. Care must be taken not to bend or crush the drum. A piece of stiff iron wire is soldered to the spindle, and bent to engage in this hole as shown.

The parts are then reassembled as in Fig. 3, using 6BA or any suitable bolts. The spindle carrying the gears can now slide up and down in the slot X. Some kind of stop must be fitted to prevent the spindle from sliding out lengthwise, and L-shape brackets held by the fixing screws as shown in Fig. 3 are suggested. Two wire springs must be made to hold up in its slot the spindle carrying the gears, and keep them engaging well with the drums. Parts of safety-pins, as shown in Fig. 2, would answer the purpose. These springs should be held to the frame by bolts and washers, and should project well to the front, as indicated. The drive should be through a loose dog-clutch as shown in Fig. 3.

Random Jottings

By JACE

Grant of Patent on Double-image Kerr Cell

THE Comptroller-General of the British Patent Office recently decided in favour of Mr. G. W. Walton, of Scophony, Limited, in respect of an application made by him on August 19th, 1932, for the grant of Letters Patent covering the use of double-image Kerr cells.

Electro-optical light valves based on the Kerr phenomena have been known and widely used for a considerable time past; however, even some of the recent constructions were optically very inefficient. In this type of light valve it is necessary to split the beam of light into two components, into the ordinary and extra-ordinary rays, and the usual construction eliminates the extraordinary ray by total reflection, thereby causing immediately a 50 per cent. loss of light in the device.

Mr. Walton claimed in his Provisional Specification an invention which has for its object "means whereby a greater amount of light can be passed . . . by using both the ordinary and the extraordinary rays of light from polarising devices." Instead of using a Nicol prism, he showed the use with Kerr cells of double-image prisms for polarising and analysing, such as, for instance, Wollaston prisms.

The Marconi Wireless Telegraph Co., Ltd., opposed the grant of a patent on various grounds, largely, however, on the ground that in the opinion of the Marconi Company the complete specification described and claimed an invention other than that described in the provisional specification, and that such other invention formed the subject of an application No. 19748/1933 (424196) of a later date made by the Marconi Company and others for a patent, which, if granted, would bear a date in the interval between the date of the application and the leaving of the complete specification by G. W. Walton.

The views, submitted by the Marconi Company, were not shared, however, by the Assistant Comptroller, who decided to grant the patent to Mr. Walton and awarded him costs against the Marconi Company.

This decision is no doubt of considerable interest to all those engaged in the television industry. The double-image Kerr cell is a definite advance on the old known type of Kerr cell, and may be of great value in achieving *projected* television pictures. The rights under this Patent No. 407385 belong to Scophony, Limited.

North Wales Relay Transmitter

THE B.B.C. announces that a site near Beaumaris has been acquired for the proposed North Wales Relay Station.

Preliminary work in connection with the construction of the station is now in hand. The transmitter, which will be of the most modern type, will radiate with a power of approximately 5 kilowatts, and will be synchronised on the same wavelength as that used by the West Regional transmitter.

The annual outing of the staff of the Peto-Scott Co., Ltd., took place on Saturday, August 31st. Several motor coaches conveyed the happy participants to Clacton-on-Sea, where a very enjoyable day included a luncheon held at Cordy's, and a visit to the pier. The photograph shows the merrymakers before the commencement of the journey to Clacton.

"Brumaire"

NAPOLEON led an expedition to Egypt in 1798 and, although he succeeded in conquering Egypt, he lost his navy and, with it, all communication with France. He escaped from Egypt himself and returned to France on October 9th, 1799, and arrived in Paris to find the Government falling into a state of disorder and the Republican armies being beaten in Germany and Italy. On November 9th—exactly a month after his return—he overthrew the Directory and, by the "Constitution of the Year VIII," he made himself First Consul for a period of ten years. Anthony Ellis, whom listeners will remember as the adaptor of "Trent's Last Case," has written a play called "Brumaire" dealing with this *coup d'état*. It will be presented in the National programme on September 30th, and repeated on the Regional wavelength on October 2nd.

RANDOM JOTTINGS

(Continued from previous page)

Unique Broadcast from Egypt

A SPECIAL programme will be relayed from Egypt to National listeners on October 6th. This unique feature has been divided into three sections—the first dealing with ancient Oriental music, the second being an actuality broadcast of a street scene in Cairo, and the third consisting of traditional music played in a modern manner. After the opening announcement in Arabic and English a reading from the Koran will be given by Sheikh Mohammed Rifaat, one of the most popular broadcasters in Egypt. This will be followed by a performance by Mustafa Rida Bey and his Oriental Takht (orchestra). Mustafa Rida Bey is a president of the Royal Institute of Oriental Music, and is famous as a performer on a species of harp called a Kanoun. The other instruments that listeners will hear include an "oud," a "nai" and a "rek," each of which will be separately announced and described. Next will be ancient music played on reeds, and then the street scene in Cairo will be described. In the third section of the programme there will be included a short recital by Umm Kulthum, one of Egypt's most famous singers, who has been described as "the Melba of the Orient." There will also be a pianoforté recital of Eastern music by Nidhat Assem, and orchestral music presented by Hassan el Shogai.

Ever Ready Window Dressing Competition

THE "Selling Fortnight" which has been an important and successful feature of Ever Ready sales activities for several years is again taking place this year from September 30th to October 12th. A Window Dressing Competition is being organised in which prizes will be awarded in the following four areas:—

A. Southern Counties.
B. London and Eastern Counties.
C. Midland Counties, Wales and Northern Ireland.
D. Northern Counties and Scotland.

