Practical and Amateur Wireless, December 21st, 1935.

MODERN COIL CONNECTIONS! New Series

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

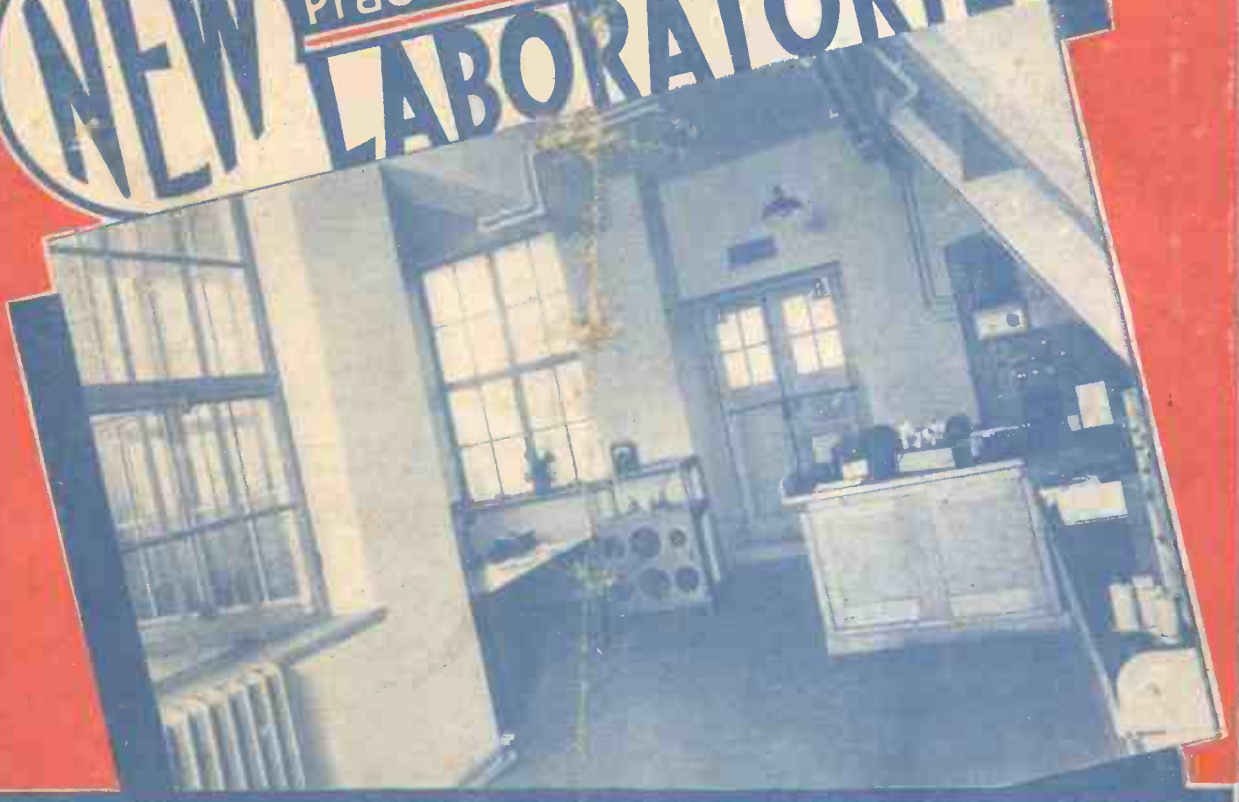
3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES *Publication*

Vol. 7. No. 170.
December 21st, 1935.

The "Practical and Amateur Wireless" NEW LABORATORIES



NEXT WEEK! The Universal £4 Superhet Four!

Practical and Amateur Wireless

Edited by
F. J. CAMM.

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

Vol. VII. No. 170. December 21st, 1935.

Round the World of Wireless

Poste Bizertin

TO replace the small military station at Tunis-Kasbah, which for some years had been supplying broadcast programmes, a new 100-watt transmitter has been opened at Bizerta, the seaport on the Mediterranean, situated at sixty miles north-north-west of Tunis. It works daily from G.M.T. 12.30-15.30, and again from 21.30-23.30, on 209 metres (1,436 kc/s).

Mr. F. J. Camm's Superformer

WILL readers please note that full sized Blue Prints of the Superformer, which was described in our issue dated 12th October, are now available at 1s. each from The Publisher, George Newnes, Ltd., 8-11, Southampton St., Strand, W.C.2.

A.C. £4 Superhet 4 Price Correction

MESSRS. PETO SCOTT, LTD., point out that, owing to an error, the price for the Kit "A" of the A.C. £4 Superhet 4 was wrongly quoted in the issue dated December 7th, 1935. The correct price of their Kit "A" is £10 2s. 6d. as given in the issue dated December 14th, 1935.

Listen to Cairo

IN the intervals of the Brussels (1) programme, it is now possible to hear broadcasts from Cairo (Egypt) which shares the same channel. The station is on the air daily until about G.M.T. 22.30, but on Fridays usually closes down an hour earlier. Announcements are made in English, French, and Arabic. At the end of the programme the Egyptian Anthem is played. The ticking of a metronome is used as an interval signal.

A Rose Under Any Other Name

IN Sweden, the studio announcer, in view of his call, has been styled by listeners the *Hallomann*, and the word has been generally adopted. Norwegians, however, liken him to the old-time Herald, and he is now known throughout the land in Norse, as the *Herold*. The French call him: *le Spik-air* (speaker); to the Germans he is: *der Ansager*. In most countries he remains anonymous; in the United States alone, at the end of the broadcast, you are informed that "your announcer is Atmos Ferricks," or whatever his name may be.

Proposed New 100-kilowatt Swedish Station

IN order to provide an adequate broadcasting service for the extreme southern districts of Sweden, the authorities have decided to erect a 100-kilowatt transmitter in the neighbourhood of Horby. Such an installation would permit them to close down the existing relays in operation at Horby, Malmo, Karlskrona, Halsingborg, Kalmar and Halmstad.

An Up-to-date Penitentiary

WHILST some prisons in Belgium, Switzerland, and the United States have provided headphones in cells to permit their occupants to listen to certain radio programmes, the warden of the Illinois State Penitentiary at Joliet (U.S.A.) has decided to organise a weekly broadcast by the convicts. Programmes will consist of instrumental and vocal items contributed by those who can perform on any kind of instrument, and every effort is to be made to form a jazz dance band!

On Other Pages:—

North Scottish High-power Station

THE 50-kilowatt station which the B.B.C. has installed at Burghead, near Elgin, to provide a Regional programme service to the more populous areas of North Britain, is now carrying out tests to find a suitable wavelength. It is hoped to bring the transmitter into operation next April.

Increased Power Upsets Lucerne Plan

SINCE Radio Strasbourg put up its power to 120 kilowatts, both local and distant listeners have complained of interference with its broadcasts. The channel on which the transmitter works is also shared by RW73, the 10-kilowatt Simferopol (U.S.S.R.) station. At the time the Plan was drawn up Strasbourg was working on 12 kilowatts.

Additions to German Network

THE new Reichenbach (Silesia) relay, situated at some thirty miles south-west of Breslau, to work on the Gleiwitz wavelength, will be opened early in 1936. It is also expected that the Stolp (Pomerania) station which is situated roughly sixty-eight miles north-north-west of Danzig, and destined to take the Koenigsberg programmes, will be ready at the same time. The Saarbruecken station recently inaugurated, is shortly to be given a 1.5-kilowatt transmitter; as it will work on 240.2 metres there is likely to be further interference with Nice - Juan - les - Pins (France). Dresden, for which a 5-kilowatt transmitter is now proposed, in 1936, will see its wavelength reduced to 204.8 metres (1,465 kc/s).

Proposed New Bergen Station

THE 20-kilowatt transmitter which the Norwegian Broadcasting Corporation has decided to instal on the Island of Askö, to the north-west of Bergen, is to be put in hand at once. The station will share the present Aalesund channel, namely, 1,186 metres (253 kc/s).

New German Interval Signals

BOTH Cologne and Leipzig have abandoned the musical phrases they have been using for many months. The former, as an interval signal, has adopted three notes, and the latter three chords in D major. Both are played on an electrical musical box.

B.B.C. Early Morning Tests

SHOULD you hear gramophone records broadcast between G.M.T. 06.00-08.00 on Friday mornings, do not jump to the conclusion that you have picked up a distant transmission. From December 3rd until January 17th, inclusive, tests will be carried out by the B.B.C. stations, for technical purposes.

Radio for West Africa

PENDING the installation of a local broadcasting station, and following the example given by the Gold Coast and Sierra Leone, Lagos (Nigeria) has opened a wireless relay service for the benefit of the British population. Programmes from the Daventry Empire transmitters are picked up and re-broadcast through the re-distribution system.

ROUND the WORLD of WIRELESS (Contd.)

The King's Christmas Message

THE B.B.C. announces that on Christmas Day at 3 o'clock, under present arrangements, His Majesty the King will broadcast a message to the Empire from Sandringham for the fourth year in succession.

Christmas Fare

CHRISTMAS listening begins on December 23rd with a special music programme produced by Stanford Robinson, the popular B.B.C. Theatre Orchestra conductor. The programme will be called "Tunes of the Year," and will be in the nature of a musical anthology of the most popular melodies of 1935. Supporting the B.B.C. Theatre Orchestra will be Henry Hall and the B.B.C. Dance Orchestra. The two will play alternately, thus covering the whole range of light music including the "hot" variety. A cast of distinguished soloists will help to make this programme one of the brightest musical memories of the year.

That inimitable character actor, Bransby Williams, will be presented by Ernest Longstaffe on December 24th, in a short feature programme entitled "A Christmas Eve Fancy."

Light entertainment on Christmas Eve is provided by the gentler sex. A second "All Girls Together" Max Kester programme is promised, and that clever radio artist, Alma Vane, will again give a party for her talented girl-friends. Alma Vane regrets that many of her former guests will not be able to be with her on this occasion, as with the exception of Marion Dawson they will in most cases be appearing in pantomime. So far Phyllis Robins, Doris Palmer, and Dorothy Monkman—Phyllis Monkman's charming sister—have accepted Alma's invitation.

Anna Pavlova Programme

PAVLOVA, London's Queen of Ballet, one of Russia's most brilliant ballerinas who endeared herself to England, is to have a commemorative hour on British radio on December 20th. Walford Hyden, who was Pavlova's Ballet conductor, and who toured the world with her brilliant corps, has chosen for his hour Pavlova's favourite ballet music and written an introduction of incidents in her life connected with these works. Cleo Nordi, Walford Hyden's wife, herself a Russian and a member of Anna Pavlova's troupe, will speak these memory sketches at the microphone before each work.

INTERESTING and TOPICAL PARAGRAPHS

"LISTEN(ING) TO THE BAND"

Jack Hylton and his boys listening to one of their Christmas records on a "His Master's Voice" fluid-light auto-radiogram.

"Dance Music Then and Now"

BEGINNING at 7.30 p.m. on Christmas day the Ritz players will give three-quarters of an hour of "Dance Music Then and Now." This combination has its headquarters at Leicester. Its first broadcast was in 1931. For several years it has held a summer engagement at the Pavilion, Jersey.

A Tredinnick Programme

FOR several years pantomimes arranged by Robert Tredinnick have been a feature of the Midland Children's Hour in Christmas week. Fortunately the extra pressure of his film, variety stage, and gramophone recital engagements have not interfered with his radio activities. This year's pantomime is "Dick Whittington."

Microphone Review

THE most successful variety acts in the series of programmes "Microphone Bows" will be broadcast on Monday, December 23rd. "Microphone Bows" is the title used for programmes given by artists appearing for the first time, and during 1935 there have been three editions: the first from Bristol, the second from Exeter, and the third from different parts of the West Country.

For Lovers of Good Music

THE Scottish Orchestra, led by David McCallum and conducted by John Barbirolli, will include in the broadcast part of their programme the Serenade from "Hassan," and the "Fantastic Dance," both by Delius (the latter to be performed for the first time in Glasgow), the waltz "Tales from the Vienna Woods," by Strauss, and the Overture to the "Mastersingers," by Wagner. May Blyth will sing "Morgen," by Strauss, and "Floods of Spring," by Rachmaninov.

A Christmas Eve Programme

ON December 24th, Percy Edgar, Midland Regional Director, presents an intimate programme entitled "I Remember . . .," especially designed for fireside listening and recalling many old favourites. He will have the assistance of the B.B.C. Midland Orchestra and Singers and a solo artist. The programme will be his personal choice. Mr. Edgar has been the director at Birmingham since broadcasting began, and is a notable microphone personality; for many of his own broadcasts he used the name of Edgar Lane.

Concert from Cheltenham

FROM the Town Hall, Cheltenham, a concert by Gloucestershire artists is being relayed. All of them have broadcast before. Constance Astington, the soprano soloist, sang several times from Italian stations five or six years ago; Chick Fowler, the Forest of Dean entertainer, gives one of his original sketches introducing "Gloucestershire George"; Philip Taylor plays two organ solos on the concert organ given to Cheltenham by Mr. and Mrs. E. J. Burrow, to mark the jubilee of the Town's incorporation. Then there are half a dozen part-songs by the Gloucester Orpheus Society, conducted by Samuel Underwood.

SOLVE THIS!

PROBLEM No. 170

Jones was not satisfied with the volume obtainable from his three-valve set, and also complained that current consumption was too high. He was advised to replace his super-power output valve by an economy type pentode. He obtained a suitably-matched speaker, and wired the new valve correctly, but was surprised to find that the substitution provided a reduction of volume, and distortion was experienced. What was the trouble? Three books will be awarded for the first three correct solutions opened. Address your envelopes to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 170 in the bottom left-hand corner, and must be posted to reach this office not later than the first post on Monday, December 23rd, 1935.

Solution to Problem No. 169.

The first tuned circuit was not accurately trimmed; the disconnection of the earth lead removed the aerial-earth capacity and brought the aerial circuit into tune with the other tuned circuits of the set.

The following three readers successfully solved Problem No. 168 and books are accordingly being forwarded to them: J. Dawney, 39, Courtenay Gdns., Upminster, Essex; J. Olvanhill, 62 Berry Scaur Terr., Workington, Cumberland; R. Sticklen, 105, Partridge Rd., Llwynypia, Glam.

The New Constructor's GUIDE to SET BUILDING

In the Two Preceding Articles the Construction of Sets Built to Published Designs was Considered. Details are now given for Building a "Progressive" or "Add-on" Set

By FRANK PRESTON

NOW that the matter of receiver construction has been dealt with from the point of view of the reader who prefers to follow a complete published design, we can consider the question as applied to those readers whose aim is not merely to have a broadcast receiving set, but who are interested more particularly in the constructional work involved, and who would, therefore, prefer to make a number of different sets, try different circuits, and gain valuable experience.

The scheme which is to be followed was clearly outlined a fortnight ago, so there is no need to explain it again, but merely to point out that a start will be made by building a particularly simple set, and later the parts will be used again with regular additions to make more advanced designs.

A Crystal Receiver

The very best starting point, for many reasons, is a crystal-type receiver, but rather than use a crystal detector of the old-fashioned type we shall make use of a high frequency metal-oxide rectifier, which is better known as a "Westector." A basic circuit diagram is given in Fig. 1, from which it will be seen that the tuning coil is of a simple type having separate aerial and tuning windings. The lower ends of the two windings are joined together and to earth, whilst the aerial is connected to one end of the untuned winding. A .0005-mfd. variable condenser is joined between the two ends of the tuning winding, and a wave-change switch of the three-point type is used to short-circuit the lower (long-wave) portions of the two windings when medium-wave reception is required. From the top of the tuned winding, marked D, a lead is taken to the positive (red) terminal of a type W.X.6 "Westector," a lead being then taken from the negative terminal of the rectifier to one 'phone terminal, the second 'phone terminal being "returned" to earth. A .0001-mfd. fixed condenser is finally connected between the 'phone terminals to act as a high-frequency by-pass.

The Choice of Coil

The practical details of construction depend to a large extent upon the make of coil employed, and there are many which are equally suitable. To simplify the identification of the terminals on different makes of coil the terminals are marked from A to E in Fig. 1, and the same letters are shown opposite the corresponding terminals of the Varley Duo-Nicore type B.P.80 coil in Fig. 3, the Wearite "Uni-gen" in Fig. 4, and the Colvern T.D. in Fig. 2. All of these coils are equally suitable for the initial circuits, but if it is proposed to complete the final superhet the first mentioned is to be preferred, since an oscillator coil is available for use with it, and both can be operated by means of a three-gang condenser to give an intermediate frequency of 465 kc/s in an extremely simple manner.

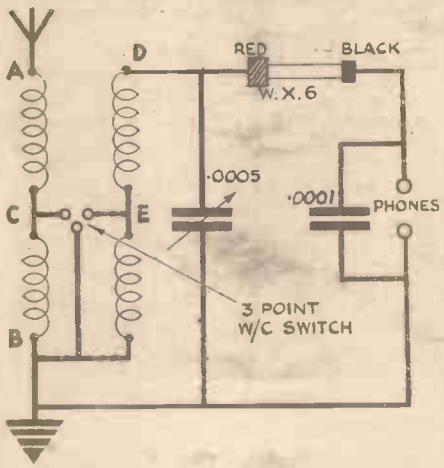


Fig. 1.—The fundamental circuit of a crystal-type receiver employing a Westector.

It should be pointed out that the Colvern coil is provided with three alternative aerial tappings for varying the degree of selectivity.

Tuning Condenser

For the sake of simplicity, a single .0005-mfd. tuning condenser is shown in Fig. 1, but those who propose to build the final superhet are recommended—if a condenser is to be bought—to obtain a three-gang superhet-type component in the first place; a suitable condenser is the Polar "Midget" (for 465 kc/s I.F.), and only the first section will be used at present.

