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P.W.14.1.39
AN EXPERIMENTAL TWO-VALVER—SEE PAGE 445.

ROUND the WORLD of WIRELESS

All-wave Superhet

Many constructors ask for multi-valve receiver designs for long-distance work, and we have described several of these from time to time. In this issue we introduce a new set of this type, in which all of the valves used are of identical types. These valves are known as “All-Stage” valves, are produced by the Hivac company, and remove the difficulty of selecting a special type for each stage, and thus when a valve fails it is only necessary to obtain an all-stage replacement without worrying about the special type number. The valves are adaptable for various conditions, and a study of the theoretical diagram in this issue will show how the valves are used. The receiver is built up in two sections and this enables modifications more easily to be carried out when desired, the two chassis being connected by small plug-in cables. The receiver has been designed on up-to-date lines, having a switch so that when local-station quality reception is required the superhet feature may be cut out and the receiver used as a “straight set.”

Home-recording

The Columbia Broadcasting System has, for the first time in America, granted facilities for the recording on discs for general sale, of a radio drama. This is supplied on three-sided twelve-inch records. It is not stated whether any rules have yet been drawn up regarding the recording by listeners of plays.

Norwegian Short-wave Station

A 5-kW station has been erected at Lamberster, near Oslo, and the present schedule is as follows: 5.00-6.00 on 31.48 metres; 7.00-10.00 on 25.50 metres; 14.00-20.00 on 19.78 metres. The Jcjoy transmitter, LKJ, will continue to radiate on 45.84 metres.

“Private Enterprise and Public Ownership”

We are informed that the best of the discussions arranged by the Midland Region under the title “Private Enterprise and Public Ownership” will deal with Broadcasting itself and will be heard on January 12th in the Midland and Regional programmes. In the chair will be Lord Stamp. The speakers for Private Enter-

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On the first two days of the show, only jobbers, manufacturers, manufacturers’ agents and engineers will be admitted. The sixth annual exhibition of components will be held in Paris from January 31st to February 3rd. The venue is Centre Marcelin Berthelot, 28, bis rue Saint Dominique, Paris.

Special precautions are taken to maintain efficiency and the chairman of the National Adequate Wiring Bureau quotes the following excerpts from the bureau’s hand-book: “At least three outlets with radio antenna and ground connections, preferably adjacent to a standard convenience outlet, in each six-room or smaller house. Proportionately more in larger houses. Unless another method at least equivalent is specified, a twisted pair of wires from the antenna leads shall be carried from each outlet to the attic.”

New Sunday News Bulletin

As from the beginning of the year an extra news bulletin has been included in the Sunday programmes. This is broadcast at 6 p.m. from the Midland, North, West of England, Plymouth, Bournemouth, Wales, Northern Ireland, Stagsaw, Aberdeen, and Scottish transmitters. The existing bulletin at 8.30 p.m. will continue to be broadcast from all transmitters.

European News Bulletins

Modifications have been made in the times for foreign language transmissions by the B.B.C. The new broadcasts are now as follows:

7.15 p.m. G.M.T.—News bulletin in German, London Regional, 242.1 metres, and GSA, Daventry, 49.59 metres.
7.30 p.m. G.M.T.—News bulletin in Italian, GSA, Daventry, 49.59 metres only.
Sundays: The French, German and Italian bulletins will be broadcast on the same wavelengths as on weekdays at 6 p.m., 6.15 p.m., and 6.30 p.m. respectively.

Installation of Leeds University’s New Chancellor

On Tuesday afternoon, January 17th, the Northern microphone will be at an important Leeds University ceremony, in the Leeds Town Hall, to broadcast speeches at the installation of the Duke of Devonshire (Secretary of State for Dominion Affairs) as Chancellor of the University.
ROUND the WORLD of WIRELESS (Continued)

Indian Rural Radio
In order to test the effectiveness and possibilities of rural radio, All-India Radio has equipped twenty of the 381 villages in the Delhi Province with receiving sets.

Cross-Channel Radio-phone
We understand that the wavelengths to be used by the new cross-Channel radio-phone stations will be 3.6 and 4.4 metres in one direction, and 3.95 and 4.9 metres in the other.

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World's First Radio Newspaper
The world's first radio newspaper, to be known as Home News, was launched in London on 14th May. It is broadcast daily at 10:30 p.m. and is transmitted from the new studios of the British Broadcasting Corporation at Broadcasting House, London. The newspaper consists of news and features, as well as music and dramatic productions. The broadcast is available to anyone within the range of the transmitter, which is located on the roof of the building.

Solve this!

Jackson had a detector-L.F. receiver with which he copied a transatlantic signal. He used a 250-ohm resistor in series with a 10,000-ohm resistor in parallel with a 10,000-ohm resistor in series with a 50,000-ohm resistor. He then connected a 10,000-ohm resistor in series with a 250,000-ohm resistor in parallel with a 250,000-ohm resistor in series with a 500,000-ohm resistor. Finally, he connected a 500,000-ohm resistor in series with a 1,000,000-ohm resistor in parallel with a 1,000,000-ohm resistor in series with a 2,000,000-ohm resistor. What is the effective impedance of this circuit?

Operating the transmitting machine for producing the first radio newspaper.

TALKS ON THE PACIFIC
It is interesting to note that among those who are scheduled to speak on the Pacific Ocean will be Sir Fredrick Wherry, who will broadcast the first talk on January 12th. Other speakers on subsequent Thursdays, up to March 30th, will include Professor C. K. Webster, Professor J. R. Coniff, and Mr. G. C. Hudson, the latter in place of Mr. G. M. Green, who is away on some important mission. However, no further comments will be made until the end of this series.

Pantomime Broadcast
SCENES from the pantomime "Aladdin," presented by Harry Benet and produced by Frank Adey at the Pavilion, Bournemouth, will be broadcast on January 16th. "Aladdin" will be played by Kitchie Prince, "Widow Twankey" by George Hirst, and "Abanazar" by Fred Kitchen, Jnr.
An All-wave All-stage Superhet

Preliminary Details are here given of a Quality Receiver, with Special Provision for Local-station Reception

This all-wave superhet receiver, which may be converted to a straight set for local-station reception, has been designed and built round the Hivac-Harrs All-stage A15 valve. This is a multi-grid critical-distance valve which is so constructed that it may be used in each and every stage of a modern superhet or straight receiver.

The “critical anode distance” employed in Hivac output valves is now well known. By suitable multi-grid design the valve may also be made to give very linear and efficient power output characteristics at a high screen voltage and low-load impedance, while, with a lower screen voltage, the same valve still possesses very linear characteristics, but has a higher A.C. resistance. In both cases the anode to control-grid capacity is kept low, and the valve becomes suitable for efficient operation as a power output, audio or radio-frequency amplifier.

The problem still remains of also incorporating the various requirements of auto-gain control, diode detection, frequency changing, etc., but this has now been done, with the result that a single valve is now available, the characteristics of which may be altered to suit every stage of a modern receiver. The advantages of such a valve from the point of view of servicing are obvious.

The use of one valve for every stage is no deterrent to the performance of a receiver. In fact, the results we have obtained with this receiver are quite up to, and in some cases surpass, the performance that could be expected from a combination of existing specialised valves. The great advantage, of course, is the use of one type of valve for every stage.

Before considering the circuit in detail it is as well to go more closely into the operation of the valve in the various stages in which it is used.

In Fig. 1 is shown the circuit diagram for the complete receiver, from which it will be seen that the A15 valve is used as a frequency changer, L.F. amplifier, second detector and.A.V.C., L.F. amplifier, phase changer, and push-pull output. The second detector valve also has one of its grids used as a leaky-grid detector when receiving local stations.

When used as a frequency changer, a false cathode is produced in the neighbourhood of G3 and modulated by the oscillations produced by the oscillator grids G1 and G2. Instead of the usual screening grid, an automatic capacity bridge balance is produced in the valve itself. The oscillator is very powerful, and operates satisfactorily on all wavelengths.

The I.F. Stage

In the I.F. stage, the operation of the valve is quite straightforward, with the exception of the A.V.C. connection, which is not made as usual to the control grid, but to another special auto-gain grid positioned between two positive grids. The A.V.C. control efficiency is very good indeed, and pre-detector distortion and cross-modulation are avoided. The control grid is always operated under optimum bias conditions, and this was shown up in practice by the fact that the distortion is far less noticeable with this circuit when a station fades, than with other more common arrangements.

Another advantage of this type of control is that it possesses sufficient input voltage-handling capacity even when the receiver is operated on a large aerial near a broadcasting station. This has been of great benefit to the designer as the set has been built and tested under these conditions. In a good many instances it has been found necessary to use a wavetrap in the aerial to cut down the strength of the local station to avoid overloading the frequency-changer and I.F. stages, but this now receiver is quite happy when receiving a 50-kW station situated less than ten miles away.

The second detector stage may look rather complicated, but it is really quite simple if you imagine G1 and the anode as two diodes of a double-diode valve. Tracing the circuit between these two will show that normal practice is followed. The L.F. output developed across the 250,000 ohm load resistance is fed to the volume control, and A.V.C. voltages to the preceding valves in the usual way. It will be noted that a 1,000-ohm resistance is

Fig. 1.—Theoretical circuit of the All-wave All-stage Superhet, showing the division of the receiver and mains sections into two separate chassis—A and B.
PRACTICAL AND AMATEUR WIRELESS

AN ALL-WAVE ALL-STAGE SUPERHETER
(Continued from previous page)

of the audio-voltage developed across the grid-leak of valve V6 is fed back to the grid of valve V5, which acts as a phase-changer, and feeds a voltage to valve V7 which is in opposite phase to that fed to valve V6.

In the output stage the advantage of low anode current is obtained by the use of more than one grid between the control grid and the anode, and the full advantages of the critical distance are obtained in the stage out grid G3 than on the other positive grids. A result of this critical distance and low anode

to grid capacity is that it is unnecessary to use a pentode resistance-capacity series shunt across the loudspeaker to equalise the load. In fact, this is undesirable since, with a shunted pentode, the characteristic rising characteristic with frequency, thus minimising the effect of side-band cutting in the F.S. stage.

Examining the receiver circuit itself in more detail, it will be seen that a single tuned circuit precedes the frequency changer so that trimming arrangements are much simpler and cost is reduced. This arrangement has the disadvantage that the receiver is susceptible to second-channel interference is increased, but, by using an intermediate frequency of 465 kc/s., this trouble is almost entirely overcome on the medium and long-wave bands. The serial primary windings have been specially designed to help reduce this interference, and even when situated near a local station, second channels are very few. Constructors living near the coast, however, may find interference caused by marine stations, as their frequency is not far removed from that of the intermediate frequency. To meet such cases, particularly in Fig. 1, it is wise to lose some loss of signal strength at the top part of the medium waveband.

The connection between the frequency changer and the L.F. stage is by means of a variable selectivity L.F. transformer. This has an auxiliary coupling wind, allowing simple tuning, low reactance, or double-peaked curve for quality.

NOTE.—Messrs. Hivic have generously offered to supply the complete kit of valves required for this receiver for £4 10s. 10d. saving of £2 11s. 6d. on the list price.

IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, January 11th.—Symphony Concert from the Queen's Hall, London.
Thursday, January 12th.—All Hands: 'Ado light entertainment.
Friday, January 13th.—Lakme, an opera by Leo Delibes.
Saturday, January 14th.—Music Hall.

REGIONAL (342.1 m.)
Wednesday, January 11th.—Star-Gazing: 10:42, Jessie Matthews.
Thursday, January 12th.—Variety from the stage and the Hippodrome, Bristol.
Friday, January 13th.—Red Riding Hood: Pantomime from Covent Garden.
Saturday, January 14th.—Three Men in the Snow, adapted as a radio play by Robert Kemp.