Separate prizes are being offered both for originality and for windows based on Ever Ready display material. In all £1,000 is to be given away. In conjunction with this a competition is being organised for buyers of Ever Ready goods during the "Selling Fortnight" in which £1,000 worth of Ever Ready goods as prizes will be offered to attract customers to the shops of all dealers who are participating in the Window Dressing Competition. In previous years Ever Ready have supported these competitions with advertising in local papers throughout the entire country, and this feature is being repeated.

Full details of these competitions, and of the plans for the "Selling Fortnight" are published in the Ever Ready Bulletin, which has already been mailed to dealers.

B.B.C. Symphony Orchestra at Swansea

IN accordance with an announcement made by the B.B.C. last June, Dr. Adrian Boult will visit Swansea and conduct the B.B.C. Orchestra in an interesting programme to be given in the Brangwyn Hall on Thursday evening, October 31st. After "Land of My Fathers" (specially orchestrated by Gerrard Williams) and the National Anthem, the programme will open with Beethoven's Overture "Coriolan."

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

C. E. M. (Weston-S.-Mare). The wiring is obviously faulty, but we cannot suggest where without a diagram of your actual wiring. Can you let us have this? A fuse in the negative H.T. lead will only protect the valves and will not avoid coil burn-out.

A. B. K. (Doncaster). An eliminator should function quite satisfactorily. The metallised coating on the chassis is connected to earth *via* the wiring.

P. B. (Neasden). Any small sensitive speaker may be used. Your local dealer will no doubt be able to assist you in making a selection. The set would not be powerful enough to operate a television receiver.

Corporal H. Franklin (Uxbridge). We are surprised that you refused to take delivery of your letter, on which you had erroneously placed ½d. instead of a 1½d. stamp.

E. V. J. (Lee, S.E.). It would appear that your test simply consisted of reading the H.T. voltage (across the battery), and thus was not conclusive. Perhaps you could make your explanation a little more clear, when we will endeavour to trace whether or not there is a constant current drain due to some short-circuit or wrong connection.

G. D. (Wallington). It would perhaps be worth while now to get into touch with the makers and have their report. We shall be glad to assist you again if necessary.

T. L. (Coventry). We cannot make comparisons with commercial receivers. It is not possible to guarantee the reception of any one station in any part of the country, without full knowledge of local conditions. The set in question should meet all your requirements.

E. G. D. (Fratton). We think it will be quite a simple matter to fit an ordinary Q. M. B. on/off switch in the *secondary* side of the speaker transformer fitted to the receiver. Then this speaker could be silenced by opening the switch, but the primary of the transformer would still be left in circuit to act as a choke for the extension speaker.

F. L. G. (York). It is not possible to suggest a cure without knowing the cause of the hum. It may be due to bad smoothing, or to interaction, and therefore the cause must first be discovered. Your eliminator may be unsuitable (not capable of delivering sufficient current), or there may be some form of instability necessitating more effective decoupling. A volume control may be fitted, and we shall be pleased to indicate the most suitable type and position upon receipt of a circuit diagram or circuit details.

R. H. (Ilfracombe). Two separate Post Office licences are required. The receivers should not interfere with each other and you should find the arrangement quite satisfactory.

C. A. H. (Swanage). We are sorry, but we have no blue print which would be of use to you. You could, of course, choose a modern set and use some of the parts from the old one, but in general this is unsatisfactory, and it would be better to try and dispose of the present set and obtain new parts with which to build a modern set.

C. M. (Forest Gate, E.). Details are given in our Television and Short-wave Handbook, price 3s. 6d. or 3s. 10d. by post. We would point out, however, that the low-definition transmissions have now been suspended.

J. M. B. (Harrow). If you can let us know the type of valve which was used we can suggest an alternative metal rectifier. This is not possible, however, unless the exact type of valve is known. Alternatively, you could write to the makers of the unit, if you know who they are.

R. P. (Sheffield). We cannot suggest an interference suppressor without knowing the type of instrument. Can the makers assist you? Alternatively, write to Messrs. Belling Lee, who may have knowledge of the particular machine and will be able to supply a suitable suppressor.

G. A. S. (Leytonstone, E.). There is no switch in the coils, but a 3-point external switch is required for wave-changing. The three points are connected as follow: one to earth, one to terminal No. 7 and one to terminal No. 8.

E. B. (Blackrod, Lancs). The coil in question is Lissen Type 5314. The issue is still obtainable if you require it, price 4d. post paid from this office.

D. R. H. (Lincoln). The circuit is quite in order and should prove quite satisfactory in use. You have not shown a wave-change switch, but we presume you are aware that an ordinary on/off switch is joined across terminals 5 and 6 for wave-change purposes.

W. R. G. (Monaghan). Turns may be added to the reaction winding, or it may be placed closer to the medium-wave winding in order to improve reaction control. The circuit of the output stage of the £5 superhet is quite correct, but there will be a great loss of signal strength, especially if you also replace the pentode by a power valve.

J. T. (Glasgow). A special rectifier may be obtained from Messrs. Heayberd and Co., or you can construct one from a mains transformer, a smoothing choke, two fixed condensers and a valve or metal rectifier. Exact values cannot be specified as we have no knowledge of the receiver, but the makers may be able to assist you.

P. T. (Wallington). We are sorry we have no blue prints of receivers using the coil you mention.

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

INTERNATIONAL SHORT WAVE CLUB (LEICESTER CHAPTER)

THE above club held its first meeting of the winter session at The Forester's Institute, St. Nicholas Street, Leicester, on September 4th, 1935, at 8 p.m. There was a very good attendance, and, after a new committee was elected, Mr. C. Cramp presented the programme for the coming winter months, which included demonstrations of short-wave and all-wave receivers by many noted manufacturers, and also a demonstration of ultra-short-wave cathode-ray television. It was also announced that the members of this chapter now had full use of a radio workshop complete with books and circuit diagrams of many kinds of short-wave receivers, and that help would be given to anyone building or rebuilding a receiver.