For the circuit of Fig. 1 a small metallised baseboard is used, and this can be bought, or it can be made as described in the first article in this series. When using a single condenser (any good type and make is suitable) a component-mounting bracket will be found desirable, and the earth-return connection is made automatically through this, as in the case of the gang condenser, except in a very few instances, where the condenser mounting bush is insulated from the moving vanes; in such cases a lead must be taken from the moving vanes terminal to the baseboard.

A simple receiver of the type shown in Fig. 1 is not intended to provide other than 'phone reception of the local station, and the "Westector" is not particularly

(Continued overleaf)

—COIL CONNECTIONS—

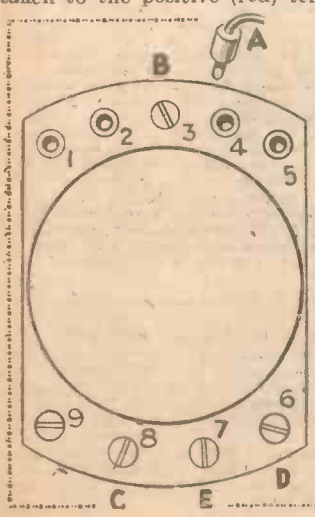
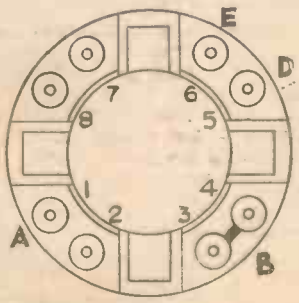


Fig. 2.

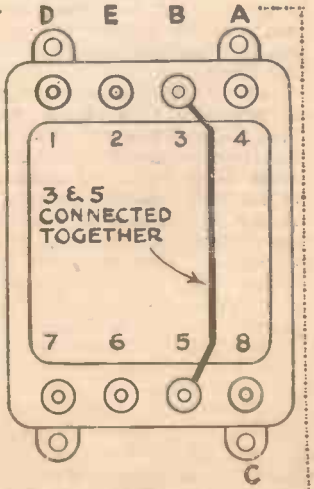
Figs. 2, 3, & 4. These three illustrations show the connections to the Colvern T.D., the Varley Duo-Nicore, and the Wearite Uni-gen coils. In the Varley coil there is no C connection and therefore only 2 terminals of the 3-pt. wavechange switch are used.



3 & 4 JOINED TOGETHER

Fig. 3.

Fig. 4.



(Continued from previous page)

sensitive, although completely stable and reliable. As a matter of fact, the makers do not recommend its use alone, but suggest that it be preceded by at least one stage of H.F. amplification. Nevertheless, it has proved satisfactory when used as indicated, provided that a reasonably good aerial is employed, and that it is within twenty miles or so of the local transmitter. However, the rectifier will be used under far more favourable conditions in the later circuits, where it will acquit itself completely.

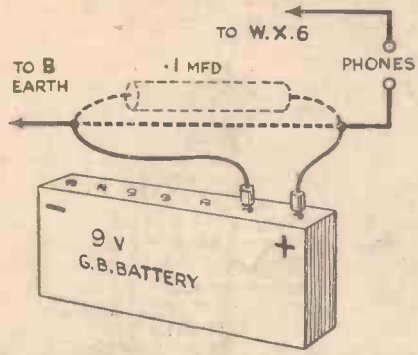


Fig. 5.—This semi-pictorial diagram shows the simple method of adding bias to the circuit shown in Fig. 1. The dotted line indicates the original connection which is removed.

Biasing the "Westector"

But even as a simple detector it can be made to perform quite well by making a slight modification to the circuit shown in Fig. 1. All that is required is to apply a slight bias to it in the same manner as the once-popular carborundum detector was biased. To make provision for this it is necessary only to break the lead from the 'phone terminal to earth and to insert a small dry cell, or a grid-bias battery, as shown in Fig. 5. It is also desirable, though not essential, to by-pass the battery with a .1 mfd. tubular condenser as indicated by broken lines. The condenser and battery are both cheap, and are thus well worth while, besides which they will be used again in later circuits.

In most cases it will be found that a bias voltage of 1½ provides best results, but the effect of varying the voltage in steps up to 4½ volts can be tried. A still better method is to apply the bias through a potentiometer wired as shown in Fig. 6, so that a very smooth variation in voltage from zero to maximum can be obtained. A 50,000-ohm potentiometer should be used since this will be required later, and it should be of a type fitted with an on-off switch so that the resistance element can be cut out of circuit when the set is not in use; this avoids the possibility of leakage of current from the battery when the set is not in use. Incidentally, it might be added that, when the potentiometer is not employed, one of the wander plugs should be removed from the battery when listening ceases.

The potentiometer can be mounted on a small component bracket on the right of the tuning condenser, where it will be symmetrical with the wave-change switch.

Operating Notes

It is not necessary to give detailed information concerning the use of the set, since operation is perfectly straightforward, and it is necessary only to set the wave-change switch to the wavelength required, and to rotate the condenser knob until the local transmitter is heard. When bias is employed, the battery should be set to give 3 volts and the potentiometer adjusted to its midway position. After a station is received the potentiometer should be adjusted for maximum signal strength.

In a few instances, where the receiver is used only a few miles from the transmitters it might be found that there is a slight "overlap," although this is extremely unlikely with any of the coils mentioned, since they are all very selective. If slight trouble is experienced, however, a .0005-mfd. (maximum) pre-set condenser should be included between the aerial lead-in and the aerial terminal on the set; by varying the capacity of this there will be little trouble in eliminating the unwanted programme. Should it be found that the condenser reduces signal strength to a rather pronounced degree, the lead from the condenser can be transferred from terminal A to terminal D.

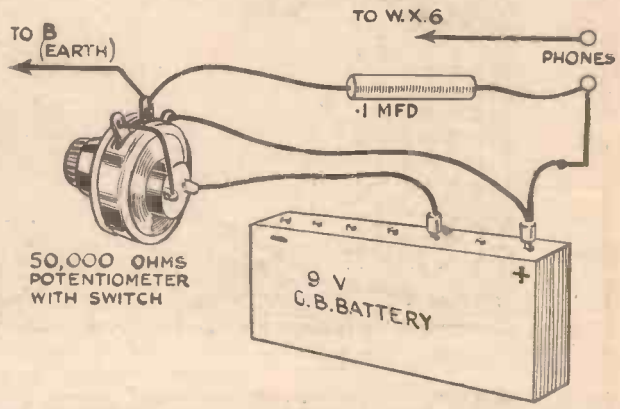


Fig. 6.—The method of applying a variable bias by means of a 50,000-ohm potentiometer is shown here. Note that the potentiometer is provided with an on-off switch for disconnecting the battery when the set is out of use.

Choice of Headphones

So far mention has not been made of the 'phones, because almost any of those on the market will prove satisfactory. At the same time, however, it is worth stressing that a good pair is worth the slight extra cost, for it will make all the difference between "just-audible," and pleasantly-loud signals. Brown "A"-type 'phones are still considered the "aristocrats" and the purchase of a pair of these will justify the cost, especially if a good deal of experimental work is anticipated. Many other good 'phones are available at prices between 12s. 6d. and 15s., but care must be taken that the pair chosen has a resistance of not less than 2,000 ohms, because there are still available a few low-resistance types which are useless in the present instance.

Next week we will proceed to elaborate the simple "crystal" receiver by adding a high-frequency stage consisting of a variable-mu pentode valve. A second coil will be required of the same type as that used in the initial circuit, and also a second tuning condenser if a three-gang component has not already been obtained.

Tyneside Recital

IN a recital from Newcastle on December 22nd, Archie Armstrong, the well-known local tenor, will take Northern listeners "Down the Tyne from Hexham in Song." The programme will, in fact, consist of traditional Tyneside songs, each associated with some particular point on the river. Thus Mr. Armstrong starts at Hexham with "The Hexhamshire Lass," and proceeds by way of Wylam and Newburn, Dilston, Blaydon, and so forth, to Newcastle for "Canny Newcassel," and from thence to the sea, illustrated by "The Emigrant's Farewell to the Tyne," while as a grand finale he will sing "The Exile's Return."

"Aladdin"

FRANK A. TERRY—of "Pleasure on Parade" fame—is to present a "potted pantomime" from the Manchester studios on December 23rd. It is called "Aladdin" and is, in fact, in some respects the same pantomime which was broadcast about this time last year. New "gags," new lyrics and music have, however, been introduced, and the "Pleasure on Parade" players will be augmented by a number of additional artists for the occasion. The pantomime is "potted" in so far as the elaborate story of "Aladdin" is compressed into the space of three-quarters of an hour; it serves also as a vehicle for burlesqueing the old-time pantomimes. Frank A. Terry will combine the parts of Narrator and the Widow Twankey.

VARIED FARE FOR XMAS

"Cinderella"

BY arrangement with Bertram Montague, extracts from the Coventry Hippodrome Theatre pantomime will be broadcast in the afternoon of December 28th. The pantomime is "Cinderella," the book being by Lewis Marks, who produces, and R. Cooper. Heather Gale takes the title part, and the other leading players are Fred Wynne, Jenny Howard, Cecile Benson, and, as the Ugly Sisters, Bert Errol and Jenny Gregson. Charles Shadwell will conduct the Theatre Orchestra, which is a favourite combination with many listeners and contributes regularly to the afternoon "pool" programmes.

Dickens From Manchester

THE third theatre to be represented in the "Round the Northern Repertories" series is the Manchester Repertory Theatre, members of which are to broadcast dramatic excerpts from the local studios on December 22nd. The play has not yet been definitely decided, but it is hoped to present excerpts from Dickens—probably excerpts from Dominic Roche's (the Manager's) own adaptation of "Pickwick Papers."

Organ Recital from Oxford

THE sixth of the organs to be described and played in the series of "Midland Organs and Organists," on December 28th, is that of Christ Church, Oxford. The talk and illustrative recital will be given by Dr. Thomas Armstrong, organist there, and a well-known musician and adjudicator. Later in the series it is hoped to include a recital on the Blenheim House organ.

OUR NEW LABORATORIES

A corner of the spacious new "Practical and Amateur Wireless" laboratories, which are equipped with the best and latest apparatus, and wherein future receivers will be designed and perfected.

This close-up of a corner of the Test Bench shows an A.C. Superhet undergoing tests, and also shows a few of the test instruments which are employed in the laboratories.

Trouble Tracking Made Easy—9

A Discussion of Tests Applicable to Superheterodyne and Short-wave Sets. By IDRIS EVANS

SUPERHETERODYNE and short-wave receivers are more difficult to adjust and to repair than the straight H.F.-L.F. type of set. The difficulties in connection with the superhet arise from the fact that an intermediate-frequency amplifier is used as well as the normal H.F. and L.F. amplifiers, and this employs between two and six tuned circuits which have to be accurately trimmed if best results are to be obtained. In the case of the short-wave receiver a very high signal frequency is being dealt with, and therefore great care must be taken in the choice of components and aerial-earth system as the higher the frequency of the received signal the greater will be the losses in the aerial-earth circuit and the tuned stage.

The Superhet

In a superhet receiver current and voltage tests can be conducted in the same manner as suggested for the straight receiver in a previous article of this series; the actual pins of the special frequency changer to which voltage is applied may be traced from the valve guide of any of the well-known manufacturers. In the case of the pentagrid (the valve generally used for frequency changing) pin number 7 has the maximum voltage of between 120 and 200 volts, and pins numbers 1 and 3 a lower voltage of between approximately 60 and 120 volts; the fourth and fifth pins are connected to the heater or filament leads, and the sixth pin is connected to the cathode in the case of the mains type valve and to the metal coating in the battery type.

If the voltage and current values are found to be approximately in accordance with the valve manufacturer's data, but no signals can be picked up, it is advisable in the case of the superhet to check the L.F. amplifier first. This is done as mentioned in previous articles of the series by placing a finger on the grid pins of the L.F. valves in turn, or preferably by connecting a pick-up across the grid circuits in turn. If the L.F. amplifier is in order attention should then be paid to the H.F. amplifying stage or stages. The first procedure is to transfer the aerial lead to the cap terminal of the H.F. valve, or to the cap terminal of the pentagrid frequency changer if an H.F. stage is not employed. If signals are now received it will indicate that the H.F. valve or its associated tuned circuits are at fault and therefore the H.F. valve, H.F. coils, and the H.F. sections of the gang condenser should be tested. If an H.F. valve is not used, as is often the case, it will only be necessary to test the coils and gang condenser sections preceding the frequency changer.

Frequency Changer

If transference of the aerial lead to the grid of the frequency changer does not improve matters, the frequency changing components and valve, and the I.F. valve and its associated components should be checked. It sometimes happens that the oscillator section of the frequency changer refuses to function, due to a defective valve, or a defective or badly designed oscillator coil. It can be ascertained whether this part of the receiver is functioning by connecting a milliammeter in the anode circuit of the frequency changing valve and noting if a variation of current consumption is registered when the reaction winding of the oscillator coil is short-circuited; if no variation takes place it will indicate that the valve is not oscillating and therefore the valve and coil should be suspected. It is also worth mentioning that it is sometimes found that oscillation only takes place over certain sections of the tuning scale. The fault can be located in the same manner as that suggested above; when the dead spot is reached the current consumption will suddenly vary. When making this test it is not essential to connect the meter in the anode circuit of the frequency changer; it may be connected in the common negative lead if this method of connection is found to be the easier of the two.

Fig. 1.—Showing a method of adjusting the I.F. transformer trimmer.

I.F. Tests

After satisfying oneself that the frequency changer is functioning, the I.F. amplifier should be tested. This generally consists of one valve and two intermediate frequency transformers, but in some multi-valve sets two valves and three transformers are employed. I.F. transformers have two windings, a primary and a secondary, across each of which a trimmer condenser is connected. Lack of signals may therefore be due to the condenser short-circuiting or to the winding being broken. These components can be tested by means of a milliammeter, a G.B. battery, and a 1,000-ohm resistance as suggested for coils and condensers in the first article of this series.

Weak Reception

If stations are picked up at low volume, incorrect adjustment of the various trimmers is generally indicated, although it is possible for low sensitivity to be due to a defect in the L.F. amplifier or in the aerial-earth system. It is therefore advisable in the first place to examine aerial insulation and the earth contact and to ascertain that the L.F. amplifier is in order. Attention should then be paid to the gang condenser and I.F. transformer trimmer adjustment; Fig. 1 shows how the I.F. trimmers are adjusted. If the tuning scale is designed for use in conjunction with the gang condenser it generally can be relied on to tune accurately if coils of the correct inductance are used, and the trimmers are correctly adjusted. In the absence of a signal generator for correct adjustment of the intermediate frequency, the easiest procedure is to tune in a weak station at the lower end of the medium-wave band and carefully adjust the trimmer of the oscillator section of the gang condenser in conjunction with the trimmers of the I.F. transformers until maximum volume is obtained. When correct adjustment has been made the stations should tune in at the correct wavelength setting on the tuning scale.

Ganging

It is often found that when the trimmers have been correctly adjusted for maximum volume at the lower end of the tuning range, readjustment is found to be necessary at the top end. If the coils are known to be accurately matched, this trouble indicates that the correct intermediate frequency is not being used; this is especially so if a moderately high intermediate frequency is being employed. A case was recently experienced where London Regional tuned in at 430 metres instead of at 342, and National at 300 instead of at 261 metres, with low sensitivity. Readjustment of the I.F transformer trimmers in conjunction with that of the oscillator section of the gang condenser completely cured the trouble.

Whistles are often experienced with superhet receivers, and may be due to incorrect adjustment of the I.F. transformer trimmers. Second channel whistles are to be expected on a superhet using an intermediate frequency in the neighbourhood of 110 kc/s, however, unless a very selective H.F. tuner is employed. If whistles are experienced, readjustment of the trimmers should be tried, and if this

(Continued on page 454)

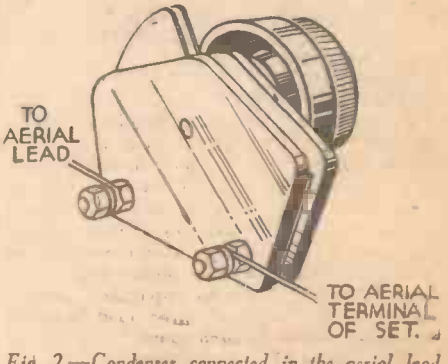


Fig. 2.—Condenser connected in the aerial lead to eliminate reaction dead spots.

New Ideas in Set Design

OCCASIONALLY one hears mild grumbles from constructors concerning the lack of any real novelty in receiver design; but while it is true that only minor developments are taking place at the present moment, this is probably due to the desire of manufacturers to consolidate advances made during past seasons before springing new technical complications on the public.

Radio having now become highly industrialised, the commercial aspects and probable economic effects of innovations must be carefully considered before manufacturing programmes are planned. Still, the advance-guard of new developments is already in sight, for we now have on the market more than one "self-tuning" receiver—a type of instrument which has long been overdue. But apart from contemplation of developments known to be in the offing, there is much amusement and not a little instruction to be gained by allowing one's fancy free flight, and trying to visualise possible or even impossible ways in which various technical problems, hitherto unsolved, might be tackled, and how to cater for needs not yet fully met.

A Trouble-free Receiver

Suppose we commence by allowing our imagination to conjure up a possible home radio installation which shall be reasonably free from some of the defects found in some of the receivers of to-day.

The average listener of 1935 is little more than a slave to his set. To begin with, he is usually confined in his listening to the room in which the set is installed. It is true that, by installing extension speakers, he can relay the programme to other rooms, but any adjustment of the set necessitates a visit to the room where the receiver is situated. Moreover, every member of the family is restricted to the programme to which the set happens to be tuned at the moment. Moreover, the average listener is almost compelled to buy or construct a large and handsome, yet nevertheless expensive, piece of furniture called a wireless receiver, in spite of the fact that in all other directions the tendency to-day is for rooms to be smaller and to contain the minimum of equipment. Quite a large proportion of the cost of a set is in the cabinet work, which serves no good purpose other than to protect and disguise the stark skeleton of the receiver. Again, it is generally conceded that very few listeners really enjoy, or even take the trouble to listen to, more than three or four different stations, yet they are practically compelled to purchase a set capable of receiving many dozens of stations, so that a further large part of the expenditure is for complicated tuning devices the full value of which is seldom required.