MIDLAND (297.2 m.)
Wednesday, January 11th.—Landmarks in English Music: orchestral programme.
Thursday, January 12th.—Discussion: Private Enterprise and Public Ownership in Broadcasting.
Friday, January 13th.—Midland Marionettes, women's concert party.
Saturday, January 14th.—Variety programme.

WEST OF ENGLAND (285.7 m.)
Wednesday, January 11th.—London Theatre Society: 11.15 a.m.: a programme of gramophone records.
Thursday, January 12th.—A Variety Programme, broadcast from the stage of the Hippodrome, Bristol.
Friday, January 13th.—Made in the West: a feature programme to introduce the forthcoming series of talks on industries in the country towns of the West.
Saturday, January 14th.—Sports Special: a feature for fans.

WELSH (373.1 m.)
Wednesday, January 11th.—Talks and Discussions on the Smallest Nations (in Welsh).
Thursday, January 12th.—Drums: Wlffrowell from Kilmorey, by J. A. Ferguson.
Friday, January 13th.—Heddle yw Ddydd. Cated yng Nghymru (Today is a Day in the Year in the Home of Valley): feature programme.
Saturday, January 14th.—An Hour of Melody: Orchestral concert.

NORTHERN (449.1 m.)
Wednesday, January 11th.—Music of the People, a concert from Birkenhead.
Thursday, January 12th.—The First Five Years: a dramatical Discussion on Nursery Schools, with recordings made at the Rachel McMillan L.C.C. Nursery School.
Friday, January 13th.—Club Concert, from East End Park Working Men's Club.
Saturday, January 14th.—Northern Choral Singing—1.

SCOTTISH (191.1 m.)
Wednesday, January 11th.—Scottish Dance Music.
Thursday, January 12th.—Choral programme.
Friday, January 13th.—Inside Information—Happy Feet, recorded programme.
Saturday, January 14th.—Three Men in the Snow, adapted as a play by Robert Kemp, from Cyril Burt's translation of the story by Erich Kästner.

NORTHERN IRELAND (307.1 m.)
Wednesday, January 11th.—Chamber Music.
Thursday, January 12th.—A Song Recital.
Friday, January 13th.—Country Concert from Armagh.
Saturday, January 14th.—Association Football—Neney v. Larne: a commentary during the second half of the match, from the Show Grounds, Warrenpoint, Down.

LIST OF COMPONENTS FOR THE ALL-STAGE ALL-WAVE SUPERHETER.

One Valey B.P. 120 455 kc/s: a.c. coil wave unit.
One Wareh P.H.B. 2 coil, complete with trimmer.
One L.B. 3-gang bar-type condenser with all-wave dial.
Five 3-pin valve-holders—Clix V.111.
Six octal valve-holders—Clix V.218.
One octal ceramic valve-holder—Clix V.218.
Five five-cores—Balgien type 3000.
One aerial-earth socket strip—Balgien P.31.
One plastic socket strip—Balgien P.6.2.
One mains input socket strip—Balgien P.6.2.
Two 10-meg. resistors—Balgien C.11.
One 5-way group board—Balgien C.31.
One 6-pin toggle, midget rotary selector switch—Balgien S.204.
One 24-pin, 300 tubs at 120 mA.—Wareh H.T.14.
One mains transformer, 200-250 volts primary, secondaries 500-500 v., 4 x 3 A: C.T.: 12:
5 A.C.T.: manufacturers' type, colour-coded to match condenser Parts.
Three 3-pin cable plugs—Balgien P.36.
One baseboard for valve with 250 mA fuse—Balgien F.12.
One 15 ohm W resistance—Dubiller F.1.
One 20,000 ohm W resistance, Dubiller F.1.
One 100 ohm W resistance, Dubiller F.1.
Two 1 meg. W resistance, Dubiller F.1.
One 10,000 ohm W resistance, Dubiller F.1.
Two 3 megahertz single-pole, Dubiller F.1.
One 450 ohm W resistance, Dubiller F.1.
One 300 ohm W resistance, Dubiller F.1.
Two 250,000 ohm W resistance, Dubiller F.1.
One 1 megohm W resistance, Dubiller F.1.
One 1,000 ohm W resistance, Dubiller F.1.
*Complete kit of Hivic Values is offered by the makers at a special price of £4 10s. 6d.

ALL-STAGE ALL-WAVE SUPERHETER.

One 100,000 ohm 1W resistance, Dubiller F.1.
One 50,000 ohm 1W resistance, Dubiller F.1.
One 200,000 ohm 1W resistance, Dubiller F.1.
One 100 ohm 1W resistance, Dubiller F.1.
One 120 ohm 1W resistance, Dubiller F.1.
One 8,000 ohm 1W resistance, Dubiller F.1.
One 10,000 ohm 1W resistance, Dubiller F.1.
One 250,000 ohm volume control, Dubiller type B.
Twelve 0.1 mfd. tubular condensers, Dubiller type 400V.
Three 0.005 mfd. condensers, Dubiller type 5000W.
Two 0.002 mfd. condensers, Dubiller type 5000W.
One 0.01 mfd. condenser, Dubiller type 400V.
One 0.5 mfd. condenser, Dubiller type 400V.
Nine 0.005 mfd. condensers, Dubiller type 699W.
Two 25 mfd. electrolytic condensers, Dubiller type 316E.
One 150 mfd. electrolytic condenser, Dubiller type 316E.
Two 0.001 mfd. condensers, Dubiller type 699W.
Two 0.01 mfd. condenser, Dubiller type 699W.
One 0.011 mfd. condenser, Dubiller type 699W.
Approximate cost £11 10s. 6d.

VALVES.

1 Hivic-Harrisons All-Stage Valves, type A.15. * 2 Hivic UG.120/500 rectifier valves.

LOUDSPEAKER.

One 15-watt field main-powered speaker with transformer to match push-pull output stage, and 50 ohm centre-tapped—W.B. type EM/S.

NOTE.—Messrs. Hivic have generously offered to supply the complete kit of valves required for this receiver for £4 10s. 10d. saving of £2 11s. 6d. on the list price.

January 14th, 1939
AN EXPERIMENTAL TWO-VALVER

How to Build a Simple Two-valve Set from Old Components for Broadcast Reception, and for Tests and Experimental Work.

By W. J. DELANEY

LAST week we explained how it is possible to utilise old components in certain types of receiver, which could be used on these lines for various purposes. Probably the best type of set to be built for general use is a two-valve in which the valves carry out the functions of detector and L.F. output stage. Such a receiver calls for only one tuning coil and condenser, and almost instantaneous change from one form of coupling to the other, and the amateur can make up various units for use with this scheme. It is, in fact, as simple as ordinary coil changing as used in short-wave receivers.

The coil may be wired according to the particular component available, although the circuit shown has a coil having a high winding. The coil described last week in the first of the articles on Making Your

Fig. 1.—Theoretical circuit of the two-valve experimental receiver. Thus there is no difficulty in setting up the receiver, nor in its operation. A set of this type may be built with practically any make of component, and will give satisfactory results, the performance depending, obviously, upon the quality of the parts which are used. Some difficulty is often experienced by the amateur in selecting the best type of low-frequency coupling, and although there is only the choice of transformer or resistance-capacitance coupling, these may be modified so far as the connections or values of components are concerned. In this receiver, therefore, a plug-in device has been incorporated so that the凝合 may be used as a stand-by test unit wherein various types of transformer may be instantly compared, the effects of different ratios noted, or suitable values of resistance-capacitance components ascertained.

Adaptability

The method of making up the plug-in device is shown in Fig. 6, whilst Fig. 1 shows the theoretical circuit with special lines indicating the wiring of the L.F. transformer. When this component is employed, if the resistance-capacitance coupling unit is desired it would be wired as shown in Fig. 4, and thus it will be seen that it is an extremely simple matter to make an

The Output Stage

A triode or power type of valve is shown in the circuit, but if desired a pentode may easily be substituted. In that case a 5-pin socket should be used and the additional terminal should be joined to the positive speaker terminal. The layout is not critical, and a suitable scheme is indicated in Fig. 2. For the panel you may use wood, ebonite or metal, as the moving vanes of the tuning and reaction condensers are also joined to earth. In the event of a coil being used in which the reaction winding is already connected to the earth end of the grid coil (which would necessitate the inclusion of the condenser between anode and reaction winding) an insulating washer would have to be mounted on the reaction condenser so that the reaction coil would not be short-circuited. A panel is not, of course, essential, and by using component-mounting brackets the condensers and switches may be supported in such a manner that they are easily replaced when alternative components are being tried.

Experimental Modifications

The details given will enable a very useful set to be built up, and for the experimenter who is just starting radio

(Continued on page 458)

Fig. 2.—Suggested layout for the receiver, showing the replaceable coupling panel.
BACKGROUND noise is particularly objectionable with any form of radio reception. Whether it is present in the form of valve noise, microphone, modulation or mains hum, or interference due to defective components, it tends to detract from the entertainment value of the reception and, in certain instances, is possible for it to affect the efficiency of the receiver to the extent of blotting out a station which, under normal conditions, would be logged at a satisfactory strength. This applies in particular to the short waves. Any listener to the transmissions on the lower wavelengths will agree that the first essential is a dead silent background. Admitted that this desirable qualification is not always obtainable so far as atmospheric conditions are concerned, but that is no reason why every ear should not be taken to make the set as perfect as possible, thus reducing the total interference to the minimum.

Valve noise, microphone and defective components can, more or less, be eliminated comparatively easily by due attention to circuit design, construction, and normal tests, but when hum is the most disturbing factor the matter is not quite simple, as it is impossible to define an exact cure for each and every case. Many constructors avoid trouble from this source, and, incidentally, others by using a battery-operated receiver for their short-wave listening. Such procedure is all very well so far as freedom from hearing interference is concerned, but it does not strengthen their position when they switch over to a mains or an eliminator-operated outfit.

A Compromise

Quite a number of listeners attempt to compromise by using a receiver employing standard two-volt valves with their filaments supplied from an accumulator, and an eliminator for the source of high tension. A certain percentage of them are fortunate and experience no trouble, but against these we have to put a surprising number who do strike the very snag they were trying to avoid, namely, modulation and mains hum.

It would appear, therefore, that the root of the trouble in such instances is, undoubtedly, in the mains section of the equipment, so before going to the trouble of modifying or rebuilding the receiver it is always advisable to concentrate on the rectifier and smoothing equipment first.

The fact that an eliminator or mains section works perfectly when used in conjunction with an ordinary broadcast receiver does not mean anything so far as its suitability for short-wave work is concerned, other than, of course, the proof that the apparatus is in order as regards delivering a reasonably smoothed output of the correct voltage and current.

Short-wave receivers using circuits tuned to high frequencies are much more susceptible to any interference, either from direct injection or radiation from adjacent apparatus, than their broadcast counterparts; therefore, remembering that the H.T. supply is common to all anodes, it is obvious that particular care must be taken to ensure that the supply is filtered in an adequate manner and that components carrying raw a.c. are kept at a distance greater than their effective fields. The circuit shown above will be recognized as a perfectly standard rectifier arrangement. The valve in question is of the 350-volt 120-mA type, but that is quite immaterial as we are only concerned with the smoothing of the output.

It will be noted that the usual inductance and capacity is connected in series and across the positive and negative lines. The inductance being provided by the field of an energized loudspeaker in place of an ordinary L.F. choke more widely used with lower outputs.