The next meetings of this chapter will be held at The Forester's Institute on Wednesdays, October 2nd and 30th. At each of these meetings there will be a demonstration of all-wave receivers. A special invitation is offered to all readers of PRACTICAL AND AMATEUR WIRELESS in the vicinity to attend these meetings. Further particulars can be obtained from the Hon. Sec., Mr. C. Cramp, 49, Avenue Road Extension, Leicester.

THE CROYDON RADIO SOCIETY

THE programme committee of this society has been carefully scrutinising suggested items for the coming session, and only those of at least last session's standard have secured dates. This new session starts on Tuesday, October 1st, in St. Peter's Hall, South Croydon, and the lecturer will be the President, Mr. H. R. Rivers-Moore.

Television has been carefully examined, and, of course, finds its place in the programmes, and the society will continue its search for the whys and wherefores of realistic sound reproduction. In this respect, it is rumoured that one or two very novel home-constructed loud-speakers and gramophones will be demonstrated. Certainly the ever-popular loud-speaker nights will be held; nor have such specialised topics as valves, coils, transformers, and pick-ups been overlooked. New members at this time are welcome.

Full particulars of membership can be obtained from the hon. sec., E. L. Cumbers, Maycourt, Campden Rd., S. Croydon.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

FERRANTI RECEIVERS

FERRANTI, Ltd., have just issued an attractive catalogue of their well-known receivers and radiograms. In the front part of the catalogue an interesting account is given of the development of the Ferranti Company from 1882 to the present day, together with some interesting facts concerning the company's extensive works at Moston. Particulars are given of the complete range of Ferranti receivers, including the popular Lancastria and Arcadia Consolettes, Arcadia and Gloria Radiograms, and extension speakers. Technical data concerning the various models is given at the end of the catalogue, a copy of which should be in the hands of readers definitely interested in the purchase of a quality receiver. The address is Ferranti, Ltd., Radio Works, Moston, Manchester, 10.

BLUE SPOT RECEIVERS AND LOUD-SPEAKERS

"A NEW Realism in Radio," the slogan of the Blue Spot Company, aptly suggests the high reputation for quality of reproduction which Blue Spot receivers and loud-speakers enjoy. Amongst the range of receivers an outstanding achievement is the Blue Spot Battery Three. This remarkable instrument which is housed in an attractive walnut cabinet, has several new features, including an illuminated station name dial, variable selectivity control, and unwanted programme rejection. The circuit incorporates an H.F. pentode, detector, and output valve, giving an undistorted output of 1 watt. The price of this receiver is £6 17s. 6d., exclusive of batteries. Other high-class models are the AC/DC4, and the AC5, which are listed at 9 guineas and 12 guineas respectively. There is also the Blue Spot AC5G Radiogram, which embodies all the latest refinements of radiogram practice and is priced at 21 guineas. The two Blue Spot loud-speakers, the "Popular" and "Senior" models, are available in chassis form, or with attractive cabinets of figured walnut. Folders giving full particulars of any of these products can be obtained from The British Blue Spot Company, Ltd., Sterling Works, Dagenham, Essex.

Facts & Figures

COMPONENTS TESTED IN OUR LABORATORY.

The Shorlon Aerial

THIS new development of the Central Equipment Ltd. is a modification of the well-known "No-Mast" Aerial, and consists of that particular equipment plus one or two extras. These consist of two metal brackets carrying insulated ends, and a small porcelain block fitted with a number of sockets and plugs. The lead from the "No-Mast" aerial is now insulated with a black waxed covering and this fitting must, as with the previous model, be erected high up on the house, preferably on the chimney stack. The first of the two brackets (which has two fixing holes in the insulated end) is then mounted beneath the guttering on the roof and the black lead is passed through one of the holes in the bracket. Firmly attached to the other hole is a length of red insulated lead. The second bracket is now mounted near the lower window and the red and the black leads are passed through two of the three holes in the insulated end, to the third hole of which a length of green insulated wire is firmly anchored. Screws enable the other wires to be firmly held. The three coloured leads are now brought in at the window and are joined to three tags on the small porcelain device above mentioned, and when the correct connections are made three coloured wander plugs will denote the respective ends of the three wires. Thus, when either of the coloured plugs is inserted in a row of three holes in the centre of this piece of apparatus, the aerial corresponding to that plug is automatically joined to the receiver, and thus by using one or more of the plugs in combination any particular aerial, or combination of aerials, is brought into use. Three sockets at the bottom of the apparatus are inter-connected, and when the appropriate tag is joined to earth the aerials may be earthed by inserting the three plugs in these holes. The complete equipment costs 15s. 6d., but for listeners who already possess the original "No-Mast" aerial, the extra parts needed may be obtained in the form of a conversion kit at 6s. 6d.

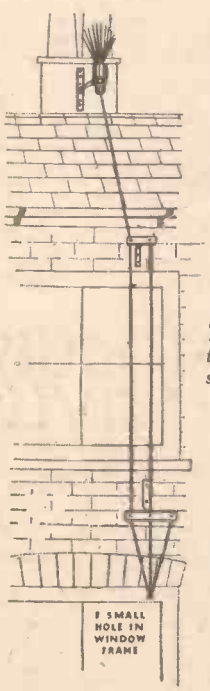
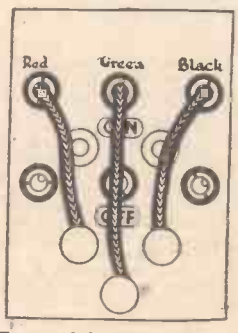
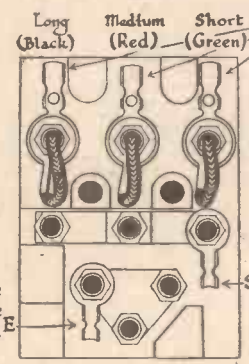


Diagram showing the method of erecting the Shorlon aerial system.