Station Switching

Imagine, then, an installation in which any one of a limited number of stations (three would be ample) could be obtained at will, and at any desired volume, by the mere touch of a switch—an installation which should not cost more than a good class commercial set, and which could be made by the average constructor even more cheaply. Yet no apparatus, save a small switch-plate with three push-buttons, would be visible in each room.

How could this be arranged? In the first place, quite a small loft aerial would be connected to the receiving apparatus *via* a transmission line and matching H.F. transformers to avoid interference pick-up, and to permit several pre-set receivers to be used. This is not a novelty, but a device which has, as yet, not been adopted as widely as it should be. Then, tucked away in an unobtrusive position—possibly the cupboard under the stairs—would be three radio units, each consisting of one H.F. stage and a double-diode-triode, each unit accurately tuned to a single programme, say, National, Regional, and the most popular continental station. Alternatively, the third unit might be capable of being tuned to a number of stations to give a choice of the third programme.

> Interesting Subjects, including Switching On Stations at Will, Control of Local Oscillations, and Sound Distribution in the Home, are dealt with in this Article

Multiple Cables for Extensions

The audio-frequency outputs of the triode portions of each double-diode-triode would be distributed *via* multiple cables of suitable design throughout the house, selection being made in each room by means of a simple switching device. Each speaker point would comprise a mains energised speaker and output valve. It might be argued that such an arrangement would mean a great duplication of apparatus, and the use of an abnormal number of valves, but in practice this is not so. The six pre-tuned circuits of the three receiving units would be cheaper than the three variable-tuned circuits and four fixed tuned circuits of a modern superhet. It is true that there would be six receiving valves always in use plus an output valve at each speaker station which, reckoning on four speakers, would mean ten valves exclusive of rectifiers; but seven-valve sets are not uncommon to-day, and all the output valves would only be used on the rare occasions when all the extensions were in use. Further, if current consumption were a consideration, a master switch could be provided for switching off individual receivers when desired, or a remote control could be fitted to ensure that any one of the units not required at the time was switched off. Anyhow, the scheme offers quite a wide field for ingenuity, and, in one form or another, would solve a very definite problem.

Control of Local Oscillations

Now let our flights of imagination deal with some problems which do not involve the radical alteration of types of receivers. It is generally recognised that one failing of the present-day superhet is that a constant strength of the local oscillation is not ideal for listening to programmes of different strength. It should be possible to vary the oscillation strength to suit strong or weak signals. So far, no designer seems to have made such provision, but it should not be beyond the wit of man to devise some scheme whereby this could be done automatically. Most sets to-day are fitted with A.V.C., and the A.V.C. voltage is proportional to the signal strength. Surely it should be possible to arrange that an amplified version of the rectified carrier voltage, possibly derived from a third diode element, could control the amplitude of the local oscillation. It might mean a reversion to the dynatron oscillator, but it seems feasible.

Contrast Expander Circuit!

A manual volume control is essential in every set, but when, as frequently occurs, this operates on the vari-mu characteristic of the H.F. valves, it is necessary to fit a separate control for gramophone reproduction. It is true that this may be ganged with the vari-mu control, but even so it means the cost of two components. It should be possible to produce a vari-mu low-frequency valve which could be used with a volume control on the audio-frequency side as the sole volume control of the set, leaving the vari-mu H.F. valves in charge of the A.V.C. feature. An extension of this idea would be to apply a modified form of A.V.C. to the imaginary vari-mu L.F. valve, to give some degree of contrast expansion. As most listeners know, the control at the transmitting end "compresses" the light and shade in all musical performances, so that the difference in loudness between the softest and the most boisterous passages in every item is not so great, as broadcast, as it is in the actual performance. A contrast expander circuit is badly wanted for the high-quality receiver.

Concealed Speakers

Nobody denies that the present practice of building the speaker into the set is far from ideal from the musical point of view, in addition to making it almost impossible for the speaker to give the best reproduction of which it is capable. It is, of course, possible to use a separate instrument, but all that is usually done in this direction is to place the speaker in the position where it gives the most satisfactory all-round result consistent with the arrangement of the furniture and general convenience. Yet wherever it is placed, the performance is likely to be more or less unnatural, for in actual practice, sounds do not always reach us from the same direction. For example, in a theatre, the music from the orchestra and the words from the stage reach us slightly from below—especially if we have the best seats—in the dress circle; but in a cinema, most of the organ notes come from above.

DESIGNING YOUR OWN WIRELESS SET

In the Final Article of this Series the Intermediate-Frequency Amplifier is Dealt With, Reference being Made to Decoupling and Variable Grid-bias Supply, Including A.V.C. Bias.

IN this rather long series of articles we have covered very fully the design of almost every popular type of receiver, and during the past few weeks the superheterodyne has been under discussion. We have considered all the principal parts of this with the exception of the intermediate-frequency amplifier and the decoupling system required for this and for the frequency-changer. In nearly every case it is found that a single I.F. valve is sufficient, and this should, for preference, be of the variable-mu type; it can then be used with a normal potentiometer volume control, or A.V.C. can be applied.

The I.F. Valve

The most satisfactory type of valve is the variable-mu H.F. pentode, and the connections for it are shown in Fig. 1. In this circuit it is assumed that the receiver is of the battery type, and if it is mains operated it will be necessary to employ a fixed potentiometer for supplying the screening grid, as shown in Fig. 2.

Choice of the I.F. transformers depends principally upon the intermediate frequency which it has been decided to employ, but 465 k/c is recommended, whilst, when the slight extra cost can be afforded, it is also suggested that transformers of the variable-selectivity type be employed. By using these the band-width coverage (which is the same as saying the degree of selectivity) can be varied as required by means of a control knob mounted on the front of the set. It has been explained in a number of previous articles in this journal that the quality of reproduction provided by a superhet is very largely dependent upon the selectivity of the I.F. circuits; if tuning is broadened, the circuits accept a wider band of frequencies, and so permit of better-quality reproduction. The connections to variable-selectivity I.F. transformers are the same as those employed with ordinary I.F's, the only differences being of a mechanical nature.

Increased Selectivity

When using transformers of the ordinary type, and which are provided with a centre-tapped secondary winding, it is well worth while to try the effect of transferring the grid lead from the terminal joined to the "top" of the winding to the centre tapping; this gives an improvement in selectivity by reducing the damping of the tuned winding, and sometimes has the effect of improving the general stability of the set. The centre tapping is of particular value when using a grid-leak or power-grid detector, but should be tried in all cases, at least in connection with the second I.F. transformer.

It is not possible to recommend any particular make of I.F. transformer in preference to others, and if components of well-known brands are used one can rest assured that they will be perfectly efficient. Do be quite sure, however, that the transformers chosen are designed for the same intermediate frequency as the ganged tuning condenser, because any discrepancy here is bound to lead to peculiar forms of trouble when attempts are made to adjust the trimmers.

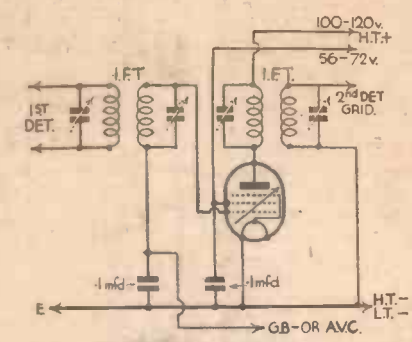


Fig. 1.—Showing the connections to a battery-operated variable-mu pentode used as an I.F. amplifier.

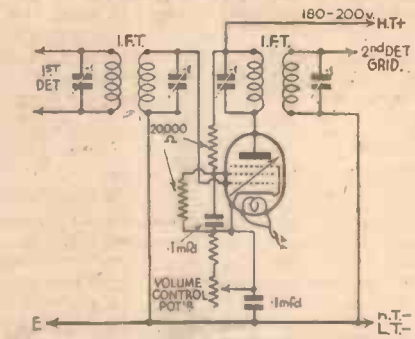


Fig. 2.—This circuit corresponds to that shown in Fig. 1, but is for a mains-operated valve.

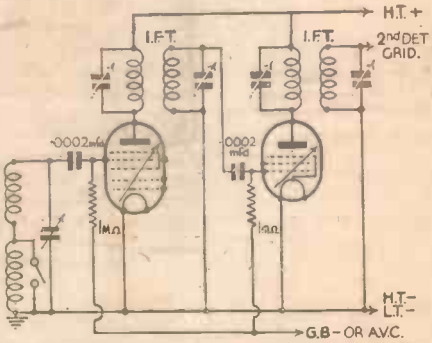


Fig. 3.—A skeleton circuit showing one simple method of applying a variable-bias voltage to the grids of the first detector and I.F. valves.

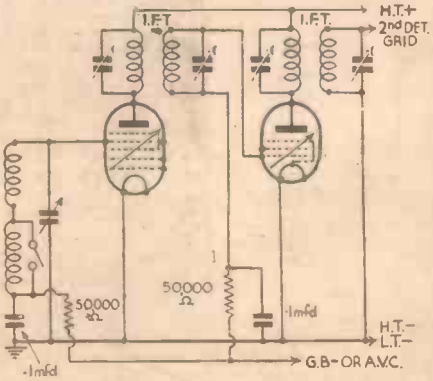


Fig. 4.—This circuit shows an alternative grid-bias arrangement to that in Fig. 3, and one which is generally applicable to battery sets or to mains sets with A.V.C.

Bias Control

There are three general methods of applying the variable bias voltage to the I.F. valve and to the first detector, these being indicated in Figs. 3, 4, and 5. In the first case the grid leads from the I.F. transformer and tuning coil are broken by inserting a .0002-mfd. fixed condenser, and the bias is applied by means of a 1-megohm grid leak. This method is preferable in the case of sets in which a complete tuning unit is employed, because it avoids the necessity for modifying any of the connections inside the unit. The arrangement is also good from the point of view of providing ample decoupling at low cost, but in certain instances is liable to introduce a little background noise, especially if the grid leaks are not of unimpeachable quality. It can be used in connection with battery sets provided with either manual (grid-bias) volume control or A.V.C., or with mains sets in which A.V.C. is incorporated.

The connections shown in Fig. 2 are generally to be preferred, and it will be seen that the "earth" ends of the tuning coil and I.F. secondary are broken by a .1-mfd. non-inductive fixed condenser, this being by-passed by a 50,000-ohm resistance. The fixed condenser is a very important component in this arrangement, since it is included in the tuned circuit; thus, if its capacity were too low it would affect ganging, and if it were not completely non-inductive there would be a risk of impairing the performance of the set at certain parts of the tuning range.

In the case of mains receivers in which manual volume control only is used the I.F. secondary and tuning coil may be joined directly to earth and the volume-control potentiometer joined between the ends of the two "minimum-bias" resistances and earth (Fig. 5). The lower end of the fixed screening-grid potentiometer should also be joined to the end of the potentiometer so as to ensure that the screening-grid voltage remains practically uniform at all settings of the control. The resistance value of the potentiometer depends upon the valves used, but a suitable average value is 2,000 ohms. It is best when using this circuit to choose an I.F. valve with a short grid base so that its conductance can be varied from maximum to minimum with the same grid-bias voltage variation as is required to produce the same effect on the detector portion of the frequency-changer. With regard to the "minimum bias" resistances, these may usually each have a value between 250 and 500 ohms.

When A.V.C. is used in addition to the manual control the earth-return connections to the I.F. transformer and coil should be as shown in Figs. 3 or 4, the cathode connections being as in Fig. 5.

Anode and S.G. Decoupling

Decoupling of the anode and screening-grid circuits is rarely of very great importance in a superhet because, as the frequency-changer and I.F. valves are working at totally different frequencies, there is little risk of interaction. Thus, it is possible in a battery-operated set with triode second detector to dispense with decoupling resistances entirely by using the connections shown diagramatically in Fig. 6. Here it

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DESIGNING YOUR OWN WIRELESS SET

(*Continued from page 452*)

will be seen that the anodes of the pentode section of the frequency-changer, the I.F. valve and the output pentode are all joined together and taken to the highest tapping on the H.T. battery, the screening grid of

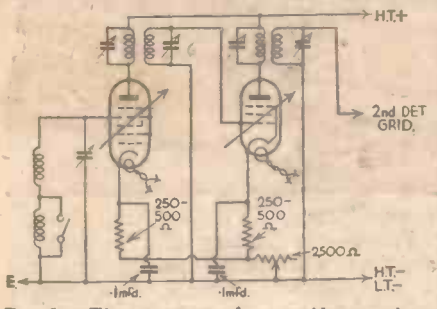


Fig. 5.—The connections for variable-mu volume control, acting on the frequency-changer and I.F. valves of a mains receiver are shown in this skeleton circuit.

he output pentode being joined to the same point. The oscillator anode and screening grid of the first valve are connected together inside the valve, and are joined to the screening grid of the I.F. valve and to the anode of the detector. In order to prevent possible motor-boating when the H.T. battery begins to run down a 1-mfd. condenser is used as a by-pass from the common H.T. line just referred to, and this should be placed as near as convenient to the detector valve. Even this can be dispensed with when the H.T. current to the oscillator section of the first valve is applied through the anode winding of the oscillator coil, since a condenser will then be connected between the "H.T." end of this winding and earth.

Voltage Dropping

In the case of a mains set it might sometimes be necessary to use voltage-dropping resistances in the anode circuits of all except the last valve, and these must be by-passed by means of condensers in the usual manner. But, since decoupling is seldom essential, it can frequently be arranged that one resistance breaks down the voltage of the frequency-changer and the I.F. valve, an additional resistance being used to reduce the voltage applied to the detector anode to a still lower figure. Whether these resistances are required or not, it can almost invariably be arranged that a single fixed potentiometer be used to feed the screening grids of the first two valves and sometimes, in addition, the oscillator anode. Nearly always, however, it is found better to provide a separate system for feeding the oscillator anode, since this valve section usually performs most satisfactorily with a comparatively low voltage of 40 to 60, and this can be arranged for by the use of a series resistance only, it being unnecessary to use a potentiometer. The lower voltage mentioned is particularly desirable with a triode-hexode valve, and here it is best to follow the valves recommended by the makers.

When the screening grids are fed from a common potentiometer it is sufficient to use a single by-pass condenser (of about .1 mfd.) although very occasionally when the valve holders are some distance apart results are slightly better when a by-pass condenser is wired directly from the screening-grid terminal of each valve holder to the cathode terminal.

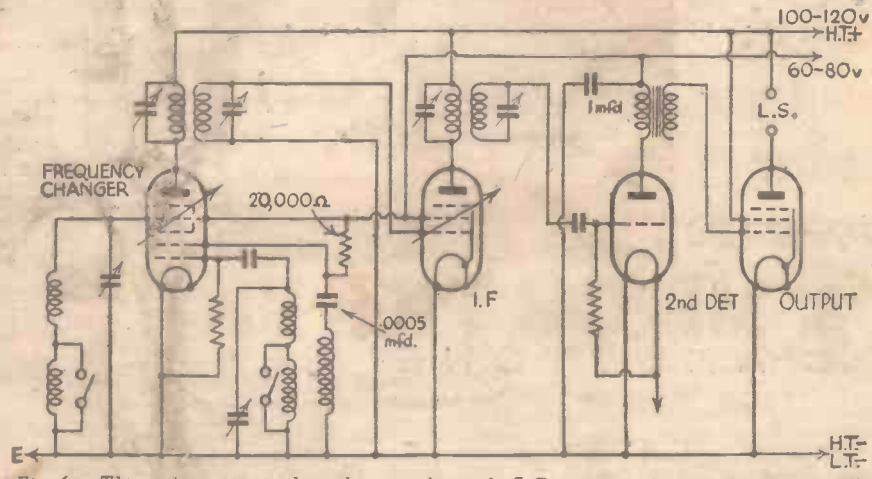


Fig. 6.—This skeleton circuit shows how anode—and S.G.—circuit decoupling can generally be dispensed with by using two H.T. + leads. Connections for volume control or A.V.C. are omitted for simplicity.

TROUBLE TRACKING MADE EASY—9

(*Continued from page 450*)

does not provide a remedy, the selectivity of the H.F. stage should be improved by adding another tuned stage, or by reducing the degree of coupling between the existing H.F. coils if a band-pass coupler is employed.

Short-wave Sets

Short-wave receivers can be of the straight or of the superhet type. In the straight type of set reception is governed to a great extent by the efficiency of the reaction circuit, and the detector valve has to be kept on the verge of oscillation in order to obtain satisfactory reception. Lack of reaction is often due to the use of a very long aerial, and unless a short aerial is employed a low-capacity condenser of the variable type should be connected between the aerial lead and the aerial terminal of the set as shown in Fig. 2. Adjustment of this will enable reaction to be obtained at all points on the tuning scale if suitable short-wave components are used. Another fault which often occurs on short-wave sets is ploppy reaction. This is generally due to the application of the wrong potential to the grid, and in cases where reaction is not smooth it is suggested that connection of the detector grid leak to LT — instead of to LT + should be tried.

In the short-wave superhet a triode valve is often used as a frequency changer, and in such receivers the reaction trouble due to the use of a long aerial may again be experienced as the triode valve has to be kept in a state of oscillation the whole time. If no results can be obtained after the intermediate-frequency and low-frequency amplifiers have been carefully checked and adjusted, attention should be paid to the aerial-earth system. If a modern frequency changer, such as the pentagrid, is used the oscillation test previously suggested in this article should be applied.

BOOK REVIEW

"Making a Living in Radio," by Zeh Bouck—published in Great Britain by McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2. 222 pp. 10 half-tone plates. Price 12s.