A.C. Ripple

The output from the smoothing choke is generally referred to as “D.C.” but it should be borne in mind that although a rectifier has been used the output will bear a ripple, the degree of this depending upon many factors. This ripple is of great importance in broadcast apparatus, but on the short waves it is possible for this to be modulated, thus giving rise to audible hum in the output circuit. Feedback between various stages is also possible as the choke is common to all stages, and it is these factors which concern the short-wave listener. A simple mains unit or battery eliminator will not, of course, employ such a high inductance smoothing choke and a speaker field and thus the trouble is even more pronounced.

The first step in removing these troubles is to isolate the detector stage, as it will be found that this is most prone to troubles from outside sources. Simple decocking may prove effective, but where experimental work is to be avoided it may be preferable to adopt the following procedure right away. As we have stated that the detector stage is most likely to be the root of the trouble, this should be fed with a separate H.T. supply, and the easiest way of doing this is to take a separate lead from the point marked “X” in the diagram and to connect a standard L.F. choke at this point. Assuming that the choke shown in the diagram is a standard component (and not a speaker field) we can then use one H.T. output for the H.F. and L.F. stages, and the remaining one for the detector stage. In addition to providing a more smoothed supply for the detector we may thus have at our disposal a much higher voltage than is available at the other choke, due to the fact that a much smaller anode current is flowing and there will consequently be a smaller voltage drop. This will enable a large value of decoupling resistance to be included in the detector anode circuit, and the additional smoothing should then enable hum-free working to be obtained.

As an alternative, the output from a speaker field (as shown in the diagram) may be used for the detector stage, and the output from the standard choke may be used for the remaining stages, providing in this case extra H.T. for output valves which may be of a more sensitive type than may be used when a low H.T. voltage is available.

A standard valve rectifier circuit using the field of an energised speaker for smoothing.
The New Year on the Air

I LISTENED to the B.B.C. broadcast of the various New Year's Ceremonies, and was not in the least surprised that Scotland was given pride of place, bearing in mind that some members of the B.B.C. are drawn from that likeable, if fiery, race, and that both Directors-General Sir John Reith and Mr. Ogilvie are Scots. One would imagine from the nature of this broadcast that the New Year Celebrations were some speciality indigenous to the soil of Scotland to which Englishmen are privileged to listen. May I offer a friendly word of advice to the B.B.C., that it is an organisation run from London, the capital of England, and chiefly out of English money. The B.B.C. must therefore sink its natural pride in the race from which it draws some members of its personnel, and give pride of place to Englishmen now and again. After all, there are only three million Scots in Scotland, and I have always understood it to be the policy of the B.B.C. to cater for the majority of its listeners! I can assure them that the majority of their listeners do not like an overweening proportion of Scottish material in the B.B.C. More boots, hoofs, hichs, and achs, from Scotland or Scotland?

Liberties with King's English

WHILST I am dealing with this problem there is one other matter to which I advise the B.B.C. to give most careful attention. It is this: Owing to the influences to which I have referred there is a grave risk that eventually all Englishmen will be speaking with a Scotch accent. Now, as an Englishman I particularly resent pronunciation by B.B.C. announcers based on the multi-dialects of the Highland and Lowland Scots. I am not alone in my objection to this, for see in the dignified pages of John o' London's Weekly the following letter: "The writer is referring to "The dialect or patois which is called Oxford." This is what he says: "The variety which emanates from the B.B.C. differs entirely from any dictionary pronunciation which I have met. For example, the announcer, who I am informed, from the very fact of his position, must be of uncommon erudition (probably Public School and University), recently called an Arterial Road." I am Materially, Herr Hitler was re-christened "Huh Hidah," and Europe "Yurrp." Then we hear about "High pressaw," from the "Naath," and "Fall period," etc., etc.

"All of this is of "cawse" quaitae naice and refined—but if it is to become the language on the country the existing dic- tionaries should be scrapped, and the folk who persist in the old-fashioned pronunciation, viz., "the King, the Archbishop of Caithness, Lord Ponsonby, and many others, should be advised that they are "out of date.""

I have commented on this matter before, and given as my opinion that only the English should decide on the pronunciation of their language. We have no need to go to a Scottishman, or a Scot. The B.B.C. is embarking upon a dangerous policy in toying with a language which is older than science, many centuries older than the B.B.C., and certainly much older than the Scottish dialect. I cannot admit that Gaelic is a language.

"Torch" Again

OUR old friend Torch wishes to illuminate my columns with another piece of poetic prose. May his filament never grow less, and may his nose never blue-glow.

Now listen to this:

May Torch the Rhymester send a New Year's wish, "Good Luck to Practical and Amateur Wireless." May Mr. Gaum, our great premier, still chase and hunt the Mad Inventor, and you to Scots cry "Fish." May manufacturers be led to know the Home Constructor isn't dead, but still is active, and very much alive; and when from them we order parts, not break enthusiastic, patient hearts, with too long waiting till their interest's fled.

be no circulation fall, in nineteen thirty-nine."

"Torch."

The Indistinct "Tim"

I HAVE drawn your attention, as well as that of the Post Office, to the indistinct enunciation of the girl with the golden voice when she is announcing 30 seconds and 40 seconds, both of which are pronounced the same when you dial "Tim," and you have to wait for the second announcement to know whether she is saying 30 seconds or 40 seconds. After the great amount of trouble which was spent in finding a girl whose diction would be plain for all to hear, it is somewhat surprising that the Post Office view this matter with equanimity, for they replied to my letter by stating that everyone who dialed "Tim" would certainly wait for the previous and following time announcement. My old friend Donald Knock (VK2NO), of the Sydney, Australia, writes in connection with this matter:

"On page 79 of your issue for October 3rd last, reference is made to the 'Speaking Clock.' You Londonders enjoy by the medium of the land-line, and the indistinct articulation of the words 'thirty' and 'forty.' In Australia there would be no doubt about the Y part of it at least, the custom on the part of radio-telephone operators being to lay stress on the Y by pronouncing it Eye. Thus 'forty' becomes 'forte.' There couldn't be much variation between 'fourteen' and 'forty.' That, however, doesn't clear up the similarity in 'thirty' and 'forty.'"

"A letter problem it will be for New York, U.S.A., if a time-speaking clock is installed. One would be likely to get something like this: The tome is forty, in the morning. At least, that's what the screen would indicate."
The Cuttings File

PRACTICAL AND AMATEUR WIRELESS

HERewith letter from A. D., of Jesmond:

"The reference you make to a cuttings file in PRACTICAL AND AMATEUR WIRELESS of December 31st, 1938, probably refers to your remarks in the issue of November 26th, 1938 (page 203) relating to my letter to you. My cuttings file is on the lines of an encyclopedia of radio, and consists of about 120 brown paper folders with white cardboard pockets. The subject contains. There are separate folders for each class, valve, also for manufacturers' details. The folders have been collected during the last 10 years, and are filed in a drawer 10m. by 10m. b 14m. long. Under 'Meters' there are particulars of meters not generally found in text-books on radio, information such as the meaning of 200 ohms per volt. All the cuttings are pasted on each side of a white quarto sheet to form a page, whilst full-page cuttings are trimmed by the removal of the margins to make them small, dates being retained when possible. I have not found any difficulty with matter printed on both sides of a page, but coming under other headings the best is chosen. When Mr. Camm's book on Oils, Books, etc., was issued, all folders relating to short-wave coils were thinned out, as my encyclopedia refers to practical points not found in radio text-books."

Television Transmission Tube Developments

At the Institution of Electrical Engineers recently two very interesting papers were read dealing with television transmission tubes and feeder cables. In the case of the first named, information was imparted which gave a much clearer explanation of the operation of the storage type camera, and helped to remove many of the points of doubt which had hitherto existed. It was pointed out that in the generation of the television signal the flow of secondary electrons from the mosaic to the second anode must be controlled by the potentials of the mosaic elements in the immediate neighbourhood of the scanning spot, and not by the potentials of the second anode. Furthermore, the E.M.I. engineers reading the paper stated that the camera tube operates with the low efficiency of about 1 per cent. of the theoretical maximum. This arises from the lack of saturation of the photo emission from the mosaic during most of the frame period. Another reason put forward for this, although of secondary importance, is bound up with the spread of secondary electrons released by the scanning beam from the mosaic. These secondaries neutralise the charges stored on the mosaic elements, and also generate spurious signals of which one is a low-frequency component known as "tilt," which is superimposed on the picture signals. Readers will remember a recent note in these columns which dealt with one method whereby this defect can be corrected by suitable electrical circuits in association with an additional grid electrode.

Separating the Functions

It was primarily as a result of the difficulty with the standard form of storage tube, coupled with its low efficiency, that steps were taken to separate the functions of the photo-surface and charge storage. This is the principle now governing the operation of the super-

emitter which has been used occasionally by the B.B.C. The optical picture of the scene to be transmitted is focused on to a continuous photo surface which is of the transparent type. The resulting electron image so generated at this surface varies in density across its section according to the varying degrees of illumination of the picture. This image is then electrically accelerated and focused on to the storing mosaic which is not photo-sensitive, but secondary emissive. At this plane a charge distribution is generated which corresponds to the optical picture on the photo-electric cathode. The scanning of the mosaic signal plate is carried out in the normal manner by the electron beam, and in this way the elements are restored to their equilibrium potential. The advantages accruing from this separation of the camera functions are threefold. First there is an improvement in the efficiency of the photo-electric cathode; second, the multiplication of the charges on the mosaic by secondary emission, and third, the greatly improved optical conditions which give a greater depth of focus.

"Gold in Australia"

Radio features have been written about many subjects, but as yet none have had gold. Yet nothing is more disastrous than the cataclysmic effect that the discovery of gold has on a country.

John Richmond is producing a story of Australia, where gold was discovered in 1859—two years after Queen Victoria’s accession. Although this radio story will describe the various gold rushes and scrambles which took place in East and West Australia, yet it is also built around the human story of migration, dealing with two or three generations of one family. The magic lure of gold drew the adventurous immigrant from the home country. Listeners will follow his fortunes as through the power and impetus of gold, see what becomes of the lone immigrant’s descendants up to the present day. Such a story is suited to the radio medium. The British Empire overseas was to a great degree financed and developed from the mineral wealth of the Irish colonists discovered in the new lands.

"Gold in Australia," which will be given in the National programme on January 31st, will also be broadcast from the Empire transmitters, and Australians themselves will not doubt like to feel that the home country is also listening to a human story of an Australian gold programme which has been written by R. L. Mégroz and will be produced by John Richmond.

Listeners’ Reactions

No one could have foreseen a few years ago that by 1938 it would have become necessary for a special section of the staff of the B.B.C. to do nothing but answer the questions, acknowledge the suggestions, appreciations and criticisms that three thousand letters of mail which bring them by the gross every day. And that’s not counting the two young women whose job it is to answer inquiries that are phoned by the public every few minutes.

This tremendous mail, however, normally totaling two thousand letters a week, is welcome, and far from being an unnecessary evil, it is one of the few ways in which the B.B.C. is helped to know what listeners are thinking, and a box office by barometer of public opinion.

Only a short time ago, stacks of letters for and against the broadcasting of what was called "dance music" on Sundays reached Broadcasting House. Similarly, more than a thousand postcards, most of them addressed to the Director-General,

Such is fame! A letter I received recently from a reader in Petersfield was enclosed in the envelope shown here, which reached me safely.

recently arrived from people in all parts of the country, asking the B.B.C. to continue the foreign language broadcasts.

If you should ever hear a comedian exclaiming "Blimey!" or "Hell!" in a B.B.C. programme, you may be sure that several hundred listeners are about to put pen to paper to tell the B.B.C. that this kind of thing must stop and should never have happened, anyway.

Similarly, there are those who urge the B.B.C. to become a tectotalitarian state, where alcohol in its various guises is outlawed, and where drinking songs should refer to lemonade, milk, or wine.