Top and bottom views of the special switching device supplied with the Shorlon aerial system.



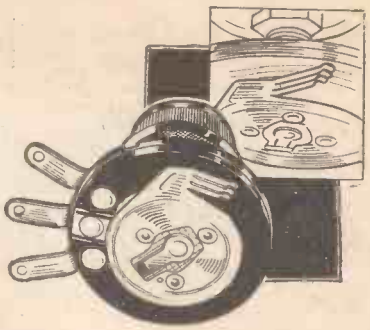
New Bulgin Components

THERE are several interesting items among the new Bulgin components which have been produced for the coming season. Amongst these may be mentioned the cathode-ray tube resistors, which are wound in the form of small cartridges and fit the normal spring-type fuse-holders. They are 1¼in. long and are rated at 5 amps. The values obtainable are .8, .9, 1, 1.1, 1.2, and 1.3 ohms. The price is 9d. each. The precision resistances are also of importance, these taking the form of wire-wound components on special porcelain formers. The wire employed is of the nickel-alloy type, and the winding is sectionalised and non-inductive. Various values are obtainable up to 1 megohm, the prices up to .1 ohms being 6s. each, and from .1 to 1 megohm the price is 24s. each.

Some new four-range coils are also being manufactured, and these are of the screened type designed to cover a band from 15 to 2,100 metres when tuned with a .0005 mfd. condenser. The coils are in pairs and a two-gang condenser is required. For superhet circuits an oscillator is also obtainable in a similar design. The price is 17s. 6d. per pair for the aerial coil or the oscillator. For the same type of circuit a 15-megacycle I.F. coil is obtainable, and this has a single flat response curve covering over 1 megacycle. Flexible connections are provided, and the price is 5s. 9d.

Dubilier Volume Controls

THE newly-introduced volume controls are shown in the attached illustration, which also depicts the novel form of contact arm. The resistance element and the "split" contact serve to provide a perfectly noiseless and smooth variation, and all the other important features of a reliable volume control are incorporated. Terminals are not provided for connection, but the majority of constructors have now mastered the art of soldering, and this will therefore occasion no difficulty. The arm is insulated from the mounting bush, and the control may be obtained with or without a combined switch. The price is 3s. 6d. without switch and 5s. with switch, and it may be obtained in practically any standard value. For special purposes a double fader type is available, and this costs 6s. 6d.

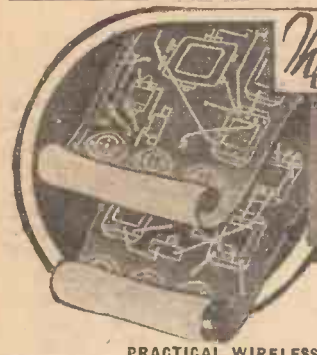


The novel contact arm of the Dubilier volume control may be seen in this illustration.

Erie Resistors

THE new quarter-watt resistors which are shown on this page will be found extremely useful in those parts of a normal circuit where a very small current is passed, and thus the usual 1-watt type of resistance is not called for. As may be seen from the illustration, these resistors are extremely small, but are provided with the full-size (2in.) wire ends for connecting purposes. The resistor itself is only ⅜in. in length and less than ¼in. in thickness, but is of the same high standard as the usual Erie resistor. In construction, a centre core of carbon-like material, which forms the actual resistance, is surrounded by a porcelain coating, and the ends of the resistance element are brass-capped and the wire ends are soldered direct to these. The insulated surround also embraces the brass caps, and thus the entire assembly is rigid and there is no likelihood of the covering becoming loose. The standard colour code is enamelled on the resistor, and in place of the customary dot for the final figure in the value, a band of colour is employed, thus permitting the value of the resistor to be seen no matter how it may be connected in a circuit. These particular resistors are not recommended for use on circuits where the normal voltage exceed 200 volts, although a peak value of 300 volts may safely be passed. The price of these resistors is 1s.

This illustration gives an idea of the size of the Erie quarter-watt resistors.



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

Where date of issue is omitted that particular number is out of print.

These blueprints are full-size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—"Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7½d., and "Wireless Magazine" at 1/3, post paid. Index letters "P.W." refer to "Practical Wireless," sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS

Blueprints, 1s. each.	Date of Issue.	No. of Blueprint.
Long-Range Express Three	—	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	—	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Empire Short-Wave Three	—	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	—	PW9
Selectone Battery Three	—	PW10
Fury Four	—	PW11
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	—	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag Three	25.3.33 and 1.4.33	PW15
Supersonic Six	—	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	—	PW22
Double Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	—	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	—	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	3.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	—	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	—	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47
Hall-Mark Cadet	23.3.35	PW48
Short-Wave Converter-Adapter	23.2.35	PW48A
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	11.5.35	PW50
Genet Midget Three	*June* '35	PM1
Cameo Midget Three	8.6.35	PW51
F. J. Camm's 2-valve Superhet	13.7.35	PW52

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	—	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.		
B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449
Two-valvers: Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG, Det. Pen).	17.6.33	AW392
Iron-core Two (D, Trans)	—	AW395
Iron-core Two (D, Q.P.P.)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
Family Two (D, Trans)	—	WM278
Three-valvers: Blueprints, 1s. each.		
8 Radiogram (D, RC, Trans)	—	AW343
P.T.P. Three (Pentode-Triode-Pentode)	*June* '35	WM389
New Regional Three (D, RC, Trans)	—	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF Pen. D, Pen).	14.4.34	AW431
£5 5s. Three: De-Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D. Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.B. Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378
The Certainty Three	*Sept.* '35	WM393
Minitube Three	*Oct.* '35	WM396
Four-valvers: Blueprints, 1s. 6d. each.		
65/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	—	WM300
Table Quad (SG, D, RC. Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb* '35	WM381
The H.K. Four	*Mar.* '35	WM384
Five-valvers: Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (2SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379

Mains operated.