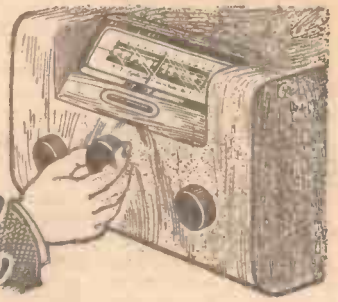
ALTHOUGH written by an American and originally published in America, this book contains a good deal of information which is valuable to all who contemplate taking up radio as a career. The ten chapters deal in some detail with the function of the service man, the business side of servicing, the wireless operator, the engineer, broadcasting and radio journalism.

The work is authoritative and the author has not failed to call the assistance of specialists in the various spheres.

"Marvels of Modern Science," by F. J. Camm. 3s. 6d. net, 192 pages. George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

THIS gift annual, with hundreds of illustrations in line and half-tone, and printed on excellent paper, deals with all of the interesting scientific achievements which will happen in your lifetime—pictures by wire and wireless—light ray control—gliding—the Bathosphere—parachutes—super-power stations—the automatic telephones—streamline trains—the latest aircraft—mono-railways—the grid system—scientific treasure seeking—neon tubes—these and many other subjects are explained in everyday language.

On Your Wavelength



By Thermion

Notify Your Local Authority

IN the great National change-over from D.C. to A.C. lots of readers are experiencing trouble with the local electrical undertaking. Many of these readers, for example, have only recently purchased D.C. wireless sets, and feel, perhaps, with a slight degree of justification, that the local electrical undertaking should recompense them for their loss, or at least meet them. There is, however, another side to the

Strange things happen to batteries charged by inexperienced people.

story. Most of the electrical supply undertakings are avoiding this issue by stating that many users have not applied to them for permission to couple a wireless set to their mains, and hence in the absence of that permission they are not liable. I believe that in most districts where a change-over is contemplated adequate warning is issued to all users, so that they can defer the purchase of electrical apparatus or choose that of the universal type. Of course, there is always the case of a reader who is moving into a new district and may be unaware that such notice has been given. It is always advisable before purchasing apparatus for use on companies' mains to apprise them of such apparatus and to acquaint them with the use to which it is to be put.

I strongly advise readers also, in view of the foregoing facts, to write to their local supply authorities asking permission to use a wireless set off the mains. This will cover any eventualities in districts where a change is likely to be made. There is a strong argument here in favour of universal sets.

Cut Price Charges

I CONSIDER it false economy to have your accumulators charged at cut price charging stations. Quite apart from the fact that they lump together batteries requiring different charging rates and charge them all at one rate—that required by the battery taking the heaviest charge—they do not give them the individual attention which this really reliable electrical device deserves. They often are given a reverse charge, they come back with terminals missing, the condition of the acid is not examined, and in some cases tap water is used to top them up. I have myself witnessed cases where a customer called for his accumulator and complained that the terminals were missing, whereupon the assistant has taken them off another customer's accumulator. I believe in nursing an accumulator and prefer to have it charged at a station which acts as agents for the particular make. They have the reputation of the manufacturer to uphold, and the continuance of their own agency is at stake if and when they fail to give satisfaction. Why ruin an accumulator costing half a guinea or so in an attempt to save a few pence on charging and service? You get what you pay for and quite often the accumulators are by no means fully charged. I am glad, therefore, that many manufacturers now fit tell-tales inside their accumulators to act as a safeguard, not only to the customer, but to the man in charge of the charging.

Wanted—An Explanation

THE other evening, I am informed by a correspondent, a reader was testing a well-known make of short-wave converter, when the cat which had been asleep on the hearthrug, got up and yawned, whereat the signal he was listening to faded away completely. The only information vouchsafed to me is that the set suffered very badly from hand-capacity effects. I am sorry that I cannot help this reader, nor can I see that the cat had any relation to the phenomenon. All sorts of things seem to happen with radio, and all manner of things seem to be ascribed to radio—bad weather, rain, wars, crooning, and so on. I am pretty good at the binomial theorem and the quantum theory, but fail ignobly at a guessing competition; perhaps some of my readers would like to help this correspondent.

Q.S.L.'s Galore!

A KEEN amateur of my acquaintance tells me that after a Sunday morning broadcast on 40 metres he receives as many as 60 to 100 Q.S.L.s and finds it impossible to reply to them all. He would have no time for his hobby of transmitting if he did, quite apart from the cost. Most of the reports he complains are from people within a mile of his aerial. If listeners would use a little thought when sending a report they would save themselves much time and postage, to say nothing of the poor amateur transmitter, who is often a considerable sum out of pocket in answering documents from all over the world. This craze for collecting Q.S.L. cards ought to stop, for it is getting almost as bad as the craze for collecting cigarette pictures among small boys who are non-smokers. Kept withing reasonable limit the hobby is good, but when it becomes the end itself it is absurd.

Music from Aeroplanes

I CALLED the other day to hear my Aunt Agatha's new all-mains superhet. She seemed to be quite happy listening to the most terrific mains hum I have ever heard in all my listening days. Seraphically she told me that she always listens to the aeroplanes, although she had not yet heard a Captain ask for his whereabouts. The dear old soul had not noticed that the switch was turned to gramo, although a pick-up was not connected to the pick-up terminals, hence the hum which she had attributed to aeroplanes.

Variety

I AM pleased to learn that the B.B.C., bowing to overwhelming popular demand, intends to devote a greater proportion of the programmes to variety. Personally I think they could do quite well by cutting down the time devoted to dance music, which always seems to take place at tea-time when people are not yet home from the office, or later at night when people wish to go to bed. I really believe that if a genuine census of the listeners could be taken they would be 90 per cent. in favour of the abolition of dance bands and everything connected therewith, including all the "boys," the carefully rehearsed surprise items, and the sausage factory music. Variety has always been the soul of the theatre, as well as the spice of life. Into one crowded hour you can introduce a percentage of amusement for everybody, instead of as at present an hour of music

100 Q.S.L.'s after a Sunday morning broadcast.

which interests but a few of the younger generation. There are many excellent music-hall artists who find it difficult to make a living, whilst trombone players and blasting trumpeters can earn £1,000 a year.

End of the Year

NEXT week's issue will be the last issue we shall produce in 1935. What great changes will take place in radio during 1936? Certainly we shall have television, and I have no doubt that next year we shall

(Continued overleaf)

(*Continued from previous page*)

be able to look in on Christmas Day. What an advantage it will be if we were permitted to see some of those who take part in the Empire Link-up. How greatly would listeners appreciate seeing His Majesty the King reading his Christmas Message to his people! Unfortunately, the delays in television have been many and exasperating. I prove to be a poor prophet as to the date of its arrival, since the experimental transmissions will not take place until March. I had every authority, however, for my previous statement, and it was merely due to matters outside my control that my prophecy did not come true. It is likely that 1936 will see marked changes in radio design, brought about by the new science of television.

When the cat yawned the station faded.

Human Receivers

I HEARD the other day of a person who is affected by the broadcast programmes. It seems that there are still many people who claim that they are able to hear the radiated music without the aid of any electrical apparatus, and upon discussing this problem with an acquaintance I was informed that there are many people still going about who claim that ill-health and serious bodily disorders are caused by radio. They are not necessarily old people to whom this new invention seems to savour of the uncanny, but in some cases quite young people have laid claim to being able to follow even a talk without any apparatus whatever. I read that in a foreign country a certain "mystic" was able to sit in a room before doctors and other experts and repeated the talk broadcast from the local station ten miles away. The "mystic" was stripped and definitely had no apparatus, the room was examined, and the talk was afterwards confirmed by checking shorthand notes with the announcers script. There thus may be more in this problem than appears on the face of it, but I do not want to receive a budget of correspondence from those who feel that they are affected by this problem, although I should very much like to hear of some possible explanation as to how it is possible to *rectify* the radiated signal. It must be remembered that the signal in the air is in the form of an H.F. oscillation, and nothing distinguishable can be obtained until rectification has taken place. This should immediately remove any doubt as to whether or not the signal can be heard without electrical apparatus, but, as I said before—there *may* be some explanation.

Speaking Books and Newspapers

IT may be possible in the near future to obtain a so-called sound edition of a newspaper, etc., in which the newspaper people will offer to the customer some "printed sound," which will reproduce the talks of leading politicians or eminent personages, etc.

Although many readers may find this hard to believe, it is the result of a new process of recording sound on paper which was recently demonstrated in London. The process consists of the printing of the ordinary newspaper in the form of a square sheet of normal size. The printing is made in the ordinary way with printing ink with only one difference. Instead of characters, phonograms are used which reproduce all sounds, such as voices, music, etc. For reproducing the sounds from this printed paper, you place it in a device known as the Fotoliptofono where, with the help of a photo-electric cell and ordinary wireless apparatus, you obtain a perfect reproduction of the voice, music, etc., which compares favourably with a gramophone record.

Notes from the Test Bench

Aerial Insulation

THE importance of aerial insulation was forcibly brought home to me the other day whilst testing a friend's receiver. This set was of the ordinary three-valve type, having an H.F. pentode in the first stage, followed by a triode detector and a pentode-output valve. On connecting the milliammeter in the H.T.— lead it was found that the current consumption increased from 15 to 35 m.a., as the bias volume control of the H.F. valve was rotated from maximum to minimum setting—this movement of the control should reduce the total current consumption, of course, as the consumption of the H.F. valve should be negligible when the bias control is at minimum. Further tests indicated that it was the consumption of the output valve that increased as the H.F. control was rotated, however. At first the problem seemed rather baffling, but it was soon realised that the grid-bias battery was being short-circuited by the volume control, a complete short-circuit occurring when the control was at minimum.

I immediately thought that this was due to a defective H.F. grid by-pass condenser, but this component was found to be in order. It was then accidentally found that removal of the aerial or the earth lead provided a cure, the consumption dropping to the normal value of 15 m.a. as soon as either one of these leads was removed from its socket. After further pondering over the matter it suddenly dawned on me that the aerial must be earthing, thus having the same effect as a short-circuit across the grid by-pass condenser, as the aerial terminal was connected to a tap on the grid coil. Investigation proved that my assumption was correct, and the trouble was completely remedied by re-insulating the aerial from the mast to which it was attached.

Mains Aerial

WHILST discussing the subject of aerials it is pointed out that if an outside aerial cannot be fitted, or if it has been damaged and cannot be repaired in time for an important broadcast, the mains leads can be used as an aerial. Great care must be taken to effectively insulate the latter from the aerial terminal, however, and a condenser must be inserted between the mains lead and the aerial terminal for this purpose. If the set is of the mains-operated type, a lead may be connected from one of the mains-input leads of the receiver to one terminal of a reliable .0001 mfd. or .0002 mfd. condenser, the other terminal of the condenser being then connected to the aerial socket of the set. If the receiver is supplied from batteries, however, it will be necessary to connect the .0001 mfd. condenser to one terminal of an ordinary bayonet plug, and then insert this plug into the nearest available lamp socket. When employing a mains aerial it is often found that one of the mains leads is more effective than the other, and, therefore, reversal of the plug should be tried if reception is not satisfactory. It is again emphasised that the condenser used must be reliable.

Dead Spots

A FEW days ago I was asked to look over a three-valve receiver made by a friend. The set functioned perfectly well on the London National, but reproduction was weak on the Regional, whilst many stations toward the middle of the medium-wave range could not be received at all, and the reaction condenser had no effect. Peculiarly enough, when the condenser dial was turned further Athlone, on 531 metres, could be received at comfortable strength. On long waves, reception was normal over the full range.

At first I suspected that the fault was due to incorrect setting of the trimmers on the two-gang condenser. However, various modified settings did not give any improvement, so that theory was obviously wrong.

It was not until the connections to the components were thoroughly examined that the fault came to light. It was found that the aerial and inter-valve tuning coils had untuned primaries which were provided with tappings. The constructor had not used these, however, and had simply fitted an on-off type of wave-change switch to short-circuit a portion of the tuned winding on medium waves. This meant that the same aperiodic aerial and anode winding was in circuit on both wavebands; the change-over to three-point switches immediately set matters right.

The untuned windings were, of course, simply acting as fairly efficient H.F. chokes on certain wavelength bands, and so producing dead spots. Do not imagine from this that all coils of this type should be provided with a switch for shorting a portion of the aerial winding, since there are a few—very few—which function satisfactorily without this slight complication.

Listening to the aeroplanes.

Please Note

WILL readers please note that questions of a technical nature should be addressed to The Query Department and must be accompanied by the Query Coupon cut from the current week's issue, and a stamped and addressed envelope if a reply is desired through the post? Even when replies are required through the paper the Coupon must still be sent. I mention this because so many readers are addressing technical queries to me personally. Quite naturally I do not want to get a member of our technical staff the sack by usurping his position in this way.

I am, of course, always delighted to hear from my readers on subjects which are outside the province of the technical department.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA

READERS WRINKLES

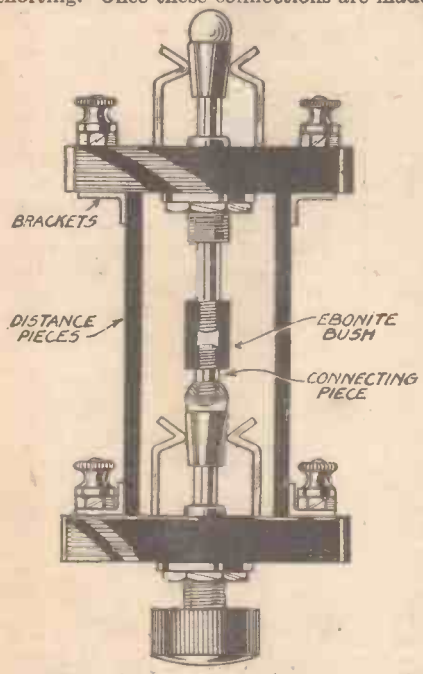
THE HALF-GUINEA PAGE

A Simple Ganged Switch

I RECENTLY wanted a couple of ganged switches, but I only had several of the push-pull type. The following sketches show how I overcame my difficulty:—

Two strips of ebonite, with small angle connectors, were fixed between the switches to keep them apart.

A small metal screw which can easily be screwed into the end of the first switch is used for coupling. The two rods are connected by a piece of ebonite to prevent shorting. Once these connections are made



By adopting the scheme shown here, it is possible to control two separate circuits or other apparatus.

it is easily seen how the combination works.—A. H. KING (Lancaster).

Anti-capacity Screwdrivers

IN the article on Adjusting and Operating the £4 Superhet 4 the constructor is advised to use thin slips of wood for adjusting the trimmer on the primary side of the I.F. transformers. Instead of this method, however, I use the simple screwdriver shown in the accompanying sketch. I obtained a pair of composition knitting needles (gauge 3), and cut one in half. The cut end of the top half I reduced down on an emery wheel to the desired angle and thickness. On the remaining half I made the point a square taper, and fitted it into a small chisel handle. The cut end of the needle I treated as before. Taking the second needle I cut off the point and rubbed down the same as the other two. I thus made three insulated screwdrivers for an outlay of a few coppers.

In use there are no capacity effects, and unless a trimmer is screwed down dead tight, they very seldom break on the reduced end.

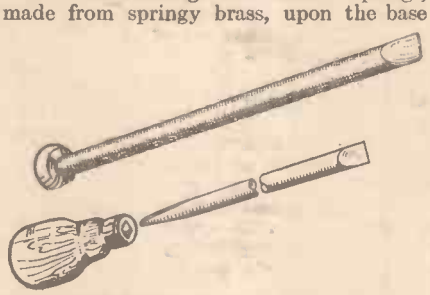
THAT DODGE OF YOURS!

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

A file may be used for shaping up if an emery wheel is not available.—J. A. BAYLIE (Peckham).

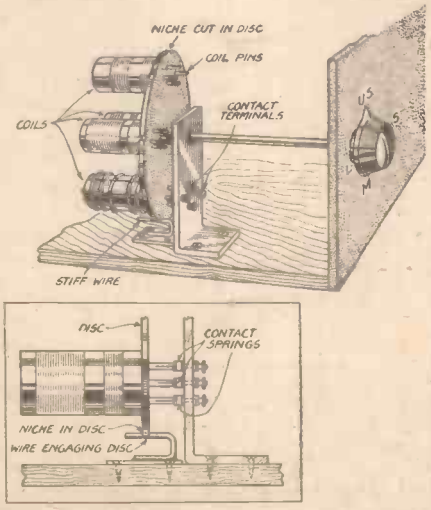
A Quick-action Coil Changer for All Waves

IN sets employing all-wave coils, losses caused by numerous leads and switches can be eliminated by the following idea. A set of four coils is mounted on a disc of bakelite or a small gramophone record 3½in. in diameter with four prongs under each. Next arrange four contact springs, made from springy brass, upon the base

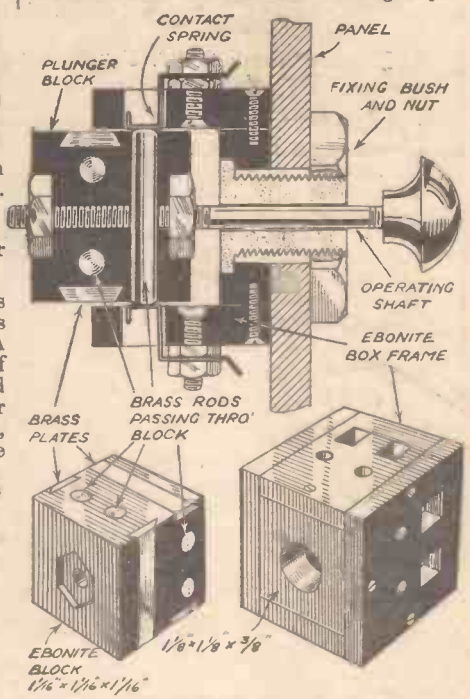


Certain units require an insulated screwdriver for adjustments. Here is Mr. Baylie's idea for constructing such a tool from an ordinary knitting pin.