Nowadays, however, the B.B.C. is so aware of the sort of things that may quite unwittingly offend listeners that it is a point of policy to see that programmes both avoid those which may honestly give pain to a considerable section of the uninformed audience and lay a minimum stress on others, which, though perfectly innocent, would, without much doubt, disturb hypersensitive listeners.

It is on record that a listener some time ago wrote to Broadcasting House asking where he could get a translation into Chinese of "O, Golden Sun of Oblivion." The B.B.C. was able to tell him.

Other strange queries, taken at random from the files, have ranged from "What would Shakespeare be writing if he were alive to-day?" and "Is the sun a fixture?" to a list of unusual Irish feminine names—by someone with a daughter to be christened.
TELEVISION RECEIVER CHOICE

SINCE the closing of Radiomedia up to the present time there has been a marked lag between television receiver orders and their ultimate delivery into the homes of the eager purchasers. With the advent of the New Year this condition is showing considerable improvement, however, and many who have withheld their interest in the new service are examining the merits of the different types of receivers available with a view to deciding which type of model meets the domestic needs of the household. When it is remembered that there are over sixty different television receivers to choose from, it is natural to find the potential customer a little bewildered, and although the complete range of models can be reduced to types with common features there are many important points to be taken into consideration, quite apart from the all-important one of first cost.

Setting the Types

There are no doubt several ways in which a list of types can be drawn up, but from observation it would seem that the most reasonable is to segregate the sets into the following headings:

(a) Adaptor or Add-on Unit.
(b) Vision and Sound Only.
(c) Vision and Sound, together with All-wave Radio.
(d) Projection Receivers.
(e) Television and Radiogram.

In any case, this form of separation will suffice for the purpose of dealing with the features to look for prior to purchase. There is no doubt that the first-named section is one around which quite a good deal of controversy exists, so it is advisable to examine the case impartially. These units, as a rule, take one of two forms—namely, those which adapt the home radio set to the vision broadcast by producing an intermediate frequency with the vision frequency-changer, so that the domestic set has to be tuned accurately to obtain the required L.F., and secondly, those which "add on" to the radio set by feeding the low-frequency output of the unit into one of the pick-up terminals of the home receiver. In each of these cases, of course, the picture is provided by the tube and chassis integral with the adaptor unit; the home set merely being a link in the ultra-short wave sound chain.

Small Saving

The sum of money saved by this means is not of considerable proportions, however, although naturally it enables a fortunate home receiver, with which an individual may be loath to part, to help in giving sound and vision entertainment. Then, again, there are some who like sectionalising their radio equipment into parts, and in those cases the adaptor scheme is an admirable one. From the point of view of immediate capital outlay there is certainly a saving, and it may be regarded as an intermediate stage, as against a future date when both adaptor and domestic radio set will together give way to a combined television, and radio instrument, with all the modern developments to meet the family needs.

To others, of course, the idea will not appeal, for it means two cabinets and connecting leads which may be inconvenient, or awkward, to accommodate in that part of the room which gives the best viewing position for television programme enjoyment. Again, there is always the possibility of frequency-changer drift, and this can only be un Lancaster, by retaining the radio set each time it occurs. More important still is the fact that since most radio sets have a fairly sharp frequency range of about 5 kilocycles, the high fidelity of the television sound transmission cannot be taken advantage of in any way.

A typical television add-on unit, providing only the television sound and picture, made this equipment available, and assuming the vision side performance is up to standard, the final choice is more of a personal problem than in any of the other categories.

A Separate Set

While the number of adaptors at present available is rather limited, there is quite a wide choice for those who feel that it would be advantageous at the present juncture to purchase a set which is designed solely for the vision and sound programmes now being radiated from the Alexandra Palace station. There are at least two dozen models which fall within this category, and the choice should therefore be dependent upon such features as reliability, ease of control, picture size and clarity, together with any aesthetic appeal in the complete design. Most of these vision and sound sets have a picture which does not exceed 10in. by 8in., being built up round a 12in. diameter cathode-ray tube. It would appear that the aim of many of the manufacturers of these sets has been to provide a potential viewing public with a neat, efficient set, relatively small in overall dimensions, which can be regarded solely for the purpose of viewing pictures and sound from the B.B.C. television service without in any way interfering with the established domestic radio installation.

Complete in itself, the price is but little in excess of the adaptor or add-on unit, and has the merit of being capable of being placed anywhere in the room where convenient viewing can be undertaken. Most of these sets have their controls reduced to the barest minimum, in some cases a simple contrast control for vision and a volume control for sound, so that after installation by the dealer or engineer it is simply a case of switching on and enjoying the programme fare now provided by the B.B.C.

Points to look for in making a final choice are an adequate range of contrast in the picture itself, with a degree of brightness sufficient for the proposed amount of lighting it is intended to have in the room when watching televised items. Be sure the colour of the picture is as near black or white as possible, and as you have a marked preference for sepia or shades towards green or purple, examine the focus of the cathode-ray tube to ensure that when close to the set each line is clear.
PRACTICAL AND AMATEUR WIRELESS

January 14th, 1939

PRACTICAL TELEVISION

(Continued from previous page)

over the available scanned area. Any patchy misfocusing becomes very annoying when the initial enthusiasm for the "new toy" wears off, and the members of the household settle down to critical viewing.

See that there is full detail in the picture with an absence of line pairing due to an imperfect interfacing. This produces a slightly blurred picture which should be capable of rectification by reducing slightly the lock control of the synchronising. Yet another item that merits the closest attention is any ghost or double images. It sometimes happens that a vision chassis has certain frequencies over-emphasised, and this results in ringing effects which are very noticeable at edges where there is a sharp change from black to white. Linearity of scan is also worth watching, received picture will be cut out at the top and/or left of the scan, and rather squeezed up on the right and/or bottom of the framing mask. Now hallucination can arise from a variety of causes, and a defect of this nature is sufficient reason for refusing to choose that particular model, as the picture will continually be out of balance, and if very pronounced, make the figures rather grotesque in shape.

The Third Class

Coming now to the third category, from which there are about the same number of models to choose from—that is, two dozen—these sets are primarily for those listeners who feel that their present set is so bad that a change is necessary, and at the same time desire to take advantage of the new form of home entertainment—television. The additional sum of money required is very when compared to vision and sound only is less than that for separation television and broadcast receivers because of the reduced manufacturing costs brought about by the saving of a cabinet and certain of the radio components. There is a choice of all types of the popular type with or without a gramophone with or without an automatic record changer. There is no doubt that these instruments represent the last word in audio and appearance, and it is significant that in the case of many manufacturers all stereophonic receivers are being built with even greater emphasis. Since these sets are not of the mass-production class, however, it will be found generally that craftsmanship and performance are of a really high standard.

Picture Correction

On two or three occasions in these television receivers it has been drawn to an annoying effect in pictures which occurs at times whereby there is a progressive increase or tilt in the brightness of the received picture towards one side, and at the same time it is often found that the darker sections of the picture have a tendency to exhibit a whitish, misty, appearance. This arises from an inherent camera fault, and various schemes have been suggested or tried to overcome the defect. Many of these prove quite effective if the average brightness of the scene which is being transmitted is not changed at a relatively rapid rate. When it is not necessary, however, such as would arise with certain classes of talking films which are being televised, the defect may only appear more, and is the presence felt to be unwanted. This has been pronounced recently for the express purpose of meeting these extreme cases. It consists simply of incorporating in the cathode-ray tube a local source of light which can, if desired, take the form of an incandescent filament. The idea of this simple addition is to liberate a small quantity of slow-moving electrons which will stabilise whatever tilt is provided that the mirror is a surface silvered one, then there is little to choose between the final reproduced picture, assuming other things are equal. As a rule, a slightly wider viewing angle than that of the picture is seen on the tube face direct, but this is only a matter of importance when a very large party desire to look in at the allocation, as a double set of these receivers range from about £30 to £90, it will be appreciated that it should be possible to satisfy all tastes.

Large Pictures

The question of very large pictures for domestic purposes does not really arise as the listener has room of ample proportions, or proposes to use the set in a hall. With the present standard of definition of 405 lines, a picture 28" wide needs to be viewed a substantial distance away to give justice to the results. The reason for this will be obvious when it is remembered that picture size and viewing distance are inter-related by simple proportion. Of course, added to this is the question of first cost which due to the fact that equipment used, is very much in excess of the simpler domestic models employing the usual form of cathode-ray tube. There are at the moment only four or five large-picture receivers on the market, and apart from the final colour of the picture the results are all comparable.

The Final Category

These receivers which give what is so often termed complete home entertainment—television, all-wave radio, and a gramophone with or without an automatic record changer. There is no doubt that these instruments represent the last word in audio and appearance, and it is significant that in the case of many manufacturers all stereophonic receivers are being built with even greater emphasis. Since these sets are not of the mass-production class, however, it will be found generally that craftsmanship and performance are of a really high standard.

A new Baird combined television and all-wave radio receiver.

TELEVIEWS

present, and in this way enable it to be more easily corrected by the standard methods.

Becoming Television Conscious

The advent of the New Year will signalise a determined effort on the part of everyone associated with the television industry in an endeavour to make the British public, or at least section within the accepted service area, really television conscious. Since the closing of the Radio Exhibition doors at Olympia in September last, the manufacturers of television sets have in nearly every case been much behind schedule in the execution of firm orders. This position has now been rectified, however, and coincidence with it a concentrated drive has been arranged between the B.B.C., dealers and manufacturers. Special forms of television advertising will be arranged, and the new B.B.C. television public relations officer, Mr. Wolfe Murray, will give a series of talks in halls situated in the London and Home Counties area. Demonstrations will accompany the talks, and naturally, dealers in the chosen areas will associate themselves with the work. The full extent of the B.B.C. co-operation is as yet unknown, but there is no doubt that this will be of a very full character for the extent of future development in hours of transmission, improved quality of programmes and, most important, the decision to extend the service to the provinces must obviously be in part dependent on the total number of viewers who are taking advantage of the existing B.B.C. service by having sets installed in their own homes. Every owner of a television set is an unconscious ambassador for television. Friends are invited in to see the new acquisition to the family fireside, and the good programme now provided by the B.B.C. convinces others that they are missing something really tangible unless they have a set of their own. Home demonstrations have proved to be the best-selling media.
A Foot-operated Switch Fitment

A position of my work-table renders the main switch normally inaccessible, I devised a foot-operating arrangement, as shown in the accompanying illustration. With a length of heavy gauge galvanized wire moulded into a spring catch, I experimented with one or two different types of movement until it became apparent that by leaving sufficient "slot" in the end of the catch the dollies of the switch would fall into position under its own spring, both for operating downwards and restoring upwards. The inset diagrams (a) and (b) show this point, and from these it will be noticed that the end of the catch "wipes" on the moulding flanges or shoulders of the switch cap, owing to the springy formation of the catch. The foot-bar was made from a length of oak strip, the retaining clip being shaped out of thick brass, and the underneath strip spring being of reasonably thick-tempered steel. The foot-bar is hinged to the floor boards, and is long enough to depress and restore whilst at work on the table, but to permit the toe of my shoe to engage under the bar it was necessary to form a slightly raised extension strip, and for this I used a piece of cadmium steel I had handy.—G. J. Lehart (Bury St. Edmunds).

A Valve-cap Repair

The following "hint" may be of use to those readers who have been unfortunate enough to displace the cap from an S.G. or similar valve when unscrewing the terminal.

It usually happens that the cap brings with it the major portion of the wire which protrudes from the top of the valve, making soldering impossible. I have satisfactorily mended two valves to which this accident occurred, and in the following manner: First clean from the top of the valve, and from the cap, the remains of the material which the manufacturer thought would cause the cap to adhere to the glass bulb. Hold the cap to the light and examine to see if there is a hole through the brass portion. If so, fill this hole with solder.