Two-valvers: Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicon A.C./D.C. Two	*Sept.* '35	WM394
Three-valvers: Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D. Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	*Nov.* '34	WM374
Four-valvers: Blueprints, 1s. 6d. each.		
A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	—	AW380
A.C./D.C. Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2 SG, D, Trans) A.C.	—	WM379
All Metal Four (2 SG, D, Pen)	*July* '33	WM329
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.		
1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375
Varsity Four	*Oct.* '35	WM395
Mains Sets: Blueprints, 1s. 6d. each.		
1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super A.C.	—	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apl.* '35	WM385

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.		
General-purpose Portable (SG, D, RC, Trans)	—	AW351
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	—	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.		
S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	—	AW452
Two-valvers: Blueprints, 1s. each.		
Home-made Coil Two (D, Pen)	14.7.34	AW440
Three-valvers: Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet, Converter	*Dec.* 1, '34	AW457
The Carrier Short-waver	*July* '35	WM390
Four-valvers: Blueprints, 1s. 6d. each.		
"A.W." Short-wave World Beater (H.F, Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver	*Mar.* '35	WM383

Mains Operated.

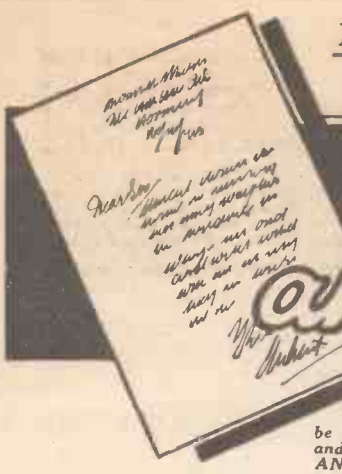
Two-valvers: Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen), A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave-Converter	*Jan.* '35	WM380
Three-valvers: Blueprints, 1s. each.		
Emigrator (SG. D, Pen), A.C.	—	WM352
Four-valvers: Blueprints, 1s. 6d. each.		
Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
A.C. Standard Four-valve Short-waver	*Aug.* '35	WM391
Trickle Charger	*Jan.* 5, '35	AW462

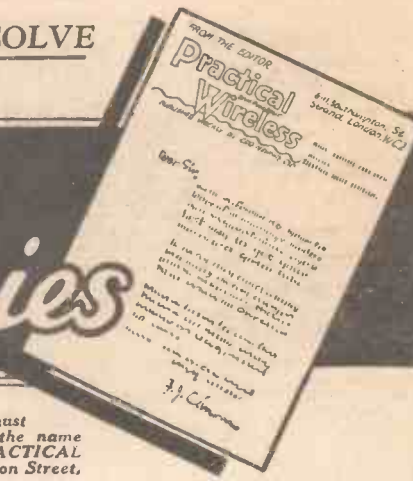
MISCELLANEOUS.

Enthusiasts Power Amplifier (1/6)	*June* '35	WM387
Newstyle Short-wave Adaptor (1/-)	*June* '35	WM388
Listeners 5-watt A.C. Amplifier	*Sept.* '35	WM392

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

Queries and Enquiries





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

SPECIAL NOTE

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

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

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

Reaction Winding for Frame

"I have a frame aerial to which I want to add a reaction winding. Will you please tell me the approximate number of turns required when a .0003 mfd. reaction condenser is employed? The frame has a total of 43 turns with a tapping for medium waves. The reaction winding will be close to the other winding."—E. N. B. (Padworth).

AS the tuned winding consists of 43 turns we assume that the frame measures approximately 14in. square, and therefore we suggest that you use three turns for the reaction winding.

A Coil for a Crystal Set

"Would you kindly inform me as to the coils to use in a crystal set? What size of former and type of wire, and the number of turns?"—F. J. W. (S.E.14).

THE simplest coil you can construct will be made with 22 gauge D.C.C. wire wound round a 3in. diameter cardboard former. Forty-five turns should be wound on, each turn close up against its neighbour, and each end of the coil should be joined to the terminals of a .0005 mfd. tuning condenser. The crystal and 'phones in series are joined across the same two points, and the earth lead is joined to the junction of 'phones and condenser. The aerial may be connected to the other end of the condenser through a .0002 or .0003 mfd. fixed condenser, or it may be joined to a tapping point situated between the centre of the coil and the earthed end. The exact position may be found by trial and error and will vary according to the type of aerial and the degree of selectivity required.

Blue Print and Kits

"Would you be so kind as to tell me where I could obtain a price list of blueprints of powerful sets such as superhets, and also the best place from which to obtain the necessary components?"—R. L. (Wolverhampton).

A COMPLETE list of all the blueprints published by us is included each week in PRACTICAL AND AMATEUR WIRELESS. These prints are available at 6d., 1s., and 1s. 6d. each, and you will see from the list which types you require and the corresponding price. A kit for practically any of the receivers referred to may be obtained from Messrs. Peto Scott, of 77, City Road, London, E.C.1.

Parallel-fed Transformer Connections

"I am thinking of altering the transformers in a straight three to the resistance-fed type. The connections for these I know, but I am in doubt regarding the value of the resistances. Should these be about four times the impedance of the preceding valve? The L.F. valve, I notice, has an impedance of 12,000 ohms and this would mean that the resistance would have to be about 50,000 ohms. This would cut down the H.T., I believe. To prevent this could I use a 100-henry 3-milliamp L.F. choke in place of the resistance, and would this give the same degree of amplification?"—G. E. N. (Peterborough).