(2½in. by 1½in. by ⅛in.) so that the four coil prongs from any one coil will come in proper contact with them. Now cut a small niche on the edge of the disc in front of each coil so that a stiff wire fixed to the base will engage this when the coil is in the exact position. Next mount the disc and base to the panel by placing a bushing and washer under the disc and running a ¼in. rod down through the centre hole and through the base. To avoid hand capacity an angle bracket is screwed to the base and the rod from the disc taken through to the receiver panel. A pointed knob may then be screwed to the spindle. To change from one coil to another all that is necessary is to turn the knob to the desired coil. —MAURICE G. PULVER (Beds.).



How a reader built up a short-wave tuner from a number of separate coil units.



This multiple switch will prove of value in various receivers, and is built up from odds and ends.

Multi-pole Push-pull Switch for Complex Switching

THIS switch, built up from scrap ebonite, has two principal component parts. The box framework and a plunger block as shown in the diagram. The ebonite block has four tightly fitting brass rods passing through from side to side, which project very slightly above the surface of the block. Four brass plates (with bevelled edges) are let into the same four sides of the block. The latter is also drilled and counterbored upon its centre line to facilitate the fixing of the spindle (see view "A"). The box frame is drilled and square slotted to receive two terminal plates on each of its four sides, whilst the front portion (of stouter material) is suitably drilled and counterbored to cater for the brass fixing bush.—W. A. HARRISON (Liverpool).

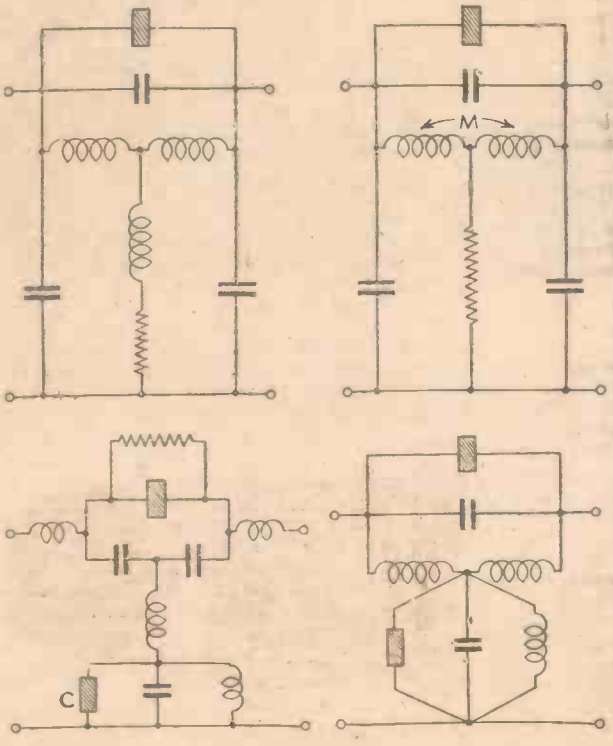
MODERN COIL

A well-known commercial I.F. Unit employing iron cores.

In this Article the Various Typ and Their Characteristics, are

PRESENT-DAY methods of receiver mass production have done much to define the trend of coil designs. The construction of a 1936 commercial set is a serious business, not only because it has to conform to rigid radio and mechanical principles, but due to the exacting demands of performance called for by the purchaser.

There are rarely less than three tuning coils in an up-to-date receiver, and these naturally have a considerable effect on the ultimate results. In consequence, the design engineers leave themselves in no doubt as to specifications for the coil units. By closely examining the latest work of the various technical staffs of leading receiver manufacturers therefore, it is possible to compute the results to be expected from different classes of coils when employed in conjunction with modern valves, irrespective of the circuit arrangements adopted, or the number of valves.



Four bridged "T" type crystal-controlled I.F. Units for high-quality reproduction due to Bell Telephone Laboratories. The balancing out of resistances in each structure leads to 'infinite "Q" factors (magnification). Symmetrical flat-topped and steep-sided response curves are also claimed.

Four Classes

In the matter of coil design, there are roughly four schools of thought, as follows :—

(a) Those who employ air-cored coils which are constructed in the most efficient manner possible, regardless of size, (b) a predetermined standard of performance provided by air-cored coils which must be constructed in the most economical manner, that is, as small physically as agreed technical data allow, (c) iron-cored coils, and (d) coils constructed without due regard to efficiency, but rather to size and low price, and for incorporating in special circuits which in themselves provide an approved level of sensitivity, selectivity, and volume.

It would be dangerous to state that any one of the above-mentioned practices was preferable to the remainder, because the overall performance of the receiver must be considered, and this can only be found by comparing the input signal to the output on a quantitative basis.

True comparison as to the merits of tuning coils is only possible in sets of identical construction tested under laboratory conditions, and frequency response curves of similarly priced commercially made receivers would quickly prove which possessed the better characteristics, and equally so for input to output volume ratio measurements. Such tests are no proof, of course, that one maker's *coils* are superior to the others, for the reason given in the preceding paragraph.

Very few of these considerations weigh with the designer of coils for the home constructor. To a large extent he is unaware as to the type of receiver in which the units are to be incorporated, and hence he must be guided by the "highest radio engineering principles."

During early days the interpretation of the words in inverted commas were accepted literally in their full technical sense. A coil was not considered good unless it possessed ample physical dimensions. Circuit designs were mostly evolved on the basis of new tuning units. It was the introduction of stable types of screen-grid valves which put an end to this practice.

Screening Methods

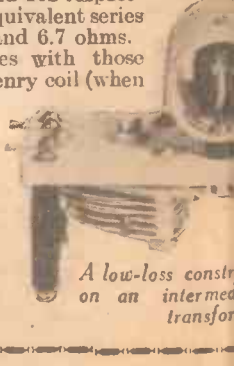
Improved screening methods in the H.F. valves themselves did away with cumbersome containers, and simple vertical metal screens, often in conjunction with copper foil baseboard overlays, were substituted.

Later, owing to improved S.G. valve characteristics, it was found possible to employ smaller coils and more compact layouts. It was at this stage of radio receiver development (about 1931) that designers commenced in earnest to "can" the coils, owing to minute H.F. leakages, or feedback, due to the increased amplification of the H.F. valves creating instability.

Considerable experimental work on air-cored units was undertaken, and data collected on the effects of coils best suited to fit in metal cans of reasonable dimensions. Early S.G. valve amplification was comparatively small, and hence large coil losses could not be tolerated. As an illustration of tests made late in 1931, a medium-wave coil of 200 microhenries, when screened (the standard is now about 157 microhenries), was wound with 87 turns of No. 28 D.C.C. wire on a 2¼in. diameter former, the turns occupying 1.9 inches in length. When inserted in a metal can 4 inches diameter by 4 inches high, and measured, the dynamic resistance was found to be 144,000 ohms at 200 metres and 70,000 ohms at 550 metres, the magnification varying between 76 and 102 respectively, and the H.F. or equivalent series resistance between 24 and 6.7 ohms.

This interesting group shows four different comm cores and co

Compare these figures with those of a similar 200 microhenry coil (when screened) wound with 106 turns of No. 30 D.S.C. wire on a 1½in. diameter former and screened in a metal can 2§in. diameter and 4 in. long. This unit exhibits a dynamic resistance of 130,000 ohms at 200 metres and 60,000



A low-loss constr on an interme transfor

CONNECTIONS—1

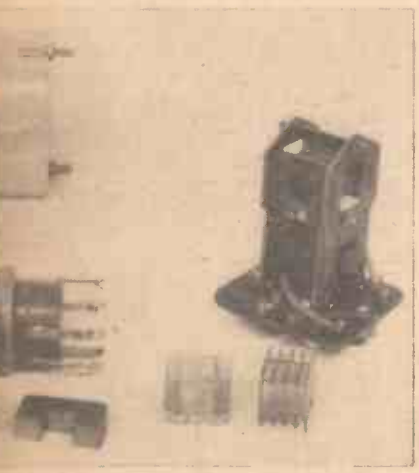
s of Present-day Tuning Coils, Discussed. By C. V. COLLE

ohms at 550 metres, with a magnification or "Q" factor of 69 to 87, and an H.F. resistance of 27 to 7.8 ohms.

Considerations of Design

The larger coil is undoubtedly superior, but its preference is questionable when the general level of efficiency is calculated at 15 per cent. more than the smaller version, whereas the screening can is over 130 per cent. larger by volume. In terms of layout, the larger coil and can occupy 12.6 square inches, and the smaller one 5.4 square inches, that is, more than two and a quarter times the area for a gain of 15 per cent.

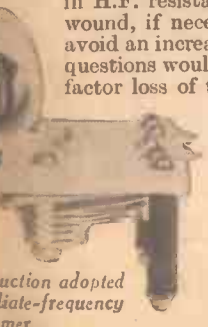
Given the same coil data to-day, there is no question but that designers would choose the smaller coil chiefly for these reasons: (1) it is possible to select an H.F. valve which would more than compensate for the



ercial coils and the method of making the iron il formers.

15 per cent. loss; (2) receiver chassis are smaller, and hence space is at a premium; (3) the smaller coil and can are more economical in materials, and hence are cheaper to manufacture.

These reasonings are purely hypothetical, as coil technicians would not accept the figures quoted as final. They would want to know, for instance, the percentage decrease in H.F. resistance by using Litz wire wound, if necessary, in bank form to avoid an increase in coil length. Then questions would arise as to the power factor loss of the former, and the insulating supports to which the coil ends are fastened.



uction adopted liate-frequency mer.

Perhaps the coil screen itself may be questioned, for it is known that the field surrounding the winding circulates as eddy currents in the metal, and too thick a material will absorb and hence increase the H.F. resistance above a level to which it is possible to reduce it.

On the other hand, a circuit designer may be satisfied with the characteristics of the smaller canned coil in question, and arrange his set on the lines indicated in (b) or (d) described in an earlier paragraph.

It may be said there is nothing revolutionary in modern coil practice, as technical and constructional data is still obtained from early formulæ. Even iron-cored coils are based on the early telephone repeater units. In what respects, therefore, do 1935-36 coils differ from their earlier counterparts?

Both arguments are unassailable, the distinction being summed up as follows: present-day coils are designed on fairly orthodox lines to include improved materials which have been the subject of specialised manufacture and rigorous tests.

These units also incorporate patented features, such as means for accurate inductance matching, and low-loss switches with trouble-free contacts.

Thirdly, they are distinguished by the fact that they are incorporated in modern circuits in conjunction with multi-electrode valves which collectively provide practically unlimited performances.

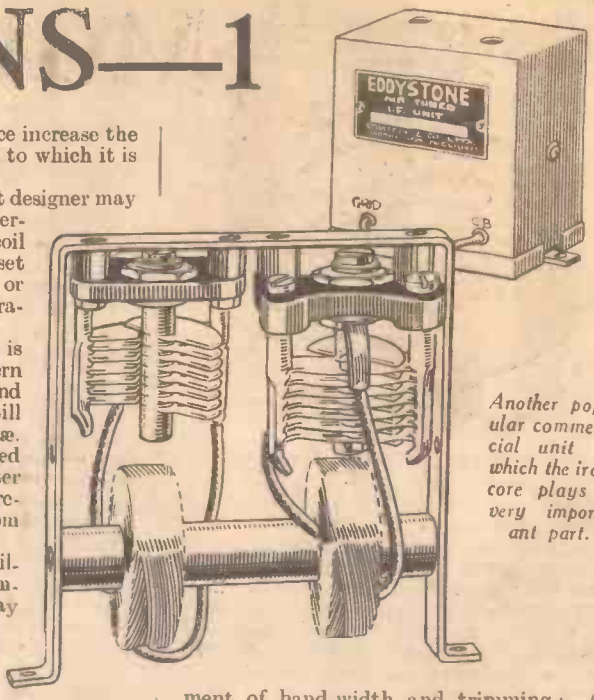
A present commercial tendency is to use iron-cored coils in simple and inexpensive receivers, including three and four-valve superhets, leaving the air-cored versions for the more ambitious superheterodyne radiograms, etc.

Tuning Units Available

For home construction purposes the following list is indicative of the classes of tuning units available: (1) Screened dual-range air and iron-cored, to cover medium and long waves; (2) Screened dual-range iron-cored, with provision for individual matching of similar units by movement of the iron cores; (3) Screened multi-range air-cored units covering from about 12 to 600 metres; (4) Plug-in short-wave coils.

There is also a minority of miscellaneous types covering unscreened dual-range for single tuned stage receivers, screened triple short-wave, and fixed single-range short or ultra-short wave composed of self-supporting copper wire coils and tubings.

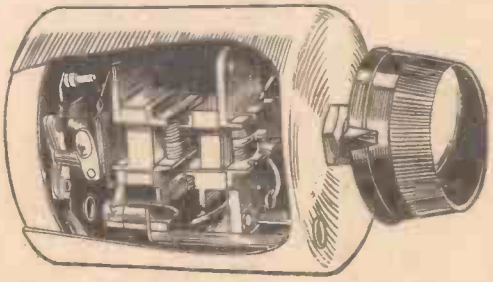
If intermediate-frequency transformers can be classified as "coils," then it is permissible to name the following types for constructors (all units being screened): (1) Air-cored, fixed separation of 8.5 to 9 kc/s, with pre-set condensers across both windings for external operation under workings conditions; (2) as in (1), but with removable cans, and provision for modifying the band-width by making one coil movable relative to the other; (3) as in (1), with fixed can but external adjustments for tuning both sections, and altering band-width within fine limits, under operating conditions; (4) Fixed iron-cored coils with external provision for capacitative adjustment of band-width and trimming; (5) Iron-cored I.F.T. unit with one coil rotatable from outside can for band-width purposes and pre-set trimmers; (6 Iron and air-cored units with trimmers externally operated and each complete unit arranged for fine manual control from the panel of the band-width, and (7) Short-wave I.F.T. units with air-dielectric trimmer condensers incorporated.



Another popular commercial unit in which the iron core plays a very important part.

Stripped Units

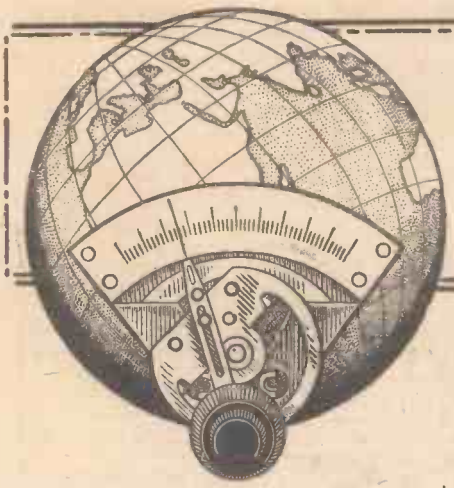
Set makers employ most of the above-mentioned types in stripped form, and these transformers in addition: (a) Fixed band-width coils wound with Litz wire and tuned with midget air-dielectric condensers; (b) Litz wound iron-cored units with variable band-width. The latter effect is often achieved mechanically by rotating or sliding one coil relative to the other, but patented electro-magnetic and capacitative systems are also employed for the same purpose.



This is an I.F. transformer having variable cores—also employing the powdered iron material.

Early I.F.T.'s were tuned to 126 kc/s; as this intermediate frequency caused internally generated harmonics of the "locals" to "fall" on the wavelengths of a number of powerful continental stations, it was superseded by 110 kc/s.

In subsequent articles we will go into the question of design and construction, and explain the various coil connections.



SHORT WAVE SECTION

FADING AND A.V.C. ON SHORT WAVES

In this Article the Writer Suggests that Short-Wave Fading Cannot be Compensated by any Existing Means, and Gives Reasons for His Assertions. You May or May Not Agree with the Conclusions Drawn.

THE serious bugbear of fading has been practically eliminated on the medium and long-wave bands, due to the application of various improved and modified systems of automatic volume control, but the same cannot be said of the short waves, unfortunately. As a matter of fact, the question of compensating for fading on short waves is an important one, and is surrounded by many difficulties, many of which cannot be appreciated until experiments are undertaken.

High- and Low-speed Fading

Before considering possible solutions of the problem let us consider the type of fading which takes place on short-wave signals, for without a knowledge of this the matter cannot be studied seriously. In the first place it must be remembered that there are two entirely different kinds of fading with which we have to contend; sometimes one particular kind is manifest, sometimes the other, and frequently both together. Normal slow fading, such as occurs on the medium waves, is not always very troublesome when use is made of a modern and highly-sensitive receiver, but high-speed fading is not only difficult to cope with, but is just as troublesome no matter what kind of receiver is employed.

Slow fading is, of course, more pronounced on short waves than on broadcast frequencies, and the strength of signals varies to a far greater extent. In fact, in many cases signal strength varies from full loud-speaker volume to inaudibility, even when using a well-designed superhet. And since all normal forms of A.V.C. function by virtue of the fact that they cause the sensitivity of the high-frequency or intermediate-frequency valves to be reduced as signal strength increases, it is evident that they can have no effect on a signal which has become particularly weak. This is a point which is frequently overlooked, despite the fact that the principle is fundamental.

Why A.V.C. is Ineffective

It can be appreciated from this that A.V.C. can never ensure anything approaching uniform signal strength on short-wave signals until, and unless, we find a means of obtaining an almost unlimited degree of H.F. amplification. There is another important point, which is that fading on short waves appears to differ from that on other wavebands in that the wavelength of the signal varies slightly, or that fading is more pronounced on one sideband than on the other—in making this statement it is being assumed that there are such things as sidebands, although a few eminent scientists tell us that there are not. Whichever of these two effects actually applies, it is a fact that signal distortion takes place at the same time as the signals fade; most short-wave enthusiasts will have observed this.

Make These Tests

We are not considering the technical reasons for fading at the moment, so it is not proposed to go more deeply into this question from the theoretical aspect, but it is suggested that readers tune to a signal that is subject to considerable fading and observe the effect of slightly modifying the tuning when fading commences. If band-spread tuning is employed, and if the low-capacity tuning condenser is provided with an accurate slow-motion control, it will generally be found that the degree of fading can be reduced by "following" the signal with the tuning control.