A Novel Extension Soldering Bit

The bit of my soldering iron having become very worn I constructed a new one, as shown in the sketch. This bit has the advantage of being easily replaceable, and is so flexible that the most inaccessible corner of the set can easily be reached. The sketch clearly shows the construction.—K. E. Watkins (West Dulwich).

A Push-button Tuning Unit

Here is a simple method of making up a push-button tuning unit. It consists of a framework, A (in my case it was of brass), with momentary action toggle switches mounted so that the projecting pins on the rods will engage with the slots in the "dollies" of the switches.

The momentary action type of switch should be used as no external restoring spring is then needed, the ratchet holding the switch in the "on" position. Thus, when a button is pressed it raises all the ratchets and thus allows any rod in the "on" position to spring back. Automatic wave-changing can be provided for by mounting two switches on one rod, and any number of buttons can be used.—D. Twyva (Market Rasen).
WHEN mention is made nowadays of plug-in coils, one naturally thinks of the popular four- and six-pin types used for short-wave work, and not of the two-pin variety so widely used in the early days of radio.

Although the majority of constructors who have any of the older types amongst their "spares" have no doubt confined them to the junk box, there are many who would like to put them into service, either for experimental or general utility purposes. A visit to the traders who deal in second-hand components or surplus material will reveal the fact that perfectly good plug-in coils of the basket and honeycomb varieties can be picked up for a few pence and, for a very slight additional outlay, holders of both fixed and variable pattern to suit. It must be remembered by those who would not be above scoffing at the thought of using such antiquated components that the coils were not discarded because of their low efficiency. Far from it. It was rather a matter of them being swept away by the introduction of "canned" coils and units when receiver design was passing through one of those rapid progressive changes. The development of multi-valve receivers, using one or more stages of H.F. amplification, necessitated effective screening between inductances and, likewise, coils of smaller bulk. The demand for self-contained switching, tuning controls, and dual-range coils all helped to oust the sturdy and reliable plug-in coils, with the result that they have been shelved and forgotten by all except those who remember the good work which could be done with them.

With modern valves there is no reason why efficient receivers of the detector and L.F. type, and even those employing one stage of H.F. amplification, should not be built on this type of coil to-day; therefore, for the benefit of those who have some on hand, and those who do not wish to lay out the cost of a modern coil, here are details of suitable circuits.

Smooth Picture Fading

WHEN watching a television transmission, when three or four cameras have to be brought into use in turn in order to allow the producer full scope for his ideas on programme presentation, it seldom occurs to viewers that the scheme of camera fading from one to another is a very important matter technically. In the control room the producer has two monitor receivers, and on one of them he is able to watch a replica of the picture which at that moment is on the air. He is able to issue instructions by telegraph to the camera-man to ensure that the picture fulfills every requirement of a correct focus, and relative positioning with reference to the artist or scene which is being enacted. On the second check receiver is reproduced a picture from the camera which passes next to bring into circuit, and during the fade-over period this picture is naturally transferred to No. 1 receiver which symbolises the "act" transmission. An item of extreme importance which occurs at the fade-over period is that the vision signals are interchanged between cameras or returned to an earlier picture modulation if desired, but during this time the synchronising signals must in no way be affected, otherwise the picture seen on every home receiver would go out of synchronism. Not only would this be annoying, but the continuity of the programme would be lost, and the continuous recurrence of frame and line slip would make many viewers switch off in disgust. The producer's control knob therefore carries out a complicated sequence of functions at a speed which depends entirely on the rate of the manual rotation, and the circuits involved are made to discriminate between the actual picture signals and the synchronising pulses. The amplitude of the former has to be adjusted without in any way affecting the latter, so that the new picture which is being faded in is correctly locked in step with the synchronising pulses. Occasionally, this does not happen, and sets with weak synchronising locks of their own, and more particularly mechanically-operated sets, exhibit a tendency to lose synchronism, although under favourable circumstances normal conditions will be restored automatically.

UTILISING TWO-PIN PLUG-IN COILS

The Original Type of Two-pin Plug-in Coils is not so how They can be Utilised in Simple Circuits which

primary winding, or by tapping the input down the tuned section. If, therefore, local condenser in a sharply-tuned circuit, it would be advisable to use the modifications indicated by Figs. 1 and 6. In the first it will be seen that two coils

with coils of the basket type and many of the honeycomb kind, it will be possible to scrape away a tiny portion of the insulation of one of the turns and solder a wire to it or make contact with the aid of a small crocodile clip. By doing this the same effect as tapping down an ordinary modern solenoid coil can be obtained. The tap should be tried at, say, a third or two-fifths of the coil from the top end (Fig. 6).

Reaction

The method of securing the necessary reaction can be by using a small condenser, or capacity and inductance. The latter is more widely used in modern designs as it

does offer certain advantages but, if the necessary condenser is not to hand, the former method can be used quite success-
IN PLUG-IN COILS

Inefficient As Many Think, and This Article Explains are Very Inexpensive to Build—By L. O. SPARKS

fully providing care is taken in the selection of the size of the reaction coil. The two arrangements are shown in Figs. 2 and 3. With the inductive reaction, control is obtained by varying the position of R to L2, this being done by mounting the reaction coil in a movable holder so that it can be swung to or from the other coil. It should be noted that H.T. is flowing through R, and that it is virtually in series with the anode of the detector and the H.T. supply.

It should not be a difficult matter to pick-up one of the original types of two-coil holders complete with operating spindle.

Capacity Controlled Reaction

Fig. 3 shows the capacity controlled system. In this, the reaction coil is fixed, and the amount of reaction controlled by the variable condenser C1, which is connected between the detector anode and the reaction coil, the other side of which is joined to earth. In this method no H.T. is flowing through the coil. The value of the C1 will depend on the size of reaction coil and its distance from the grounded or tuned coil. For medium waves, a thirty-five turn coil with a .0001 mfd. condenser will give satisfactory results. Fig. 3—An efficient two-valve, a pentode and tetrode can be used in the output by making slight wiring modifications.

H.F. valve and the detector grid, three coils are required, two being for the coupling and the third for the reaction. It should be noted that the coupling is the same as the aerial arrangement of the two valves; instead of the aerial being taken to the first coil, the anode of the S.G. valve is taken to one side, while the other is joined to H.T.; positive (120 volts), thus allowing the H.F. energy to be transferred to the detector grid. This form of coupling is known as an H.F. transformer and for the best results, as regards volume, selectivity, and stability, the size of the anode coil must be determined by experiment.

ON NOTES

Foreign Praise

All representatives of foreign countries, who have visited England for the purpose of investigating the television position have been loud in their praise of what has already been accomplished. That there is nothing comparable anywhere else in the world seems to be the keynote of the remarks, and what has already been achieved will undoubtedly form a basis for the service inauguration in other countries. In France, for example, the future plans are very ambitious, and not content with what has been achieved by the Eiffel Tower station in Paris, the authorities have declared that stations in Lyons and Lille will be completed shortly in order to give the widest possible section of the French public an opportunity of participating in this newest form of home entertainment. America is trying hard to face up to its own local difficulties, and there are still a large number of sceptics who expect delay in spite of the announcements which have been linked up with the opening of the World's Fair in New York in May. In that country they say that television, like radio, must be supported commercially, and this, of course, needs a very large number of viewers to make advertising via this medium really worthwhile. This would entail the erection of several stations, which is admitted to be a rather expensive business, while their interior television results there is little incentive for the people to stay at home and watch poor quality pictures having low programme value. Whether the united efforts of the huge American radio combines will change this condition is a debatable point at the moment, and the results of what is undertaken this year will no doubt have a considerable bearing on the future of progress of television in that great continent.
A Robot Critic

HITHERTO it has often proved difficult for a singer or instrumentalist to ascertain when an exact note was produced. Tuning pipes and other aids are often used, but there is often a slight difference in pitch which, when two or more voices or instruments are operating together may produce a discord or otherwise prove disconcerting. From America comes an invention in the form of a stroboscope, and which is claimed to be a hundred times more sensitive than the human ear. A microphone is employed and when sounds are picked up—either from an instrument or from a human voice, a "picture" is reproduced on a scale and thirteen little windows, lit by neon tubes, and black circles spin round. When dead in pitch the circle on the window does not move. The instrument is portable, and will, no doubt, find great favour in musical circles, where it may yet prove of value in re-designing certain instruments in order to ensure perfect accuracy of the note produced. The accompanying illustration shows the first model in England in operation.

Alfredo Campoli, radio violinist, Ruby Moul, B.B.C. singer, and Warde Morgan, first singing professor to use the "Robot Critic," seen with the apparatus in London.

ALL-Glass RADIO VALVES

REVOLUTIONARY new valves, called Lottak-Tubes, which eliminate the ordinary valve-bases, are being introduced by Philco for the first time in the new Transitone models, according to an announcement made by Sayre M. Ransdell, Philco vice-president, says our contemporary Radio To-day.

Nothing like these Lottak-Tubes has been used in radio sets before. Much smaller in size than the ordinary valve, some of them measuring only 2½ in height, they are without a base and are the first valves to be all valve.

The lower portion of the bulb is simply fitted with a metallic shell holding a small metal guide-pin which accomplishes the locking in action in the socket.

The Lottak-Tubes made it possible for the new Transitone models to be the first compact-type radios ever approved by the Underwriters Laboratories, Inc., as being safe from fire and shock. They consume only half the filament current of valves customarily used in small-size compacts, with a resulting tremendous reduction in the amount of heat generated by the set.

Due to the use of the Lottak-Tube, it was possible to design circuits for the new Transitone radios whereby all resistance was built into the set itself, thus enabling them to avoid the practice of using the socket cord wire for resistance.

Before the development of these valves fire underwriters have refused to approve as safe any compact-type radio because the valves used for their operation represented a fire menace due to the serious overheating of the radio.

Additional novel features of the Lottak-Tubes include prongs different from those used in the conventional type of valve, thus calling for a new type of socket. Troublesome cap connections are eliminated through the use of much shorter grid leads, made possible by the fact that they connect toward the head of the valve.

The small dimensions of these new valves which are being made available to the entire industry in America make possible the building of compact radios which offer the facilities and performance, as well as the safety, of radios many times their size.

A NEW METHOD OF TESTING WIRE ROPES

A NEW development of the Philips Industrial X-Ray Service is the Philips-Suchytsky method of testing wire ropes. The instrument operates on the magneto-inductive principle, alterations in the magnetic field caused by faults in the specimens being detected by a system of search coils which pick up and measure the electro-magnetic disturbances. The use of intensive fields and concentrated oscillating coils makes the apparatus extremely sensitive to fault disturbances even where they may exist inside the rope. In practice, the rope is passed through the electro-magnet and the current oscillates in an axial direction in the measuring coil, which encloses a section of the magnetic poles. The coil picks up induced currents as soon as the magnetic field is disturbed by the presence of a broken strand.

The coil is sub-divided into three parts and the induced currents are recorded by means of three extremely sensitive galvanometers. In this way, the instrument gives not only an indication of the breakage but also shows its approximate position. The apparatus also embodies a camera attachment, by which the existence and position of a fault can be recorded photographically on a sensitized paper strip.

The instrument is simple to operate and the provision of various pole pieces enables it to be used for ropes of widely varying diameters up to a maximum of 3½ ins.

FIRST GENERAL LISTENING BAROMETER

THE B.B.C. announces that a new Listener Research scheme has been set up, designed so that between two and three people can listen to each programme. The scheme is being used by the B.B.C. to find out how many people listen to each programme. Five or six different programmes are broadcast each week and the B.B.C. would like to know the size of the audience for each item. So its Listener Research Unit is tackling this question, which, in the normal way, the B.B.C. has no means of answering.