THE value of the resistance should be as high as possible, although the higher values will naturally reduce H.T. and thus result in loss of signal strength which will offset the gain in amplification due to the high value of resistance. In general a value of twice the normal impedance may be found quite satisfactory in the resistance-fed transformer circuit, but the use of the choke you refer to will be productive of better results owing to the increased H.T. which will be obtainable. It is only when dealing with ideals that the effect of the inductive anode load, as distinct from a pure resistive load, may be considered.

Reducing Eliminator Output

"I have a battery eliminator giving an output of 25 milliamps at 120 volts. I wish to fit a resistance to cut down the output to approximately 15 milliamps at 120 volts. What type, and what value resistance should I require, and how do I connect it?"—J. W. (Berkshire).

THE value of the resistance cannot be calculated until you know the total current flowing through it. Again, there may be no necessity to fit such a resistance in your case. If your eliminator delivers 25 milliamps, and you connect it to a receiver in which the total load is only 15 milliamps. there will be a voltage rise. This will depend upon the regulation of the mains unit and may only amount to a few volts. Therefore, at the most, the voltage will rise to about 130 or so, and as most modern valves work with 150 volts on the anode there will be little risk of damage. On the other hand, if you are anxious to restrict the output to the figures given, then you should connect a resistance in parallel with the mains unit so that the current flowing through that, plus that taken by your receiver, will total 25 milliamps. You must calculate the total current consumption of your set and subtract this from 25. Then the answer must be divided into 120, and the answer will be thousands of ohms. For instance, if your set consumes only 15 milliamps, the difference between that and the output of the unit is 10 milliamps, and 10 divided into 120 gives you 12, and thus the resistance should have a value of 12,000 ohms.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C.4 (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the following Manufacturers' Unused Goods at a Fraction of the Original Cost: all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad, carriage extra; orders under 5/- cannot be sent C.O.D.; please send 1½d. stamp for large new illustrated catalogue, also August bargain supplement.

SPECIAL Bargains for callers at our Clapham Branch where Summer Sale is now taking place.

WORLD Famous Continental Valve Manufacturer; mainstypes, 4/6 each, H.L., L., power; high and low magnification, screen grid; variable Mu screen grid; 1, 3 and 4 watt A.C. output, directly heated pentodes; V.H.P., D.D.T. Diode Tetrodes, 250 volt 60 m.a. full wave rectifiers; A.C. D.C. types, 20 volts, 0.18 amp. filaments; screen grid; variable Mu screen grid; H., H.L., power and pentodes.

THE following Types, 5/6 each; 350v., 120 m.a. full wave rectifiers, 500v., 120 m.a. full wave rectifiers, 2½ watt indirectly heated pentodes.

2-VOLT H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable mu screened grid, 5- or 4-pin pentodes H.F. Pen., V.M., H.F. Pen., 5/-.

THE following American Types, 4/6: 250, 210, 245, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 281. All other types, 6/6.

B.T.H. Moving Coil Speakers, matched pairs, 8in. 1,500 ohms. 7,500 ohms (1,500 speaker as choke 7,500 speaker in parallel with H.T. supply), with output transformer for pentode, 15/6 per pair; A.C. kit for pair, 12/6.

M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6; 100 henry chokes, 2/6.

A LARGE Selection of Pedestal, table and radiogram cabinets at a fraction of original cost.

BLUE-SPOT 29P.M., P.M. Moving Coil multi-ratio transformers, 15/-; handles 4 watts. Sonochorde ditto. Ideal for Battery Sets.

ELIMINATOR kits, condensers, resistances and diagrams, 120v. 20 m.a., 20/-: Trickle charger, 8/- extra, 150v. 30 m.a. with 4v. 2-4 amp. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps, with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a. with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

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

B.T.H. Trusped Induction Type A.C. only, Gramophone Motors, 100-250v. 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor 200-250v. high quality pick-up and volume control, 45/-. Motor only, 35/-.

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

WIRE Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

MAGNAVOX 144, 15/-, 144 Magna, 25/-. 152, 17/6, 152 Magna, 37/6, 154, 12/6, Dual-Matched Pairs D.C. 144/152, 32/6. Ditto Magna, 62/6. A.C. Energising Kit to suit any of above 10/-, all 2,500 ohms. P.M. 7 inch, 16/6, P.M. 9 inch, 22/6. State transformer required.

12 TO 2,000 Metres without Coil Changing: huge purchase of all-band 2-gang screened coils, suitable for screen grid, H.F. stage (tuned) screen grid detector type receiver, complete circuit supplied, 12/6.

BRITISH made Meters, moving iron, flush mounting, 0-10, 0-15, 0-50 m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps., all at 6/-; read A.C. and D.C.

POTENTIOMETERS, by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg., 2/-; 5,000, 10,000, 15,000, 100,000 with mains switch, 2/-.

1,000 OHM, 150 milliamp, Semi-variable resistance, 2/-; 1,000 ohm 250 milliamp, tapped, for any number .18 valves, 3/6; 800 ohms, 350 m.a., tapped, 2/-.

COSMOCORD pick-ups with Arm and Volume Control, wonderful value, 10/6.

THE following Lines 6d. each or 5/- per dozen: 4- or 5-pin baseboard or 4-, 6-, 6-, or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp, 2- or 3-point switches, Cyldon double trimmers, 6yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1 yd. 7-way cable, 9ft. resincored solder, 6yds. push-back connecting wire.

RELIABLE Soldering Irons, 200, 250 volts, .2 amps. 2/6 each.

ELECTROLYTIC Condensers T.C.C., 8mf. 440v., 3/-; 550v., 4/-; 15 mf. 50v., 1/-; 15 mf. 100v., 1/-; 15 mf. 12v., 1/-; Dubilier 4 or 8mf. 550v., 3/-; 8 plus 4 500v., 4/-; 50v. 50mf., 1/9; 12mf. 20v., 6d.; U.S.A. 4, 8, or 12mf. 550v., 1/9; 100 mf. 12v., 1/3; 2,000 mf. 12v., 6/-; 8+4 mf. 500v., 2/3, 4+4 mf., 2/-.