If the receiver is provided with a tone control, it will also prove interesting to observe the difference which this makes at varying signal intensities. There is ample scope for experiment along these lines, and it is quite likely that some reader may evolve a system of fading compensation if he is sufficiently interested to pursue experiments in this direction.

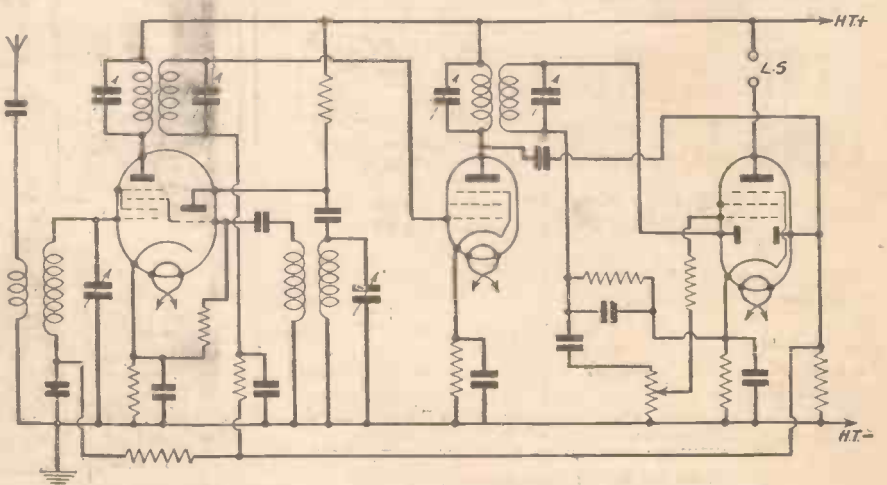
The Best Circuit

From what has been stated above it should not be concluded that A.V.C. is always completely useless on short waves, but it should be borne in mind that it cannot be as effective as might be desired. If A.V.C. is to be employed, it is a practical essential that a superheterodyne circuit should be used, and one on the lines suggested in the skeleton circuit shown on this page is probably the most satisfactory. It will be seen that a triode-hexode frequency-changer is used, this being followed by an intermediate-frequency stage working on 465 kc/s and by a double-diode pentode detector and output valve. This is the simplest possible arrangement, but it is extremely satisfactory nevertheless. It will be seen that the A.V.C. voltage is applied to both the detector portion of the first valve and to the variable-mu I.F. A somewhat better A.V.C. action may be obtained by employing two I.F. stages and applying the control voltage to three different valves, but a good deal of care is necessary in the design and construction of the set to ensure complete stability.

Rapid Fading

High-speed fading, in the experience of the writer, is not reduced at all by the use of A.V.C. On the other hand, it has often been found that the trouble is accentuated, especially if there is an appreciable "time lag" in the circuit due to the incorrect choice of decoupling condensers and resistances. As a result of this, the correcting bias voltage is often applied to the controlled valves just at the moment when the signal has attained a lower intensity, the result being a partial paralysing of the set. In other words, the fading is doubled in effect, and signal strength may easily fall to zero. It is because of this that even a well-arranged system of A.V.C. often renders reception much worse than that obtained when A.V.C. is not employed.

It has not been the intention in this article to condemn automatic volume control, but merely to show its ineffectiveness for short-wave reception.



This is a skeleton circuit of a three-valve short-wave superhet employing a triode-hexode frequency changer, and a double-diode output pentode. Component values are not given, since these are dependent upon the valves employed, and other factors.

Leaves from a Short-wave Log

THIS is the period of the year when an attempt should be made to capture transmissions from the Japanese stations, as it happens that they have recently extended their programmes. The transmitters used for the broadcasts destined to the U.S.A., or other English-speaking listeners are JVH, Nazaki, 20.55 metres (14,600 kc/s); JVM, Nazaki, 27.93 metres (10,740 kc/s), and JVN, Nazaki, 28.14 metres (10,660 kc/s); JVH works daily from G.M.T. 05.00-06.00; JVM on Mondays, Wednesdays, and Fridays from G.M.T. 21.00-22.00, and occasionally early Sunday morning (04.30-07.30); JVN is on the air daily from G.M.T. 11.00-12.00. Occasionally, JVH, JVM, or JVN test for the British Isles between G.M.T. 19.00-20.00 on Tuesday and Friday, and the transmission is sometimes relayed by JVP, 39.95 metres (7,510 kc/s). The call, *in extenso*, is: *This is the Nazaki transmitting station of the Kokusai Denwa Kaisha International Telephone Company of Japan*, and the letters are given out in the same way as adopted by amateur experimenters, namely, J (as in Japan), V (Violet), M (as in Maiden). The announcer is always very conscientious to make his meaning clear, and usually when closing down concludes with the words: *Good-bye friends.*

Philips Experimental Station

PCJ, Eindhoven (Holland), the Philips experimental station opened as long ago as April, 1927, and which has been working on 19.71 metres (15,220 kc/s), is still in possession of its old 31.28 metre (9,590 kc/s) channel, and I understand that test transmissions on this wavelength are to be resumed. It is a frequency shared with VK2ME, Sydney (N.S.W.), and W3XAU, Byberry (Pa.), the outlet of WCAU, Philadelphia, but in view of different time schedules the broadcasts should not clash.

Batavia

In addition to the Bandoeng transmissions which are coming in so well, reports are now being received of broadcasts heard from Batavia, namely, PKYDA, Tandjong Priok, one of the new N.I.R.O.M. transmitters on 49.67 metres (6,040 kc/s). It is a 10 kilowatter, and the key station of the West Java Network. The announcements are in the Dutch language, with occasionally English translations. Broadcasts have been heard in the early afternoons. Here again the channel is not an exclusive one, but also used by PRA8, Pernambuco (Brazil). In this case, however, the latter is seldom heard before G.M.T. 23.00, and is easily identified by its time signals, *i.e.* clock chimes striking at that hour, 8 p.m.

Java

To go back to Java, if you happen to be listening on roughly 15 metres in the afternoon, you will probably hear the 60 kilowatter PMA, Bandoeng, on 15.5 metres (19,350 kc/s), when it is carrying out its public telephony service with Amsterdam (Holland). It is not a broadcasting station, although you might be induced to think so by the fact that you may hear an occasional gramophone record. These musical items are put over to bridge intervals between booked calls, and help to keep the two stations in touch with each other.

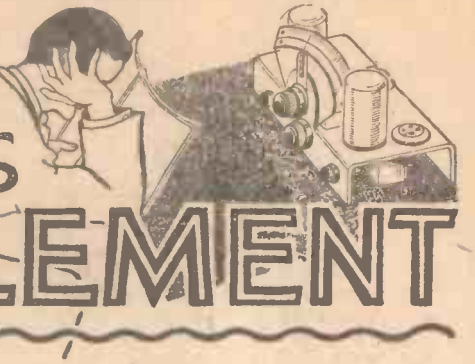
Vienna

Interval signals are sometimes misleading, inasmuch as casually tuning in to the top of the 40-metre band or so, a few evenings ago, I wrongly jumped to the conclusion that the ticking of a clock emanated from Vatican HVJ. Upon further investigation—as dial readings did not tally—I found I was listening to OER2, Vienna, which uses a metronome between broadcasts, as does the medium-wave station. The short-wave relay works on 49.4 metres (6,072 kc/s) daily except Sundays, from G.M.T. 14.00-22.00. Occasionally, it transmits a special programme for North and South America between midnight and 03.00 G.M.T. As a rule when closing down it gives a "grand good-night" in several languages.

HVJ, Vatican, to which I referred previously, has a regular schedule on 19.84 metres (15,123 kc/s) and 50.26 metres (5,968 kc/s). On the former channel Holy Mass is broadcast on Sundays at G.M.T. 10.00, and at the same hour on weekdays talks are given respectively in Italian, English, Spanish, French, and German, with, on Saturdays, a special transmission in all these languages. Again at G.M.T. 19.00 on the higher wavelength a broadcast is nightly made in Italian. The wavelength of 19.84 metres is also used for the afternoon transmission between G.M.T. 15.30-15.45. I am informed that the service is to be extended, and that other frequencies which have been allotted to this station may be used in the near future; they are 25.55 metres (11,740 kc/s), 31.41 metres (9,550 kc/s), and 49.75 metres (6,030 kc/s).

IMPROVING THE PICK-UP

BEGINNER'S SUPPLEMENT



How the Modern Pick-up is Built, and Details for Modifying Certain Parts, With Interesting Data for the Construction of a New Type. By W. J. DELANEY.

IT is not recommended that the amateur should take to pieces any piece of apparatus with which he is unfamiliar, but as the gramophone pick-up is always enclosed it is impossible to see "how it works." To many amateurs the method by which the sound grooves on a record disc are converted into currents, which may be amplified by an ordinary wireless receiver, is already well-known. Our correspondence shows, however, that there are still many listeners who use this accessory, but are not familiar with its construction and, consequently, when anything goes wrong, they are unable to effect a remedy or repair.

Fig. 1 shows the main essentials of a

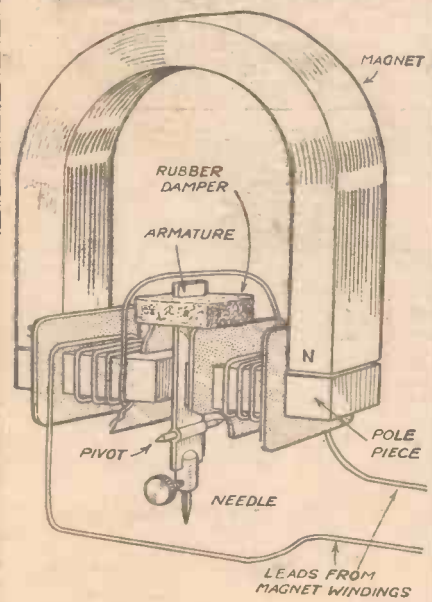


Fig. 1.—A diagrammatic view of a pick-up showing the essential features.

pick-up, although it should be understood that various manufacturers adopt different methods of construction. The main principle, however, is the same, namely, an armature is made to move between two magnetic poles. Thus, there are two important parts to be considered, namely, the armature and the magnet. The latter must be as strong as possible, and the armature must make the greatest possible movement when influenced by the grooves on the record in order to obtain the maximum signals. From this it is obvious that the pivot (if one is provided) must be free; that the length of the armature must be much greater than the needle length in order to afford a greater movement at the armature end than at the needle end; and the magnetic poles must be carefully designed.

Fig. 2.—This view of a commercial pick-up shows the armature, damping strip and other important details.

Needle Armatures

Going still further into the assembly of the armature, it will be found that the movement normally adopted cannot be permitted to cover the theoretical area as the poles of the magnet must be sufficiently close together to preserve the magnetism. The farther away they are placed the weaker will become the "field" beyond a certain distance, and thus some compromise is required. The illustration of a modern pick-up, which is shown on this page, will enable the various features to be clearly seen, as the pick-up has been partially dismantled to illustrate the following points. Firstly, the pole pieces are laminated in order to avoid losses and preserve the maximum strength across the gap, and it will be seen that the upper part of the pole piece is slotted to receive a small piece of rubber which is shown in the position it actually occupies near the armature. This piece of rubber prevents an excessive movement of the armature, and is one of the points which requires attention. This will be referred to later. To avoid distortion certain pick-ups are not provided with this armature, but rely upon the actual needle which projects between the pole faces, and thus forms in itself an armature.

Causes of Distortion

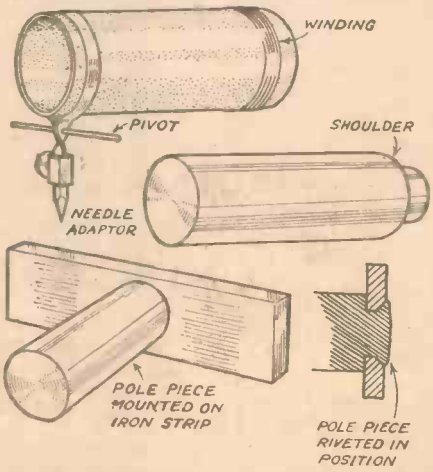
From the foregoing description it will be seen that there are several points at which distortion may occur. Firstly, the needle is clamped by means of a screw, and as this results in a metallic junction which may or may not be perfectly made, there is risk of a change in the form of movement set up by the needle point, and that carried out by the upper part of the armature. Secondly, in order to prevent chatter between the clamping-screw socket and the pole pieces, a strip of rubber is generally wrapped round the socket. (This may be seen in the illustration, Fig. 2). This rubber perishes in time, and thus restricts the movement when it becomes hard, or allows slackness to take place in the movement when it breaks or crumbles. Thirdly, the rubber damping strip at the upper end (which may sometimes take the form shown in Fig. 5) also perishes in time, and if it becomes hard it will prevent the armature from moving freely, whilst if it becomes torn (due to the needle being moved by the fingers in order to test whether or not it is free) it will allow the armature to touch the pole faces, and thus set up chatter.

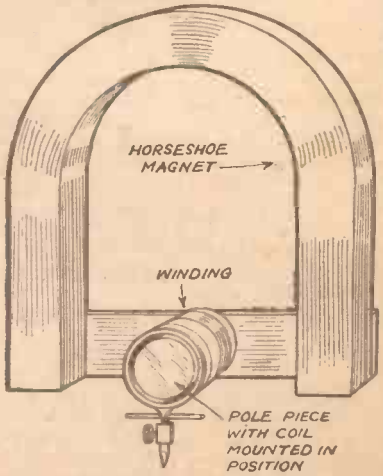
Furthermore, the armature should be centrally disposed between the two pole faces, and part of the function of the rubber-damping strips is to carry out this adjustment.

Repairing Pick-ups

If, therefore, you have had a pick-up in use for some time, or have obtained a

(Continued on facing page)





Figs. 3 and 4.—Details of the construction of an experimental pick-up and the method of assembly. This pick-up employed a moving-coil principle and gave promising results.

(Continued from facing page)

second-hand model and find that volume is poor; that distortion is present which is definitely not traceable to the amplifier; or that loud metallic chatter takes place in the pick-up, the above points should receive attention. The rubbers should be tested and, if found perished or hard, should be replaced. An improvement may sometimes be effected by using finer grades of rubber in the place of the damping pad, and for those readers who are keen on experiments, various types of rubber damper may be tried out. Do not be tempted to put vaseline or other substances on the rubber to preserve it, as various chemical reactions may be set up which may cause an electrical breakdown in the windings.

An Improved Design

To attempt to overcome some of the above troubles the writer made up a new type of pick-up, basing the design upon the modern moving-coil loud-speaker. It will be seen, of course, that the ordinary type of pick-up follows closely the lines of a moving-iron type of loud-speaker, and an attempt was made to carry still further the likeness to a loud-speaker by designing a pick-up with a moving coil in place of the iron armature. A pole piece of cylindrical form was made from an old bolt, and this was shouldered and riveted to a flat strip of iron. This was then mounted across the ordinary horse-shoe magnet, the magnetism being sufficient to hold it in position. A small cylindrical coil former was made from thin paper, and over one end was wound a small coil—exactly in the same manner as the loud-speaker speech coil. At the opposite end of the former a narrow brass strip was fixed to accommodate a needle holder, made from a steel-fibre adapter, and a suitable pivot was then attached. The idea was that the movements of the needle would cause the small coil to be moved relative to the pole piece, and, subsequently, improvements were effected by using a small length of tube to form a complete magnet pot, and finally a small energising winding was incorporated. Owing to the weight, careful counter-poising had to be adopted on the carrier arm, but the results were very promising. No doubt the keen experimenter will be desirous of carrying these experiments still further, and perhaps an improved pick-up may be produced in which a much better frequency characteristic may be obtained.

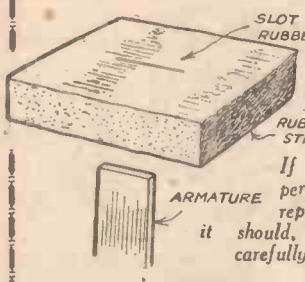


Fig. 5.—The damping strip in a commercial pick-up. If this rubber perishes it affects reproduction, and it should, therefore, be carefully protected.

Premier Supply Stores—Price Correction

Owing to a printer's error the price of the manufacturer's type Mains Transformer 500/500, 150 m.a. 4 L.T.S., advertised by the Premier Supply Stores in our issues dated December 7th and 14th, should read "19/6," not "10/6" as printed.

The Ostar Ganz "Tri-pen" Receiver

A Three-valve All-wave Receiver Kit for the Home Constructor, which Employs High-voltage Mains Valves

THE "Tri-Pen" is a constructor's kit supplied complete with valves and all components, but without a cabinet or speaker. The chassis is ready drilled and is of metal, and sockets are fitted for speaker, aerial, earth, and pick-up connecting purposes. The complete circuit is of the all-wave type, the short-wave ranges being covered by a small short-wave coil which is mounted beneath the chassis, and the broadcast bands by screened coils mounted on top of the chassis. The circuit employs three pentodes, the first acting as a variable-mu H.F. amplifier, the second as a power-grid detector, and the third in the usual output manner. An H.F. stopper is included in the grid circuit of the output stage, and coupling between detector and output is by means of resistance-capacity components. Tuning is effected by a two-gang condenser and a reaction circuit is fitted. A novelty is introduced in the connections for the pick-up which, to avoid difficulties on the short-wave bands, and to avoid extra switch complications, is included between the screening grid of the detector valve and earth.