For the success of this General Listening Barometer, the B.B.C. is relying on the help of 4,000 listeners in every walk of life. They have already been picked at random from 30,000 listeners who have offered, from time to time, to help in Listener Research work, and it is a striking fact that over 90 per cent. of those invited to co-operate have agreed to take part in the inquiry.

These 4,000 listeners are receiving every week for four months a Listening Log Sheet, consisting of a printed list of the principal evening programmes of the week in the National, Regional, Midland, North and West of England programmes. A specimen is attached. Listeners are marking the log sheets so as to show which programmes they have heard and are then returning them to the B.B.C.

The new scheme is one further step in a campaign to get at the facts about listening. It is a development of the Variety Listening Barometer in which 2,000 listeners co-operated a year ago. That scheme was so successful that the new Barometer has been given much wider scope to cover all types of programme, from Band Wagon to Chamber Music, and from Boxing to the News.
www.amateurwireless.com/PRA_566.pdf
An 11-metre Log from Essex

Sir—I have pleasure in enclosing my log of stations in the 11-m. broadcast band during December 25th and 26th, which I hope will be of interest to other readers.

W9KA (Kansas City), 11.33 metres, relays KQWC.
W9XAZ (Milwaukee), 11.36 metres, relays KZFM.
W9XJ (New York), 11.4 metres, relays W9OH.
W9XJL (Superior), 11.49 metres, relays WEBC.
W9XTC (Minneapolis), 11.51 metres, relays WCTN.
W9XUP (St. Paul), 11.56 metres, relays KSST.
W9XUM (Cincinnati), 11.6 metres, relays W9AH.

All above stations were received between R7 to 9 between 2 p.m. and 6 p.m.

A special attraction of station W9KA, Kansas City, is the fact that it will read out over the air free of charge for any S.W. listener, any equipment they wish to exchange or swap with other listeners. The question of finance cannot be taken by this station.

The star station of the band is W9XUP (St. Paul), which is rated at 1,000 watts, and can be tuned in any afternoon at R8.

My receiver is a three-valve battery-operated set with S.G.H. stage, Det. and tetrode output using Hitac valves with ceramic bases, and covering from 4.5 to 15 metres, with plug-in coils coupled to an inverted "L" type antenna. Lastly, I would be pleased to correspond with any other readers interested in ultra-short waves.


Correspondents Wanted

Sir—I wish to thank PRACTICAL AND AMATEUR WIRELESS for the very interesting articles on transmission and reception which have been published during the last three years. Before that time I knew nothing about wireless, but by a stroke of luck I happened to read one of my friend's copies, and since then my knowledge of wireless has increased by leaps and bounds. I should like to correspond with someone in the Midlands who is interested in short-wave work.—FRANK E. LANE (0, St. James Rd., Handsworth, Birmingham, 21).

Sir—I have been a reader of your fine magazine for nearly three years. It has added much to my knowledge of radio, with its invaluable assistance. Also, I should be glad to hear from any reader in Great Britain who is interested in amateur transmission. Wishing PRACTICAL AND AMATEUR WIRELESS every success.

PETER MC. LEH (22 Fillerd Avenue, Birstall, Leicester).

S.W. Results in Ross-shire

Sir.—It is about a year since I last wrote you. I still take PRACTICAL AND AMATEUR WIRELESS every week, and every day then I do not get the papers is like being without the threepence and a lot more. I am especially interested in the transmitting section and "Leaves from a Short-wave Log." 

Last October I joined the B.S.W.L. I have now 13 SWL cards, and about ten SWLs cards at this moment. From W9XUP and JLVH, while the nicest is from SWP. I have heard every Continent now, except Australia. This locality seems to be a hot spot of short-wave reception of Australian transmissions, as even people around here with seven or eight-valve all-overs, only get them faintly, and others never receive them. Any day now I should have QSL's from HP5G, W2XGB, and YV1D.—WILLIAM FORSYTH (Avoch, Ross-shire).

PRACTICAL AND AMATEUR WIRELESS

January 14th, 1939

A Reader's Appreciation: Correspondent Wanted

Sir.—A few days ago I bought a copy of your publication, "Wireless Transmission for Amateurs," and think it is the best half-crown's worth I ever spent for a long time. I find your series, "The Amateur Transmitter" most helpful.

I should also like to get in touch with an amateur enthusiast in the Ross-shire district.—DENNIS ROBINSON (70, Penny Lane, Mosley Hill, Liverpool, 15.)

Car Radio

Sir.—Regarding the controversy over radios, a few tasters of interest. The armatures of most car dynamos, excepting those on the smallest cars, are wound with wire ranging from 19 S.W.G. to 18 S.W.G., that is, from 38 to 44 mils, diameter. Four thousand amperes per square inch is generally considered a very good average value, and not so much as would be comparable with one amper or so on an ordinary dynamo. It will be seen, therefore, that when 10 amperes charge is shown on the ammeter, such a machine is doing as much as is reasonably safe for it, and, in fact, most of them are not simply warm but fairly hot at this amperage.

To increase this current by five amperes, or anything approaching it, seems to me to be asking for trouble; it must be remembered that the total heat generated varies as the square of the current, so that the heating in a machine whose total armature resistance is raised from 0.05 to 0.10 amperes, will go up by well over 70 per cent.

With the ordinary car dynamo having third brush regulation, it is easy for anyone to advance the third brush until the machine is doing far more than its safe output, and having rewound a good many of these armatures, I would say that three out of every four which rewound by me have failed not through any defect, but through sheer overload, the cotton covering of the wires being burnt black, and falling off as it is unwound.

The special construction of these machines makes them self-regulating only when coupled to a battery, not even on a load, and if the battery circuit be broken, the voltage will rise, certainly to 25 on a 6-volt dynamo at ordinary speeds. It must be remembered that the field current will rise in proportion to the machine voltage, and a rise to three times normal voltage means three times normal field current in the fields; that is, the heat developed in them will be nine times normal, which would be disastrous, hence the practice of fitting field fuses.

A resistance of 1.5 ohms in the main circuit when running at 10 amperes causes a drop of 15 volts, reducing the field volts to be 15 above normal. The field winding would not stand this for any length of time, and the makers themselves— a resistance in the field circuit. But let it be noted that the makers have a definite resistance for variation between full output and part output, not between full output and no output.

A 1.05 ohm resistor in a main circuit carrying 10 amperes means a waste of energy, P.I.T., of 150 watts. A 10-init resistor would be useless.—A. O. GRIFTHE (Wreatham).
Items of Interest

Variety in The New Year

VARIETY series scheduled by John Watt for production during the quarter from January to March include two for which increasing popularity has brought promotion—"Anthony Hall's "Alpine Hot" and Dora Arnaud's "The Melody Is There" programmes. Up to now they have been broadcast only during the afternoon; during the next quarter they will be broadcast twice in home programmes the same week, once in the afternoon and once in the evening.

Here is other news about some of the B.B.C.'s best-liked series.


"Monday Night at Seven" will be extended in length from 50 minutes to one hour, and "Music Hall" will again become the vehicle for night variety production, "Sing Song," "The Legionnaires" and "Good News" will be "rested."

Louis Levy will launch a new edition in several sound films from the Japanese story, and arrangements have been made for the "gypsy-party broadcasts from the Hungarian Restauarturn to return to the programmes each fortnight.

Two "Kentucky Minstrels" shows will be on the air, one in January and the other in February; both are being made to return the radio adaptation of the big sound-film success, "Congress Dances" (provided that Conrad Veidt, the star, is again available) and to adapt two other sound films for broadcasting during February and March.

Operetta and Musical Comedy

A SPECIAL seventy-five-minute radio version of the complete opera "Die Fledermaus," is being written by V. C. Clinton Baddeley for production in March, and the German light musical play, "The Merry Widow" (Ron Yorke) to be produced in February. It had a great success in Berlin a year or two ago, but has never been broadcast in this country, Eric Maschwitz, former Director of the B.B.C. Variety Department, is making both the translation and the adaptation.

Merchant Shipping Wireless Tele-

The Board of Trade announce that the revised Statutory Wireless Telegraphy Rules were made on December 15th, 1938, and came into force as from January 1st, 1939. Amendments in pursuance of the Merchant Shipping (Wireless Telegraphy) Act, 1919, and the Merchant Shipping (Safety and Load Line Conven-

ions) Act, 1932, and replace the previous Rules dated November 1st, 1932.

The changes in the requirements under the new Rules, in telemetering cases, arise from the decision of the International Radiocommunication Conference which was held at Cairo early this year. The ever-increasing shipping traffic must be equipped with wireless telegraphy remain unaltered, that is, all sea-going passenger ships, irrespective of their tonnage, and all seagoing cargo ships of 1,000 tons tonnage and upwards. The classification of ships for the purpose of wireless watch-

keeping at sea for safety purposes is also unchanged.

B.B.C. Exhibition at Leicester

THE Director-General of the B.B.C., Mr. F. W. Ogilvie, paid his first official visit to the new headquarters at Leicester on February 2nd, when he spoke on the occasion of the opening of the B.B.C. Exhibition in Leicester by the Lord Mayor of that City (Alderman T. J. Cochrane, M.B.E., J.P.). While in Leicester Mr. Ogilvie visited one of the largest hosiery factories in the country, and also the works of a firm which makes lenses for television cameras.

The B.B.C. Exhibition will be at the Midland Art Gallery in the New Walk, Leicester, until January 14th. This is the first visit of the B.B.C. Exhibition to the provinces, apart from its appearance at the Empire Exhibition at Glasgow. By thirty-three photomontage panels (including one specially devoted to Midland broadcasting) the Exhibition illustrates the development of the B.B.C., and the manifold activities of the B.B.C.—in fact, takes people behind the scenes. There are a number of models, and the latest type of television equipment is shown. The Exhibition is open free to the public. Several Midland towns to be visited are Northampton (January 29th to 28th), Nottingham (February 2nd to 18th), Wolverhampton (February 24th to March 8th), and Birmingham (March 15th to 26th).

SSENSATIONAL BARGAINS

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Wavelengths 150,000 metres: Low-power direct drive, magnetic tuned, 220 volt capacity switch, full-wavelength secondary coils. Vacuum tubes 6.3 volt, 2 transistors. £3.3s. £2.10s. Smaller coils, 6.3 volt, 2 transistors. £1.10s. 6d.

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PRACTICAL AND AMATEUR WIRELESS 457

January 14th, 1939

PRACTICAL AND AMATEUR WIRELESS

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PRACTICAL AND AMATEUR WIRELESS 457

January 14th, 1939

PRACTICAL AND AMATEUR WIRELESS
Television Programmes

Sunday Afternoon Television Features

OUTDOOR feature programmes will be among the principal items in the regular Sunday afternoon television transmissions which begin in the New Year.

On January 15th, a mobile unit will visit Walthamstow, Essex, to show some of the more spectacular operations in locomotive maintenance. An entire engine will be partly dismantled and viewers will see how the boiler is cleaned, how bearings are tightened and how connecting rods are fitted. The process requires expert crane work. A high-speed job will be the replacement of a sixty-foot rail by a gang of twenty-four men who must complete the job in twenty minutes.

A visit to the International Telephone Exchange at Park Only House, which is the main control point for transatlantic cables, will be shown on February 9th. Telephones will pass slowly along the bays in which girls operators are in touch with all parts of the world. Long distance telephone conversations will be heard.

The "courtesy cops" will be seen at work on one of London's arterial highways on February 9th. A spot has been chosen where accidents occur frequently and it is expected that the majority of the road users who drive unknowingly into the picture will provide the officials with all the necessary examples of good and bad driving.