PAPER Condensers. Dubilier 4mf. 500v. working 4/-; ditto 700v., 5/-; ditto, 800v., 6/-; Western Electric, 250v., working 1 mf., 6d.; 2mf., 1/-; 4mf., 2/-; 1mf. 2,000v., working, 3/-.

CONDENSER Blocks 250v. working various taps. 6mf., 2/-; 10mf., 3/-; 8.5mf., 2/6.

MAINS Transformers. Premier all have tapped primaries, C.T., L.T.'s and Engraved terminal Board. H.T.8 plus H.T.9, 2 L.T.'s, 10/-; Rectifier, 8/6 extra; H.T.10 2 L.T.'s, 10/-; Rectifier, 9/6 extra; 250 plus 250 60 m.a. 3 L.T.'s, 10/-; 350 plus 350 150 m.a. 3 L.T.'s, 12/6.

WESTERN ELECTRIC Manufacturers type 350 plus 350, 60 m.a. 2 L.T.'s, 6/3; 350 plus 350 120 m.a. 3 L.T.'s, 9/6; 500 plus 500 150 m.a. 5 L.T.'s, 19/6.

VARIABLE condensers. Premier, all brass, short wave, .00015 slow motion, 3/9; British Radiophone, all brass, 2-gang, .00015 each section, 5/6; Ormond, .00025, 1/6; Polar, all brass, .0005 slow motion 3/11; Lissen 2-gang, .0005, front trimmer, disc drive, 5/11; Utility 3-gang fully screened trimmers and disc drive, 7/6.

BAKELITE reaction condensers, .00015, .00035, .0001, .0003, .0005, 9d.

LISSEN 3-gang, superhet coils, 6/-; Iron core coils with circuit, 2/11 each; Varley band-pass aerial coils, B.P.5. type, 2/9; ditto band-pass transformer, B.P.8, 2/6.

H.F. Chokes Premier screened, 1/6; Premier short-wave, 9d.; pre-sets, any value, 6d.

PREMIER smoothing chokes, 25 m.a., 20 henries, 2/9; 40 m.a. 40 henries, 4/-; 60 m.a., 40 henries, 5/6; 150 m.a. 50 henries, 10/6; 60 m.a. 80 henries, 2,500 speaker replacement, 5/6.

PREMIER auto transformer 100/200-250 and vice versa, 100 watt, 10/-.

CLARION S.M. drives, moving light, 2 inch knob for short waves, 2/-.

PREMIER SUPPLY STORES

20-22, High Street, Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest Station Clapham North (Underground).

RADIO CLEARANCE announce that owing to increase of business they have found it necessary to take larger and more spacious premises at No. 63, High Holborn. All future orders should be sent to this address.

RADIO CLEARANCE.—5-Valve Dorchester A.C. Sets, incorporating A.V.C., Fluid Light Tuning, Mullard Valves, complete in handsome Walnut designed Cabinet, £7 10s. 0d. each. Easy terms can be arranged.

RADIO CLEARANCE.—3-Valve Battery Chassis. Screen Grid Detector Power fitted air spaced 2-Gang Condenser. While stocks last, 15/11 each.

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RADIO CLEARANCE.—Utility 3-Gang Midget Type Superhet Condensers with 110 kc/s Oscillator Section, fully screened, also 3-Gang Straight Condensers offered at 5/11 each.

RADIO CLEARANCE.—Handsome Walnut Table Cabinets by Lissen, with provision for Speaker and cut out for Straight Line Dial, offered at 4/6 each.

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ALL orders under 10/- must be accompanied by a reasonable amount of postage.

RADIO CLEARANCE, 63, High Holborn, W.C.1. Tel.: HOLBORN 4631.

FREE GIFTS.—Save money. Obtain exceptional surplus bargain lists of guaranteed Bryce Mains Transformers and Condensers, etc., and how to obtain free gifts. Easy payments. Don't delay. Associated Mail Supplies (No. 6), 4, Ashland Place, Paddington Street, London, W.1.

OUR CATALOGUE SAVES POUNDS BUT COSTS ONLY STAMP.

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FOX INDUSTRIAL 4-Valve Amplifiers. A.C. Mains. 3½ Watt Output with two tuning coils. For Television. Radio, Gramophone and Microphone Chassis Complete, less valves, 30/-. With four specified Mullard Valves, £3 12s. 6d. Specified Speaker for same, 15s.

SPEAKERS.—BLUE SPOT 1935 Series with Universal Transformers to suit any circuit. 99P.M., 24/6, 45 P.M., 20/-, 99 P.M. (Extension Model, less transformer), 21/-. Celestion Soundex, 11/-. ALL IN SEALED CARTONS.

LISSEN 2-Valve Sets for D.C. Mains. Complete with Speakers and Valves. Contained in attractive Bakelite Cabinet. £2 10s. (List, £8), in sealed cartons.

LISSEN Skyscraper 3-Valve Screen Grid Battery Kits. Complete with 3 Lissen Valves, in sealed cartons, 42/- each (77/6 list).

TELSEN 3-Valve Battery Sets. Model S93. Complete with three Mazda Valves in handsome Bakelite Cabinet, 30/- (List, 75s.).

BURGOYNE CLASS "B" Three-Valve Sets. Complete with three Mullard Valves, Exide Batteries and Accumulator. Magnavox Moving-coil Speaker. Contained in magnificent modern cabinet. Finished in chromium. 1935 Series. £2 15s. Complete (List, £6 10s.). In sealed cartons.