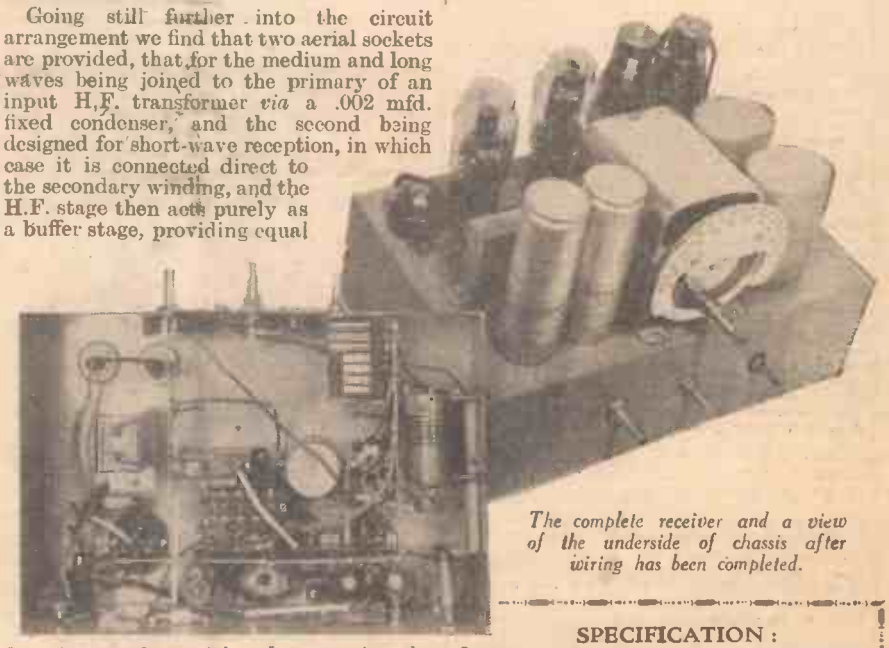
Circuit Details

Going still further into the circuit arrangement we find that two aerial sockets are provided, that for the medium and long waves being joined to the primary of an input H.F. transformer *via* a .002 mfd. fixed condenser, and the second being designed for short-wave reception, in which case it is connected direct to the secondary winding, and the H.F. stage then acts purely as a buffer stage, providing equal damping on the aerial and preventing the difficulties of blind spots, etc. The coupling between H.F. and detector stages is by the parallel-fed transformer system, with the coupling condenser provided with a separate condenser in parallel, operated by means of the general wave-change switch. The remaining details are more or less standard, and two 8 mfd. electrolytic condensers are employed for smoothing purposes in the mains section. A fuse is included in the negative mains lead which is connected to the earth terminal *via* a fixed condenser to prevent danger of short circuits or shocks with certain types of mains supply.

Results

As might be expected with three pentodes arranged in the manner indicated, the sensitivity is of a high order, and on the broadcast wavebands a really good performance is put up. Many stations may be tuned in without interference, and the reaction control is very smooth in action. The long-wave band seemed rather better on this receiver than is usually the case with most commercial receivers which employ a straight circuit, and the short waves also were very good for an all-wave type of circuit. In addition to the usual short-wave telephony stations it is possible to tune in C.W. stations by making use of the reaction control, and although a number of different types of aerial were tried no difficulties were experienced in making full use of the short-wave band.

The ranges covered by this receiver are from 19 to 60 metres, from 200 to 550, and from 800 to 2,000 metres, and a number of loud-speakers and cabinets are available for use with the kit. Full details of these may be obtained from the makers, E. J. Forbat, 28-29, Southampton Street, Strand, London, W.C.2.



The complete receiver and a view of the underside of chassis after wiring has been completed.

SPECIFICATION:

KIT: Universal three pentode 4-valve all-wave receiver.

MAKERS: Eugen J. Forbat, 28-29, Southampton Street, Strand, W.C.2.

DETAILS: An all-wave receiver for use on the electric supply mains. High-voltage valves are employed, and the receiver covers three separate wavebands. The kit is supplied with valves, but without cabinet or speaker.

CIRCUIT: H.F., detector and output stages, employing pentodes in each stage. Half-wave valve rectifier employed in the mains unit. Separate tuning circuit for short waves. Broadcast coils screened. All metal construction.

PRICE: £9 9s. complete with valves.

REPLIES IN BRIEF

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

W. J. T. (Leamington Spa).—We are not clear what type of diagram you require. You did not send any stamped envelope or P.O. for the purpose of enclosing any blueprint or diagram.

R. M. (Catterick Camp).—It would appear that the switch or leads to it have become broken. We cannot give fuller details as we have no details of the switch or receiver.

P. R. C. (Warwick).—You should adopt the throw-out aerial with your particular set. Simply attach a few yards of flex to the aerial terminal and keep this rolled up when not required. Throw it over a branch of a tree or lay it along the ground. The earth may be obtained by attaching a metal rod to a short length of wire and sticking this in the ground.

F. O. A. (Hull).—We have no details of the transformer in question. Any ratio may be used in the case you outline.

R. E. H. (Godalming).—The valve you mention is quite suitable, although the performance will not be so good as with the specified valve. You could select a lower priced valve from the Hivac or 362 lists.

S. W. (Southend).—The transformer is for Q.P.P. or Class B purposes.

J. J. M. (Cork).—The ideas you mention are quite sound and the change should still enable you to obtain a satisfactory charging apparatus.

H. G. (Spondon).—The valve should not affect the results and it would appear that there is some other circuit fault.

R. J. D. (Ipswich).—There should be no snags and we do not think you will experience any difficulty in building this receiver.

T. S. R. (Luton).—The device is simply a meter for measuring resistances and consists of an ordinary meter connected in series with the resistance and a battery. Thus you will see that an ordinary milli-ammeter may be converted by taking the current reading and dividing this into the voltage applied to the resistance. The current should be expressed in amps., or alternatively you can divide the voltage by the milliamps and multiply the answer by 1,000.

C. T. (Halgranoya, Ceylon).—The blueprint of the Superformer may now be obtained from this office, price 1s. The points you have marked on your sketch are earthing points. Wires are soldered to the metal screening braid and these are joined to the earth *via* the M.B. point, which is simply a screw or bolt through the baseboard.

H. G. (Glasgow).—The receiver could be mounted up on end, but it would not be good practice. We suggest that you employ remote controls, utilising either cord drives or bowden cables.

J. D. (Limerick).—It is not possible to help you as we are unaware of the arrangement of your wiring and the switching connections. It is quite possible that you have made a mistake in this part of the circuit, or have adopted wrong ideas regarding switching. A diagram would be necessary for us to locate the trouble.

H. H. (Nr. Dudley).—The heater supply may be sufficient, but it would be preferable to adopt the specified parts. We cannot guarantee performance unless you do this.

A. I. B. (Bristol).—The blueprint may be obtained from this office, price 1s. The coil for the set you mention is not now obtainable, but any good modern coil could be used in its place.

S. C. (Market Rasen).—The trouble is undoubtedly instability, and it may be due to the H.F. choke or chokes. Short-circuit these temporarily and see if the whistling stops. Although decoupled, the values may be inadequate and we would suggest that you increase both the capacities of the condensers and the values of the resistances. Also attend to the layout.

C. F. W. M. (West Norwood).—Any good radio dealer should be able to carry out the adjustment, but if you cannot find anyone near you to do the work, send to the National Radio Service Co., Alfred Place, Tottenham Court Road, London, W.C.

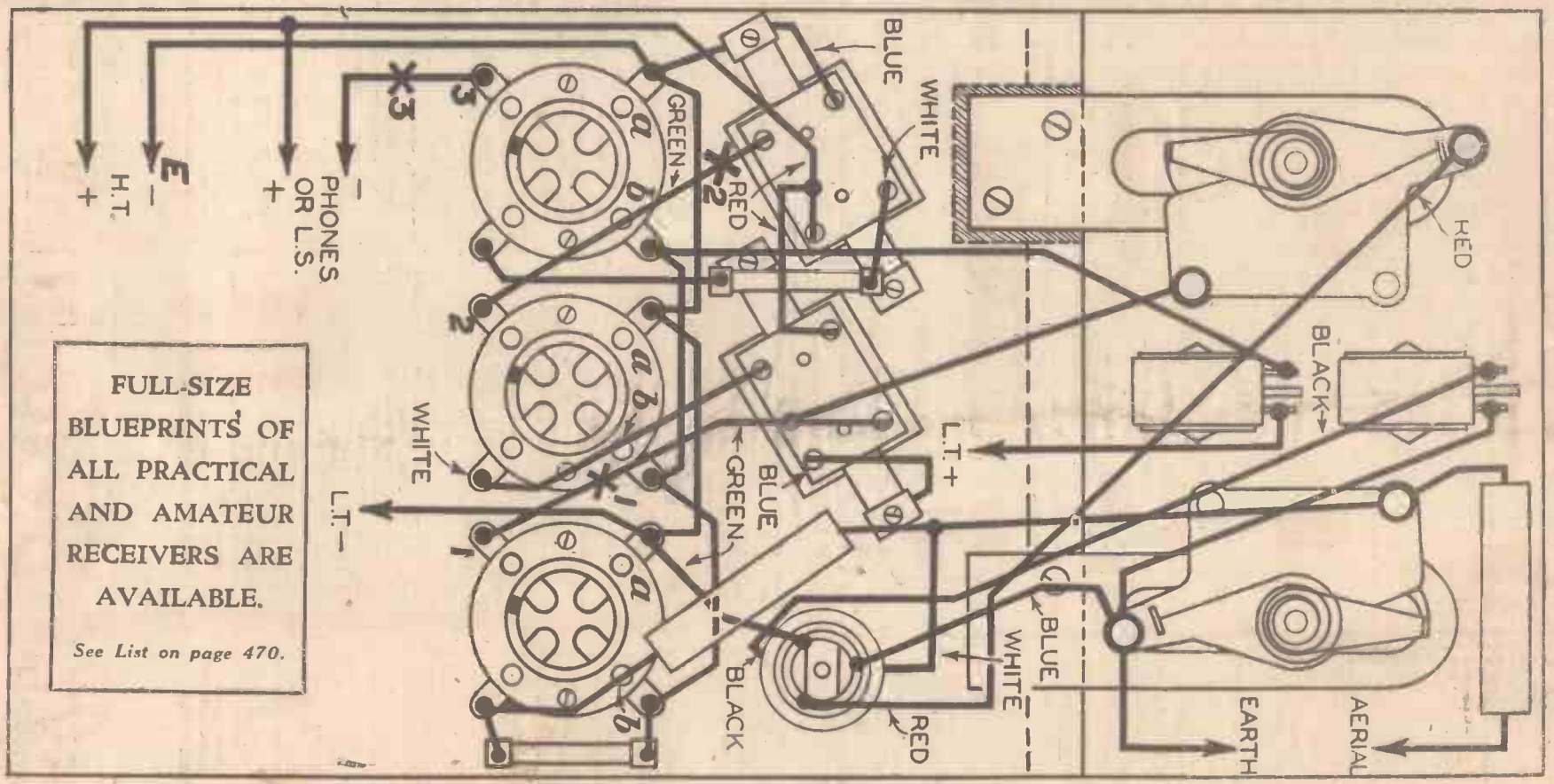
F. C. (Tuam).—Any good modern valve may be used in the receiver in question. The combination is S.G., detector, and pentode and you may use any valve in this heading, selected from a modern valve list. Q.S.L. cards are obtained from transmitting amateurs, and an article dealing with the subject was given in our issue dated July 20th, 1935.

M. H. G. (Clydebank).—Any good modern coils could be used, and most manufacturers supply a diagram showing the circuit diagram and giving terminal identifications. Thus it should be quite simple to incorporate the coils in the circuit.

L. P. (Swansea).—There were two or three circuits designed by the engineer you name, and further details would be necessary to enable us to identify the set and supply you with the correct blueprint number.

R. G. L. (Leyton).—We have published no details of a circuit employing the particular coil combination you mention.

Practical and Amateur Wireless SERVICE DATA SHEET No. 13 FOR THE CAMEO MIDGET THREE



FULL-SIZE BLUEPRINTS OF ALL PRACTICAL AND AMATEUR RECEIVERS ARE AVAILABLE.

See List on page 470.

Approximate Voltage Readings

Voltmeter —to E.

„ +to 1=43 volts.

„ +to 2=42 volts.

„ +to 3=42 volts.

„ across a and b=2 volts.

Approximate Current Readings

Milliammeter connected at × 1=1 m/A.

„ „ „ × 2=1½ m/A.

„ „ „ × 3=1½ m/A.

Approximate Resistance Readings

Coils

Ohmmeter connected across Red and Green leads= 6 ohms.

Ohmmeter Connected across White and Blue leads = 15 ohms.

„ „ „ White and Black leads = 4 ohms.

L.F. Transformer

Ohmmeter connected across Red and Green leads = 700 ohms.

„ „ „ Blue and White leads = 2,000 ohms.

LETTERS FROM READERS

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

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

Avoiding L.T. Problems

SIR,—The suggestion of your correspondent, John V. Burt (Dundee), in a recent issue, that dry cells (bicycle-lamp batteries) be substituted for the L.T. accumulator, is of the very first importance, and I feel sure that any elucidation of the subject by PRACTICAL AND AMATEUR WIRELESS readers would be greatly appreciated by a large number of other readers.—A. GILMAN (Aldershot).

Short-wave Club for Carshalton

I SHOULD very much like to join a radio club that deals with short-wave transmitting, and would like to hear if you know of one in or near my district, or failing this perhaps one of your many readers living in my district, with the same idea in mind, would like to get into touch with me.—E. W. TAYLOR (Carshalton).

[*Perhaps local readers would get into touch with us.*—ED.]

Telsen Blueprints

SIR—I see in your paper for September 7th, 1935, an inquirer, W. C. (Chorley) in "Replies in Brief," asking for Telsen receiver blueprints. I have two of "Telsen Radiomag" and four of last blueprints published by Telsen, and I would be pleased to supply the above inquirer with same if you could put this person in touch with me. I am a regular reader of your valued and interesting paper, and I shall be glad to help any other readers if possible.—V. DUCKWORTH (Moss Cottage, Brindle, Chorley).

Brutal Tests

SIR,—I noted with interest your paragraph entitled "A Shock-proof Receiver," inserted on your "Facts and Figures" page, PRACTICAL AND AMATEUR WIRELESS, July 27th, 1935, it recalling similar experiences of mine. Firstly, whilst employed as service-maintenance mechanic for Messrs. Wigfalls and Son, I was called out to a receiver and repaired the volume control and the wave-switch in the scullery. I was carrying the receiver back into the room for re-installation when I tripped over a mat. The receiver fell on to a concrete floor, the result being the cabinet smashed and speaker "knocked-out," but upon testing the electrical portion of the receiver found to my surprise that everything regarding results was O.K. After its insertion into a new cabinet we heard no further complaint for about twelve months, and then only a faulty valve TDD4. Secondly, I remember our van door flying open and a set falling out. This suffered no injury except cabinet badly damaged; truly remarkable, considering that the valves were out of their sockets and our speed at the time was well over 20 m.p.h. Remembering these incidents, I was called upon to demonstrate a Cossor 341, and somehow or other I let the above facts slip to my prospective buyer, whereupon he challenged me to drop the Cossor 341, and if it played after such treatment he would purchase it, whether cabinet was damaged or not. I removed the valves and let it fall, my customer purchased it, we heard no complaint up to my leaving; the incident happening a little over twelve months ago. Accidents, it seems, prove better than actual tests although such would never pass the approval of "wireless men."—A. HAYCOCK (Wakefield).

Some Short-wave Tests

SIR,—Somewhere about June, 1935, I could no longer read about short waves without feeling that I must build a set in order to receive just a few stations and thus be able to say that I had tried my hand at S.W. work, and found it easy. I did not want to spend much money, so I decided on a "o-v-o Reinartz" circuit. For the tuning condenser I used an 11-1 S.M. .0003 mfd. air-spaced condenser, with a .0003 mfd. fixed condenser in series to give .00015 mfd. For the reaction a .00012 mfd. condenser is used. The coils were wound on lengths of cardboard postal tubes (about 2½in. in diameter). All three coils were wound with 22 D.C.C. copper wire. No terminals were used, but instead suitable lengths of wire were left in order to connect direct to the necessary points, such as valve-holder, condensers, etc.

The reaction turns were close wound and the others space wound. The valve used was a Mullard PM1LF.

For the first test I used a flex earth and a flex aerial. Two G.B. batteries were used as H.T. One morse station received! (No reaction breathing could be obtained.) Also the noise of cars was noticed as they passed.

In the second test I received four or five morse stations, and one or two telephony stations. Several weeks later I again had a chance to try the set. This time I got a German station, Zeesen (49.83 m.), Daventry (49.586 m.), and also several other stations.

During the next test I received several amateurs on the 7 megacycles band, including G5RX, G2RF, G2RS, and PA0EO.

Referring back to my set, the reaction in most places goes in with a plop or an equally bad noise. There are several dead spots, but these are cured, in most places, with a pre-set or a piece of wire twisted round the aerial lead-in, in the usual manner. For receiving Australia I connected the aerial direct to the aperiodic coil and applied about 60 volts H.T. to the valve. Even so it was weak and had to be kept in tune by means of my hands! I have not received America. Perhaps this is because I do not do any listening after 22.15 hours.—J. M. GAYE (Ipswich).

Special Spanish Transmission

SIR,—I hope the following will be of interest to short-wave listeners, and again I should be grateful to you if this could be inserted in your weekly paper for those interested in short-wave reception.

I have received a *special transmission pamphlet from station* EA8AB, Radio Club, Tenerife, which will be broadcast on 41.60 *metres*, *1st transmission, December 21st*, G.M.T. 20.15 to 21.15. (1) Lady of Spain; (2) La Dolores; (3) Bohemios; (4) Suspiros de Espana, up to eleven pieces of music.

2nd transmission, G.M.T. 24.30: First part: (1) Lady of Spain; (2) Invitation to the Waltz, up to six pieces of music. Second part: Selections of Spanish and American music. Third part, December 22nd, G.M.T. 2.45: (1) Lady of Spain, up to twelve pieces of music. Closes down with Spanish National Hymn, December 22nd, G.M.T., five hours.

I may state that I have their official card for July 6th, 1934.—T. W. Moss (Exeter).