In February, visits will be paid to the Exhibition of Invention and Discovery at the Science Museum, and to the Exhibitions of the Royal Naval Air Service, the Armoured Car, and the Canadian Lumber Company. A display of the work of the Royal Air Force will be held on March 20th, and a demonstration of the work of the Royal Flying Corps will be shown on May 1st.

Western Cabaret

TELEVISION will go all "hill-billy" during January and February, when Harry Pringle repeats his Western Cabaret programme, comprised by Big Bill Campbell. The Alexandra Palace studio will be decked out as a camp clearing with log huts and a camp fire, around which the cowboys and girls will gather.

The Sensational Corduroys will be seen in a knife-throwing act, and Evelyn Bannister, whose band plays hill-billy music, will appear as a country singer. The visitors will also include "Black Shadow" of "The Ghosts of Dan McGraye"; Chief White Eagle, the tenor singer, in full Indian regalia; Steve; and Fred "Hank in "hill-billy" songs; and "Freddie "Trump" Wood and the Hill-Billy Band.

Western Cabaret was first televised on January 10th.

AN EXPERIMENTAL TWO-VALVER

(Continued from page 433)

construction there are two or three interesting modifications which can be incorporated. Firstly, the anode-by-pass condenser may be replaced by a pre-set type of condenser, by the aid of which the effects of this condenser on signal strength may easily be ascertained. Varying the capacity from zero to maximum will result in variations in reception control, and on some weak stations it may even be found that at some value the stations will be practically inaudible. The same remarks apply to a series-aerial condenser, which may be used to control the aerial terminal and the tuning coil. Again, a pre-set condenser may be included, and its effect on the wave-range of the coil and the selectivity will be easily noted. If a pentode output valve is used, a tone-control circuit may be made up and wired either across the loudspeaker terminal or between the anode of the output valve and earth.

If the tuning coil is replaced by one of the modern all-wave types the receiver may be used as a satisfactory all-wave receiver, but it is not recommended that short-wave coils alone be used, as the components for an efficient short-wave receiver have to be carefully selected, and that in that case a short-wave tuning condenser should be used rather than a 12K9 unit, component. All-valve coils, however, are designed for use with the higher-value condenser, and thus the receiver is suitable for that purpose. Separate H.T. leads have been fitted so that a suitable voltage for the detector valve may more easily be found, and if a separate valve is to be used in that stage the screen must be connected to a suitable tapping on the H.T. battery. This type of valve is available with four-pin base, and the original anode pin in Fig. 2 should then be connected to the new H.T. lead shown in that illustration joined to the anode terminal and connected to the top cap on the valve. A 4-pin H.F. pentode can be used in this case, but the electrode place of the S.G. valve. A variable-mu type of valve cannot be used in a straight detector stage unless the variable characteristic are neglected, and a straight type of valve is therefore called for.

Fig. 3.—How the panel is made up for transformer coupling.

Fig. 4.—A resistance-capacity assembly on the panel.
These transformers are mounted on a chassis by passing a bolt attached to each side of the can through holes in the chassis and cutting a large clearance hole for the connecting wires. In some cases inductance may arise or a large clearance hole for the connecting wires. This is a very fine set that will quickly lose its color and show a good deal of gold and silver for much as one may obtain of $34.10. Other chargers at bargain prices are below.


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Making Your Own Components—2


By FRANK PRESTON

The coil of which I gave full constructional details last week can be used in the majority of "straight" circuits, but is most suitable in sets having not more than one H.F. stage. The reason for this is not that the type or size of the coil is not of general application; but that it is an extremely difficult matter for the average constructor to match a set of coils with sufficient accuracy to permit of the satisfactory performance. If an inductance bridge or other

for the other coil. Obviously, this test must first be made with the wave-change switch in the medium-wave position, and turns must be removed only from the medium-wave winding. Afterwards, the test must be repeated for long waves. To ensure accurate matching on medium waves it will be found that close adjustments are required, and it is worth noting that a slight reduction in inductance (the self-capacity of the gap condenser) can be obtained by moving four broken line. It should also be noted that the reaction winding on the first—-aerial—coil is not used. This will not affect matching to a marked extent when using the grid coupling; any discrepancy can be balanced out by means of the trimmers on the gap condenser. Of course, if two separate gap condensers are

used any trouble in this direction will be obviated.

If it is considered desirable to screen the coils completely there are two effective methods. One is to obtain screening cans about 2½ins. in diameter by approximately 8ins. long. The coils would then be fixed to the base or lid with small angle brackets, or by fitting them over 4½ins. diameter wooden discs placed over the lids and held in place with central screws passing through the discs and the lids. Screening cans of this type are not readily obtainable nowadays, or it is customary to make coils a good deal smaller than described (this point was explained last week). But it might be possible to pick up screens from some old coils, or to make new screens from 20 gauge (approximately ½in. thick) copper sheet. Details are given in Fig. 2.

First a cylinder 6½ins. long and 2½ins. in diameter is made by curling a sheet of copper measuring 6½ins. by 8½ins. round a wooden cylinder. This can be held in place with the fingers and a wooden mallet so that the edges of the joint butt closely. The cylinder can be kept close by binding a length of wire round it after that a small amount of flux down the joint and run solder along the joint with a large soldering iron. A disc is made 10½ins. just into the top of the cylinder and is soldered in position. A lid is made in a similar manner, using a strip of metal about ¾ins. wide and 8½ins. long. Before soldering the joint make sure that this ring is a tight fit round the main can. Then fit an end disc.

The slots for the connecting wires can be made before bending, or after if a wooden rod is available which is a close fit in the can. Drill ¾ins. holes and cut down to

highly-developed test gear were available, matching could be carried out without great difficulty, but even then a fair amount of patience and not a little skill would be necessary.

Simple Matching of Coils

When only two coils are to be used, in a circuit similar to that in Fig. 1, for example, it is possible to match them sufficiently well to permit of the use of a standard two-gap condenser. The simplest method is to make up a single-valve set having a circuit similar to that shown last week. Then, with one coil in circuit, tune to a steady transmission. If the signal is so strong that tuning is comparatively flat, try another station or reduce voltage by substituting a short length of wire for the aerial. Note the exact condenser setting for the station and then remove the coil and connect a second coil in its place. Adjust the condenser setting so that the same station as before is accurately tuned.

It will almost certainly be found that the condenser reading is lower for one coil than for the other, indicating that that coil is of higher inductance. A few turns, or even a fraction of a turn, should then be removed from the grid winding until the "test signal" is received with the condenser at the same setting as that required or five of the end turns a fraction of an inch away from the main winding. On long waves it is not necessary to work as closely, and even a complete turn more or less will not have a marked effect.

Coil Screens

Provided that the coils are spaced fairly well, and if they are mounted with their axes at right angles and a vertical aluminium screen erected between them, complete screening will seldom be necessary.

With regard to the method of mounting, one coil should be fitted upright on top of the baseboard, or chassis and the other mounted end-on to the panel or on a disc of wood attached to an angle bracket screwed to the baseboard.

It will be seen from Fig. 1 that the type of circuit suggested is one with an H.F. pentode followed by a triode detector. Tuned-transformer coupling is used between the two valves, and the grid lead to the detector is taken from the grid tapping—terminal 8. With this arrangement really sharp tuning can be obtained, particularly if the reaction circuit is used skilfully.

As with the single-valve circuit shown last week, either a double or ordinary single aerial can be used; when using a single aerial terminals 2 and 6 of the first coil should be joined together as indicated by a

Fig. 1.—An H.F. detector circuit using a pair of the coils described. The reaction winding is not used in the case of the aerial coil.

Fig. 2.—Details of a screening can which can be made from sheet copper.

Fig. 3.—A suitable perforated or sheeted cardboard former for H.F. chokes.
them with a pair of shears. To protect the connecting wires it will be wise to pass them through lengths of styroflex sleeving or, better still, to solder lengths of rubber-covered flex to the leads close to the windings. These leads can be used to connect directly to the components or they can be soldered to tags on terminals mounted on a couple of copper strips. Alternatively, the whole coil and screen can be mounted on a metal baseplate, remembering to fit an earthing terminal to the screen.

Screening Boxes

The other method of screening is to place each coil with its corresponding valve holder and allied components inside a square copper screening box of the type that can be obtained from various accessory makers and from certain dealers in obsolete components. In that case, the gauze condenser would be placed alongside the screening boxes and connected to the coils with screened leads. If separate tuning condensers were employed, the screening boxes could be placed side by side and parallel to the front edge of the chassis whilst the condensers could also be mounted in the boxes with the spindles passing through them.

Making an H.F. Choke

An efficient H.F. choke can be made by following a similar form of construction for that employed for the coils. Fig. 3 shows how suitable formers can be made from lengths of tin, diameter paxolin or shellacked cardboard tube and six spacing washers. A total of about 1,500 turns of 36-gauge enamelled wire should then be wound, 300 turns in each slot. The wire is passed through small nozzles in the chassis from one section to another and is anchored at the ends by passing it through a pair of small holes.

This type of choke is very efficient for use in a detector circuit of a broadcast receiver. When making an anode choke for an H.F. pentode it is better to wind about 2,000 turns in all to provide a higher inductance. Lengths of rubber-covered flex should be soldered to the ends of the winding for connection, or soldering tags might be riveted to the end cores and the 36-gauge wire soldered to these; connecting leads would also be soldered to the tags.

An All-wave Choke

If an all-wave choke were required it could be made by following the same general form of construction, but by placing a single-layer winding in the first slot, about 30 turns in the second, 100 in the third, and filling the other two with the 36-gauge wire. The beginning end would be connected to the anode terminal of the valve, the other end being the H.T. + connection. The object of this method of construction is to reduce as far as possible the self-capacity of the "anode" end of the choke.

For that reason it is better to break up the 50-turn winding by means of a layer of insulating tape between the two layers of turns.

Other components, such as fixed condensers and resistors, will be dealt with in a later article, while readers are invited to forward requests for construction details of any components that would be of general interest. Remember, however, that there are limitations to the home construction of components for other than simple sets, for it is often impossible to ensure the necessary degree of accuracy in making parts for sensitive superhetys, and advanced multi-range receivers.

(To be continued.)

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Tuning Coils

When building a simple receiver the problem often arises as to the best type of aerial circuit to adopt. Selectivity is obviously the long-distance listener's main aim, and although there may be a loss of sensitivity when using a highly selective circuit, the fact that a station may be received without a background and generally of the first importance. The simple receiver will employ a single coil, and therefore the most satisfactory plan to obtain necessary degree of selectivity is to use a coil which is tapped well down for the aerial connection. If the same degree of selectivity is required on the long waves the long-wave section must also be tapped, and this means that a transfer aerial tapping will have to be employed. A typical circuit of such a coil is shown, and this is a Colvern F.10 coil which was at one time very popular. In most cases an existing coil may be modified to adopt this scheme merely by soldering a lead to a point on the two windings and taking them to a change-over switch mounted on the panel. To find the appropriate point on the coil the aerial lead should be connected to an ordinary sewing needle and the end wound with insulation tape. The point of the needle may then be pushed into the wire, where it will pierce the cotton or other covering and make good contact with the wire, without giving rise to a short-circuit. When the appropriate point has been found the wire may be scraped and the lead soldered in position. A point about 25 per cent. of the total winding from the earth end will generally be found most suitable to give adequate selectivity without loss of signal strength.

Band-pass tuning will provide selectivity, but generally the losses incurred result in weakened signals and in many cases this will be found unsuitable for a simple type of receiver. Two identical coils are required and this means two tuning condensers or a ganged component. A condenser is used for coupling in one form as shown in the next column, but it is impossible to use a condenser on the "arms" of the two coils to give better sensitivity, whilst a combination of both top and bottom coupling will often give the desired results.