MIDGET SETS. — "Lucille" 1935/36 Series. A.C./D.C. Universal Sets for 100/250 Volts, Medium and Long Waves. 5 Valves, complete with moving-coil Speaker in beautiful walnut cabinet. £3 19s. 6d. Similar Model for Medium Waves only, £3 10s.

ELIMINATORS.—Regentone 1935 Series. A.C. Mains, 200/250 Volts, Type W5a, complete with trickle charger, 39/6; WIa (less Trickle charger—carries 30 milliamps), 33/-; WIc (less trickle charger), 30/-. All in sealed cartons.

CONDENSERS.—Lotus 0.0005. Fully screened, with trimmers, escutcheons, dials and knob. 3-gang, 11/-. 2-gang, 7/8. TELSEN SINGLE VARIABLE CONDENSERS, 0.0005, 2/3; Piessy 4-gang Super-het, fully screened with trimmers, 7/3. Igranic, 1 mfd., 1/3, 2 mfd., 1/9. LISSEN HYPERNIK TRANSFORMERS: 4-1 ratio .3/11 (List, 12/6).

COILS.—TELSEN Triple matched screened coils, Type W288, 10/9 per set; Twin Matched Iron Cored Type W478, 12/6; Telsen Intermediate frequency transformers, Type W482, 4/-; Igranic Super-het Coils, set of four (1 Osc., 2 I.F. with pigtails, 1 I.F. plain) 9/- per set (List, 50/-). Varley Square Peak Coils, B.P.5, complete, 2/3.

THE following Telsen Components in original sealed cartons at sacrifice prices:—

ACE L.F. TRANSFORMERS.—5/1, 2/9; Binocular H.F. Chokes, 2/-; Standard Screened H.F. Chokes, 2/-; Coupling Units, 1/1, 2/6; ACE MICROPHONES (P.O.) with Transformers, 5/- each. This Microphone can be used with any radio set and is a very efficient article.

AMERICAN VALVES.—A full range of valves for all American sets at 7/- per valve.

SOUTHERN RADIO BARGAIN PARCELS.—We are offering the following parcels of mixed components at a fraction of their value. The items comprise up-to-date Radio parts, new and perfect, which are too varied to be advertised individually:—

5/- PARCEL.—Contains modern components valued at 20/-, including Resistances, Condensers, Coils, Wire, etc. Circuits of modern Receivers included with each parcel.

10/- PARCELS.—Containing Components valued at 45/-, including Volume Controls, Condensers, etc., also circuits.

20/- PARCELS.—This is known as the "small trader's" parcel, and contains a wonderful selection of components valued at 85/-. We have supplied this parcel to hundreds of Traders for re-sale at a profit.

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THE following unused set manufacturers' Surplus; all goods guaranteed perfect; immediate delivery.

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

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

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W.B.C. Short-Wave Chokes, 10-100 metres 10d.
W.B.C. Short-Wave condensers, .0001, .00015, .0001G .0002, .00025, .0003, all with slow motion, 2/-, two-piece Ormond slow motion dial to fit, 1/-.
WESTINGHOUSE H.T.8 and 9, 8/6. Popular iron cored dual range coils, 2/6. L.F. Transformers, 5/1 and 3/1, 2/6. Mike Transformers, ratio 100/1, 2/6. Differentials .0001, .00015, .0003, 1/4. Tubular, .1, .01, and .02, 6d. Erie resistances, all values, 6d. each. Radiophone, piano type, three gang, .0005, superhet condensers, with top trimmers, few only, 6/-.
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TRADE List ready. Send trade heading and stamp.
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HULBERT. All speakers previously advertised still available. All are brand new and made by one of the best-known British makers of high-grade moving-coil speakers. Prices from 10/6. All Music lovers interested in realistic reproduction should write for list of amazing bargains. Repeat orders are coming in daily.
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'Phone: Holborn 4434.

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NEW cones, coils, etc., fitted M/c speakers. Mains Transformers, fields, etc., rewound. English/American receivers repaired. Quick service, low terms, trade discount.
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There was a young man of Skegness
A Wireless-FIEND!
More or less!
All day he would tinker—
This clever young thinker—
With FLUXITE and GUN—no mess!

See that FLUXITE is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for 30 years in government works and by leading engineers and manufacturers. Of Ironmongers—in tins, 4d., 8d., 1/4 and 2/8.

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is always *ready* to put *Fluxite* on the soldering job instantly. A little pressure places the right quantity on the right spot and one charging lasts for ages. Price 1/6.

ALL MECHANICS *WILL* HAVE

FLUXITE

IT SIMPLIFIES *ALL* SOLDERING

FLUXITE LTD. (Dept. W.P.), DRAGON WORKS, BERMONDSEY STREET, S.E.1

Add* 50/- WEEKLY *to your earnings

Charge accumulators in your spare time

Complete Charger, incorporating Westinghouse Metal Rectifiers. Will charge 84 accumulators weekly.

Trade Price £4.4.0

Send for full particulars.

M.P.R. ELECTRICAL CO., ROMFORD, ESSEX.

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COUPON

This coupon is available until October 5, 1935, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 28/9/35.

ADVERTISEMENT INDEX

MISCELLANEOUS

WANTED, good modern wireless parts, sets, eliminators, meters, valves, speakers, etc. Spot cash waiting. Exchanges. Send or bring. We pay more than any other dealer. Open 9-8.—University Radio, Ltd., 142, Drummond St., Euston, N.W.1. 'Phone: Museum 3810.

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

AN extra good allowance made on your old set or parts in part exchange for any new receiver for cash or easy terms. We take your goods as deposit. Peto-Scott kits and components supplied for cash only, or part exchange. Highest allowances; prompt attention.—R. Wigfield, Wireless Agent, Furlong Road, Goldthorpe, Yorks.

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