Push-pull Bias

When using indirectly-heated output valves in a push-pull stage, bias may be obtained automatically through a cathode resistance, but as the two valves are more or less identical a single resistance may be employed. For this purpose both cathodes should be joined together and the bias resistance with by-pass condenser then joined between the cathodes and earth (or the junction of the two grid leaks when R.C. coupling is employed). Remember that when calculating the value of resistor required, there is double the anode current flowing and the rating of the resistor will accordingly need to be modified.

Coil Windings

A MEMBER recently wrote and asked how he could wind a winding range coil to obtain good results on the long-wave section. His main point was that he had tried to make a neat pile winding which was found on a modern coil and failed. One scheme was illustrated in our issue last week in the article on making your own components, and there is another such illustration below which may be used. For this a ribbed ebonite former is used, and the medium-wave winding is wound on the rib inside the former. For the long-wave section it is desirable to split up the winding into sections, and by slotting the ribs the various windings may be placed in position as shown in this illustration. The reception tuning being placed between the medium and long-wave sections. This type of winding is very efficient and the air-spaced medium-wave winding will give much better sensitivity and selectivity than the winding which is placed flat on a former. A coil of this type may, of course, be tapped as above mentioned, a separate primary winding may be placed inside the coil former on a smaller diameter tube.

How a sectioned winding may be wound, using a ribbed ebonite former.
Motor Interference

I have an A.C. mains set and the switch is on the mains as an electric motor. This is the cause of crackling noises when kept running. Can you suggest a remedy for this, keeping the motor running? — J. W. (Hull)

If the motor is of the standard type, it is quite possible that the noises arise from the brush and frame. In this case a fixed condenser joined between each brush and the frame (earth) would probably cure the trouble. On the other hand there may be a need for some more elaborate suppressing device, and if you find that the condensers do not prevent the noise, we suggest that you get into touch with the Rollin Lee people who specialise in interference suppressors, and give them details of the motor when they will, of course, suggest a suitable suppressor. The condensers should be of 2 or 4 mfd. capacity and designed for working at the voltage which exists across the brush circuit. You might also try a mains input filter consisting of condensers between each side of the mains and earth, the values of these condensers being found by trial and error methods.

Home Recording

We have been asked if it is possible to take records of broadcasts, and I should try to like this. What apparatus do I need and how must it be fed? — H. K. E. (Perth)

A Radio OFF-TANG pick-up joined to an output filter circuit in a standard receiver may be used to cut either aluminium or other type of record disc. Other forms may be used to advantage and may be amplified by any ordinary pick-up and amplifier circuit. Some standard pick-ups may be used for recording purposes, but although ordinary needles may be used for the cutting, special needles should be used for the best results. A tracking device will have to be obtained to obtain a steady trace on the record blank. We refer you to the article on the subject in our issue dated March 20th, 1937.

Untuned Aerial Circuit

"I am thinking of adding an H.F. stage to my short-wave four, but am uncertain regarding the circuit to adopt. I propose to use a variable-mu valve, but would like to avoid a further tuned circuit, and I believe that a choke or resistance may be employed. If this is so can you recommend suitable components and values?" — W. E. (Belfast)

An untuned circuit is quite standard, and although either a choke or resistance may be used we think you will find it preferable to use a carbon type variable resistance. This will enable you to adjust the value to the best position according to the waveband in use and a maximum value of 100,000 ohms for the component may be recommended. If you do adopt an H.F. choke, a good short-wave component should be employed and although a screened choke would avoid troubles from interaction, you may be able to place it in such a position that it cannot interact with other inductive components in the receiver.

L.F. Instability

"Reproduction on my set is spoiled by a high-pitched whistle, and I find that this is not audible at all stations except between stations. Is it possible to say what causes this, and how I can prevent it? It is loudest on London Regional." — J. L. (Uxbridge)

It is possible that your case is L.F. instability, and there are several methods of avoiding it. If you are using two L.F. transformers a reversal of the connections to the secondary of one of them should stop the whistle. Other cures are to include a high resistance in the grid lead to the output valve and to use a higher value resistance in the anode lead to that valve. 100 ohms should prove suitable in the latter case and a value of 50,000 to 100,000 ohms in the former.

Coil Connections

"I am constructing an all-wave receiver using a 24-gauge wire consisting of 24 turns of 18 gauge wire on a 14-in. former. If this coil is connected in series with the broadcast coil and left in circuit when receiving on the broadcast bands will it make any appreciable difference to the wave-lengths covered by the broadcast coil?" — E. W. (S.W.20)

The amount of wire included in the 24-gauge coil would make very little difference to the broadcast coil, especially in the long waves. On the medium waves the tuning points on the dial will be lowered slightly and the range covered by that coil will be shifted slightly upwards. In practice very little difference should be noted, but it would be preferable to use a change-over switch so that each coil could be used alone.

Screening a Coil

"It is said that if a coil is screened too closely its efficiency is affected. Does this mean that the strength covered is altered, or that the electrical efficiency is reduced? Does this apply to short-wave coils more than to broadcast coils?" — W. B. (Northend)

There is a magnetic field surrounding a coil, and if a screen (earthed) is placed close to the coil it will cut this field and consequently modify the inductance of the coil. In this way the strength covered may be reduced owing to the inductance modification and the wave-length covered will be altered. A short-wave coil is generally wound more efficiently than a regular broadcast coil and accordingly has a larger field. Therefore, the effect of screening as mentioned you would be more noticeable on a short-wave coil.

Using Headphones

"I have an aged member of the family who is very deaf. We have a commercial set, A.C. 6. For him to be able to listen it has to be on so loud that no one else can stand it for long. There are extension speaker sockets. Could any differences be used with these? I have tried it with an old pair of 2,000 ohm 'phones, but it's just a whisper when volume is on full. Can you help me?" — J. H. J. (Northfield)

It should be quite possible to fit headphones to extension speaker sockets, but these are probably designed for a low resistance speaker and to replace them headphones will have to be used. You can make use of your present 'phones by connecting a step-down transformer between them and the sockets. With this arrangement you will be able first to communicate with the makers of the receiver and ascertain whether or not this can be done. It is highly probable that in some cases with A.C. apparatus a shock may be experienced if precautions are not taken when connecting the 'phones.

RULES

We wish to draw the reader's attention to the fact that the space below is reserved 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 or complete multi-viewed drawings.
(2) Suggest alterations or modifications of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Address the editor of the telephone.
(5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender. Requests for blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newes, Ltd., Tower House, Rotherhithe Street, W.E. The coupon must be enclosed with every query.

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

A. H. (Holborn). The push-button 4 may be used for record reproduction, but we have not published a design of a complete unit. — J. C. (Barnsley). The receiver was published in a previous issue. We regret that we have no details of the circuit. — J. T. (Edinburgh). Without a type number we cannot give connections, as several different types have been produced by the firm in question. There is no standardisation of terminal and pin numbers.

B. F. (Long Eaton). Without a circuit diagram we hesitate to give connections as in some cases special precautions have to be taken. You give no details as to number of valves, etc.

F. M. (Dartington). The circuit is quite in order and the only improvement we can suggest is the use of a pre-set condenser for the anode by-pass component.

S. G. B. (Marden). Although you can use the 4-pin coils, the absence of a primary winding will reduce efficiency and perhaps induce difficulty in reaction control, etc. In the circumstances, we suggest that you adhere to the 6-pin coils.

H. J. M. (Edgware). We regret that we have no details of the coils, which were specially designed by the manufacturer, and upon which no longer难过. It is well advised that you should not supply a blueprint or circuit in which they may be needed.

S. O. (Blackheath). Although you could use the valves mentioned we recommend the use of the SEFD for the L.F. stage. We note your remarks concerning the switch, and the correct type number is S.139 (S.E.)

THE XYL.

The circuit should be used, but the markings referred to are merely the field resistance wire, which will not connect with the L.F. stage unless disconnected. The speaker is simply joined to the L.F. terminals.

D. A. L. (Leicester). We regret that we have no blueprint or circuit details which would enable you to use the parts mentioned in your letter. We can only guarantee our receivers when parts which we specify are employed.

The coupon on page 330 of cover must be attached to every query.
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- **SUPERNETS**: blueprint, 1s. each.
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- **MISCELLANEOUS**: blueprint, 1s. each.

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- **SUPERNET**: 3s. 6d. each.
- **PORTABLE**: 5s. each.
- **MISCELLANEOUS**: 10s. each.

**Mains Operated**

- **Two-valve**: blueprint, 3s. each.
- **Three-valve**: blueprint, 8s. each.
- **Four-valve**: blueprint, 12s. each.
- **Semi-electric**: blueprint, 16s. each.

**Super-Valve (S.V.)**

- **Two-valve**: blueprint, 3s. each.
- **Three-valve**: blueprint, 5s. each.
- **Four-valve**: blueprint, 8s. each.
- **Semi-electric**: blueprint, 12s. each.

**Portable Set**: blueprint, 7s. each.

**Miscellaneous**

- **Amateur Wireless and Wireless Magazines CRYSTAL SETS**
- **Blueprints**: 6s. each.

**SHORT-WAVE SETS**

- **One-valve**: blueprint, 1s. each.
- **Two-valve**: blueprint, 2s. each.
- **Three-valve**: blueprint, 3s. each.
- **Four-valve**: blueprint, 4s. each.
- **Semi-electric**: blueprint, 6s. each.

**SPECIALS**

- **SUPERNETS**: blueprint, 2s. each.
- **PORTABLES**: blueprint, 5s. each.
- **MISCELLANEOUS**: blueprint, 10s. each.

**MAIN SETS**

- **BATTERY SET**: blueprint, 3s. each.
- **SUPERNET**: 5s. each.
- **PORTABLE**: 8s. each.
- **MISCELLANEOUS**: 12s. each.

**SHORT-WAVE SETS**

- **One-valve**: blueprint, 1s. each.
- **Two-valve**: blueprint, 2s. each.
- **Three-valve**: blueprint, 3s. each.
- **Four-valve**: blueprint, 4s. each.
- **Semi-electric**: blueprint, 6s. each.

**SUPERNETS**

- **BATTERY SET**: blueprint, 2s. each.
- **SUPERNET**: 3s. 6d. each.
- **PORTABLE**: 5s. each.
- **MISCELLANEOUS**: 10s. each.

**MAIN SETS**

- **BATTERY SET**: blueprint, 3s. each.
- **SUPERNET**: 5s. each.
- **PORTABLE**: 8s. each.
- **MISCELLANEOUS**: 12s. each.

**SHORT-WAVE SETS**

- **One-valve**: blueprint, 1s. each.
- **Two-valve**: blueprint, 2s. each.
- **Three-valve**: blueprint, 3s. each.
- **Four-valve**: blueprint, 4s. each.
- **Semi-electric**: blueprint, 6s. each.

**SUPERNETS**

- **BATTERY SET**: blueprint, 2s. each.
- **SUPERNET**: 3s. 6d. each.
- **PORTABLE**: 5s. each.
- **MISCELLANEOUS**: 10s. each.

**MAIN SETS**

- **BATTERY SET**: blueprint, 3s. each.
- **SUPERNET**: 5s. each.
- **PORTABLE**: 8s. each.
- **MISCELLANEOUS**: 12s. each.

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- **Two-valve**: blueprint, 2s. each.
- **Three-valve**: blueprint, 3s. each.
- **Four-valve**: blueprint, 4s. each.
- **Semi-electric**: blueprint, 6s. each.

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- **Three-valve**: blueprint, 3s. each.
- **Four-valve**: blueprint, 4s. each.
- **Semi-electric**: blueprint, 6s. each.
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