CUT THIS OUT EACH WEEK.

Do you know

—THAT the changing of a signal into one of lower frequency in a superheterodyne receiver increases the percentage separation.

—THAT the current-carrying capacity of fixed resistances may be doubled by using two identical values in parallel.

—THAT the above point is explained by the fact that the current is automatically halved and thus each resistance is dealing with only half of the total load.

—THAT it is often advisable to employ the S.G. output on a small mains battery eliminator for the detector stage, and to feed the S.G. from a potential divider.

—THAT the above arrangement is essential where reaction is difficult to control.

—THAT variable wire-wound components should not be employed in an anode circuit owing to the risk of noise which will be amplified by succeeding stages.

—THAT the decoupling condenser in an H.F. indirectly-heated S.G. or pentode valve should be returned direct to the cathode, and not to the earth line.

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

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

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

New Mullard Receiver

DETAILS are now to hand of three new receivers from Mullard. All are housed in upright walnut cabinets and have full-vision dials. The first is the MB4, an efficient 4-valve battery receiver, particularly designed for high-quality reproduction. The four Mullard valves employed are: V.P.2, S.P.2, P.M.2DL, and P.M.2BA. These valves, in conjunction with Litz wire coils wound on special low-loss formers, ensure high sensitivity and selectivity. The full-vision dial is calibrated for simple and accurate tuning by means of a single tuning knob—with no auxiliary control. Other features include alternative aerial tapping, a novel wave-change indicator, and gramophone pick-up sockets. The price, complete with all batteries, is £9 12s. 6d.

Mullard M.B. 3A is a well-designed 3-valve receiver of low battery consumption, employing the following Mullard valves: V.P.2, S.P.2, and P.M.22A—a pentode in each stage. As in the case of the M.B.4, the coils are of Litz wire wound on low-loss formers. The L.F. stage is R.C. coupled, fully utilising the high gain of the pentode detector. An accurately matched moving-coil speaker gives true-to-life reproduction. Full-vision dial, single knob tuning, and novel on-off switch and wave-change indicator. Gramophone sockets are also provided. Price, with all batteries, is £8 8s. 0d.

Mullard M.U.35 is an efficient super-heterodyne receiver for all homes wired for electricity—built for A.C. mains; can also be used on D.C. The following Mullard valves are incorporated: F.C.13, V.P.13A, 2D.13A, H.L.13, Pen.26, and U.R.I. Band-pass H.F. coupling is used, and the I.F. stages are so designed that the highest degree of efficiency is obtained. Mains interference is eliminated by means of filters; delayed automatic volume control gives freedom from fading; and a control is included for the suppression of inter-station "background noise."

Wearite Uni-Gen Coil

THE Wearite Universal coil was a very popular low-priced coil of the screened air-core type and had a good application to the simpler types of receiver. It was used, readers will remember, in our Leader series of receivers. This coil was improved by the makers and a tapping point was provided on the primary winding, in which form it was known as the Type A coil, and this also received considerable popularity among home constructors. After some further experiment Messrs. Wearite have carried out even greater improvements in the design of this particular coil, and it is now available in the form of the Uni-Gen coil. The overall dimensions are slightly smaller, but in general the coil has a similar appearance to the original Universal coil. The windings are now differently disposed and the Type A method of windings has been adopted, with the primary winding tapped. The coil has been tested and found to be a considerable improvement on the Universal or Type A coil, and it has been embodied in our Centaur receiver. It has been found that the primary winding may be included in full on the medium-wave band without the necessity of short-circuiting a portion, and the results then are still very good. This arrangement avoids the difficulty of obtaining a suitable switch when two or more coils are employed. To obtain maximum performance, however, a multi-point switch should be used so that both primaries and secondaries may be shorted for medium-wave reception. Messrs. Wearite can supply a switch for the purpose. The coils cost 5s. each, and when tuned with a .0005 mfd. condenser cover a waveband from 200 to 550 metres and from 800 to 2,100 metres.

Celestion Speakers

LISTENERS who require a large type of speaker for use with a powerful amplifier will be interested in the Senior Celestion model shown below. This is known as the Universal 9, and is fitted with a 7½in. cone, and has the new ring magnet which gives improved field strength. The speaker may be used with any type of output stage, three terminals being fitted so that a centre-tap may be adopted for push-pull and similar stages. The matching of the output stage is carried out by the adjustment of a small knob, seen at the bottom of the speaker chassis, and this is rotatable to provide high- or low-resistance windings. The various positions are indicated by letters on the upper portion of the slot in which this knob travels, and by figures on the bottom of the slot, and thus it is easily possible to obtain duplicate settings when the adjustment has to be changed. The method adopted for obtaining contact in this switch avoids open-circuiting and the knob may be moved from one position to another without breaking the anode circuit. The speaker is substantially made and gives a very even response. It provides a good signal even with a two-valve receiver, and on a test it handled 5 watts without any signs of distress. The price of this speaker is £2 15s.

The Senior Universal Celestion Loud-speaker.

RADIO CLUBS AND SOCIETIES

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

THE CROYDON RADIO SOCIETY

LOUD-SPEAKER night meant a large attendance for the Croydon Radio Society, on Tuesday, December 3rd, in St. Peter's Hall, Ledbury Road, South Croydon. Mr. W. J. Bird presided, and welcomed Mr. E. Remington, this being that official's first visit since his accident. In charge of members' speakers was Mr. J. A. Delves-Broughton, assistant technical adviser, and he used an amplifier, built on the paraphase system, as well as an H.F. unit designed by Mr. L. C. Irvine. Both these had been constructed specially for this meeting.

On Tuesday, December 17th, the hon. secretary, Mr. H. G. Salter, is giving his musical programme on records. It is non-technical, and PRACTICAL AND AMATEUR WIRELESS readers are invited to what is expected to be a very enjoyable musical evening. Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

INTERNATIONAL SHORT-WAVE CLUB (MANCHESTER CHAPTER)

A MEETING of the above club was held on Tuesday, November 26th, at "The British Legion Club," Long Street, Middleton, when a very interesting lecture was given by the chief engineer of Messrs. Clarke's Atlas Radio Co. on "Testing Receivers and Components." Meetings will be held on January 7th and 21st, 1936, at the above club. This is the leading short-wave radio society in the district and all readers of PRACTICAL AND AMATEUR WIRELESS are invited to attend. Full particulars of the club can be obtained by enclosing a 1½d. stamp to the Hon. Sec., H. Wild, 1, Elm Street, Middleton, Lancs.

CATALOGUES RECEIVED

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

"THE WIRELESS AND GRAMOPHONE TRADER YEAR BOOK AND DIARY"

THE 12th annual edition of "The Wireless and Gramophone Trader Year Book and Diary," just published, contains so much information and reference data appertaining to radio and gramophone trading, that it seems to be indispensable to every radio and gramophone trader. New features included in this edition give a Summary of the Television Report and an article describing the principles of Television. The popular Valve Reference Tables have been revised completely and are right up to date. Diagrams are also given of British and American Valve Base Connections. 1935/6 Receiver Specifications (with valve types and resistance values for extra speakers) list 400 sets by fifty-four British manufacturers—a complete guide to the current market. Technical, legal, and general commercial information has been revised, and includes every up-to-the-minute item of value in everyday trading.

In the Directory Sections, the Buyers' Guide arranges alphabetically some 200 classes of goods together with suppliers' names. The Trade Directory provides 1,200 addresses of manufacturers and wholesalers, with their telegraphic and telephonic details. 1,300 proprietary names of radio and gramophone products are alphabetically listed.

Other matters dealt with include the legal aspect of radio trading, licences, the public performance of gramophone records, electrical interference, mains voltages in over 1,000 places and districts, and servicing information.

A very practical Diary for 1936 (one week at opening) is provided.

"The Year Book" is priced at 5s. 6d., but subscribers to any "Trader" publication can obtain their copy for 3s. 6d. The book is obtainable from the publishers, The Trader Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1.

WEARITE A.C. SUPERHET

MESSRS. Wright and Weaire, Ltd., of 740, High Road, Tottenham, N.17, have just issued a handy constructional chart giving details of their new three-valve A.C. Superhet Receiver, Model 354. The chief features of this receiver include a triode-hexode frequency-changer fed by a band-pass input circuit, the output from this valve feeding an I.F. amplifying stage operating on 110 kc/s. The output from this stage is fed to the two diodes of the output valve, one of which provides the bias voltage for automatic volume control, the other diode providing the audio-frequency signal for feeding to the grid of the pentode section of the output valve. A valve rectifier is used in the power unit, and the loudspeaker field provides the inductance necessary for smoothing. Half full size above and below wiring diagrams are given on the chart on the back of which the theoretical circuit diagram is given, together with a list of parts, prices, and constructional notes.

IMPRESSIONS ON THE WAX

By T. ONEARM

Decca Records

THERE have been hundreds of songs about roses, and Campoli has selected six that have withstood the test of time and weaved them into an entrancing record—*Decca F*5770. The songs included are "The Wedding of the Rose," "Rose in the Bud," "Moonlight and Roses," "Love's Garden of Roses," "Mighty Lak' a Rose," and "Roses of Picardy." Hill-Billy songs are becoming increasingly popular and the latest of these, "Boots and Saddle," appears in Decca's list for this month, attractively played by Ambrose and his Orchestra, coupled with "The King's Navee" on *Decca F*5794.

There is scarcely anyone who does not know at least one or two tunes by Chopin. Reginald Foort, on the mighty Wurlitzer Organ at the Paramount Theatre, New York, gives a selection of the popular works of Chopin on *Decca F*5776.

H.M.V. Records

THE December list of "His Master's Voice" records includes many world-famous artists, such as Caruso. Kreisler, Gigli, to name but a few, as well as some amusing Christmas records.

It is some years since Kreisler made new records and an interesting example of the great progress made in electrical recording is afforded by his re-recording of the Mendelssohn Violin Concerto. The former set was issued in the comparatively early days of electrical recording and took seven sides (with a fill-up for the eighth). Now one has the Concerto complete on six sides, which marks still another advance from the purchaser's point of view. The orchestral part is played by the London Philharmonic Orchestra with Sir Landon Ronald conducting. The numbers of the records are *H.M.V. DB*2460-2 (Connoisseur List).

Fun for the Party

THERE is excellent fun in Marriott Edgar's latest creations. One concerns the Battle of Hastings when King Harold sat "on 'is 'orse with 'is 'awk in 'is 'and"; the other describes the incidents culminating in the signing of the Magna Charta ("Thro' the 'ole in 'is 'elmet"). They are extremely funny and are recited by the author, Marriott Edgar, on *H.M.V. C*2793.

Leonard Henry and Company give a complete pantomime of Cinderella on *H.M.V. C*2798, and Norman Evans, the Lancashire comedian, continues his history of the Ramsbottom Family with "Joe Ramsbottom's Concert" and "Auntie Ramsbottom's Visit" on *H.M.V. BD*302.

Co-optimist Memories

WE are reminded what a clever crowd the Co-optimists were by a selection of "Memories," sung by favourites of to-day. No jazz, just straightforward tunes and clever lyrics, sung by Olive Groves, Effie Atherton, Webster Booth and Stuart Robertson on *H.M.V. C*2800.

Other vocal selections include "1066 and All That," by members and orchestra of the Strand Theatre—*H.M.V. C*2804—and the best numbers from "The Desert Song," sung by the Light Opera Company.

FREE ADVICE BUREAU

COUPON

This coupon is available until December 28, 1935, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 21/12/35.

Practical and Amateur Wireless
BLUEPRINT SERVICE

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

PRACTICAL WIRELESS.

STRAIGHT SETS. Battery Operated.

	Date of Issue	No. of Blueprint
One-valve : Blueprints, 1s. each.		
All-Wave Unipen (pentode)	14.10.33	PW31A
Two-valve : Blueprints, 1s. each.		
All-Wave Two (D, Pen)	—	PW28
Four-range Super Mag. Two (D, Pen)	11.8.34	PW36B
Three-valve : Blueprints, 1s. each.		
Bijou Three (SG, D, Pen)	29.10.32	PW5
Argus Three (SG, D (pen), Pen)	12.11.33	PW6
Solo Knob Three (D, 2 LF (trans.))	10.12.32	PW8
Selectone Battery Three (D, 2 LF (trans.))	—	PW10
Alpha Q.P.P. Three (D, Q.P.P.)	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag Three (SG, D, Q.P.P.)	25.3.33	PW15
Three-Star Nicore (SG, D (SG), Pen)	24.6.33	PW24
Auto-B Three (D, LF, Cl. B)	—	PW27
F.J.C. 3-valve A.V.C. (Transfer Print) (SG, D, Pow.)	—	PW32
Sixty-Shilling Three (D, 2 LF (R.C. & trans))	2.12.33	PW34A
Leader Three (SG, D, Pow.)	3.3.34	PW35
Summit Three (HF Pen, D. Pen)	18.8.34	PW37
All-Pentode Three (HF Pen, D (pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow.)	—	PW41
Hall-Mark Cadet (D, LF, Pen (R.C.))	23.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector Pen)	17.8.35	PW53
Battery All-wave Three (D, 2 LF (R.C.))	31.8.35	PW55
Four-valve : Blueprints, 1s. each.		
Fury Four (2 SG, D, Pen)	—	PW11
Beta Universal Four (SG, D, LF Cl. B)	15.4.33	PW17
Radiopax Class B Four (SG, D, LF, Cl. B)	27.5.33	PW21
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push Pull)	2.2.35	PW46
F. J. Camm's Superformer (SG, SG, D, Pen)	12.10.35	PW57
Five-valve : Blueprints, 1s. each.		
Superset (SG, SG, D, LF, Cl. B)	—	PW26

Mains Operated

Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (pen), Pen)	22.4.33	PW18
A.C.-D.C. Two (SG, Power)	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow.)	29.4.33	PW19
Three-valve : Blueprints, 1s. each.		
Mains Express Three (SG, D, Pen)	8.10.32	PW3
Double-Diode-Triode Three (HF Pen, D.D.T., Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	15.7.33	PW25
A.C. Three (SG, D, Pen)	16.9.33	PW29
A.C. Leader (HF Pen, D, Power)	7.4.34	PW35C
D.C. Premier (HF, Pen, D, Pen)	31.3.34	PW35B
Iblique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"Allwave" A.C. Three (D, 2 LF (R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	31.8.35	PW56
Four-valve : Blueprints, 1s. each.		
A.C. Quadpack (SG, SG, D, Pen)	2.12.33	PW34
A.C. Fury Four (SG, SG, D, Pen)	25.2.33	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	10.2.34	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47

SUPERHETS.

Battery Sets : Blueprints, 1s. each.		
Supersonic Six (Six valve)	—	PW16
Premier Super (Five valve)	23.9.33	PW30
£5 Superhet (Three valve)	—	PW40
F. J. Camm's 2-valve superhet (two valve)	13.7.35	PW52
Mains Sets : Blueprints, 1s. each.		
Luxus A.C. Superhet (four valve)	14.10.33	PW33
A.C. £5 Superhet (three valve)	—	PW43
D.C. £5 Superhet (three valve)	1.12.34	PW42
Universal £5 Superhet (three valve)	15.12.34	PW44

SHORT-WAVE SETS.

Two-valve : Blueprints, 1s. each.		
Midget Short-wave Two (D, Pen)	15.9.34	PW38A
Three-valve : Blueprints, 1s. each.		
Empire Short-wave Three (D, 2 LF (R.C. and Trans)	—	PW7
Experimenter's Short-wave Three (SG, D, Power)	23.9.33	PW30A

PORTABLES.

Three-valve : Blueprints, 1s. each.		
Atom Lightweight Portable (SG, D, Pen)	2.6.34	PW36
Four-valve : Blueprints, 1s. each.		
Featherweight Portable Four (SG, D, LF, Cl. B)	6.5.33	PW12

MISCELLANEOUS.

S.W. Converter-Adapter (1 valve)	23.2.35	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

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

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.		
B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG, Det, Pen)	17.6.33	AW392
Iron-core Two (D, Trans)	—	AW395
Iron-Core Two (D, Q.P.P.)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
Family Two (D, Trans)	—	WM278
Three-valve : Blueprints, 1s. each.		
8 Radiogram (D, RC, Trans)	—	W343
P.T.P. Three (Pentode-Triode-Pentode)	*June* '35	WM389
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF Pen, D, Pen)	14.4.34	AW431
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	—	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June*, '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.B. Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378
Four-valve : Blueprints, 1s. 6d. each.		
65/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four	*Mar.* '35	WM384
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (2SG, D, LF, Class B)	*Nov.* '33	WM340
Class-B Quadradyne (2SG, D, LF, Class B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379

Mains operated.

Two-valve : Blueprints, 1s. each.		
Consolectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Three-valve : Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF, Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	*Nov.* '34	WM374

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

SPECIAL NOTE

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

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

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

Universal Circuit Fuse

"I am building your Universal Ubique receiver, but wish to fit some form of protection in the heater circuit to prevent damage to the heaters which might occur due to a short circuit. What is the best protection which I can fit to this particular circuit?"—I. H. (Crewe).

THE heater circuit may be protected by including a special .2 amp. fuse bulb in the heater circuit. It will take its place in the ordinary series wiring, including it preferably between the barretter and the output pentode. This is the positive lead, and consequently, when mounting the fuse-holder on the chassis (which is in direct connection with the negative side of the supply) great care must be taken to avoid a short circuit across the supply, and insulated leads and adequate protection of the fuse-holder terminals must be taken.

Detector By-pass

"Can you tell me why the fixed condenser is sometimes placed between the detector anode and L.T.? I believe this is the same as a differential condenser, but I am not certain what advantages this confers."—G. U. (Enfield).

H.F. currents are present at the anode of a detector valve, and to prevent these from passing to the L.F. circuits it is customary to include an H.F. choke in the anode circuit. If this performs its designed function it will prevent the passage of H.F. currents, but these cannot be left at the anode and must be provided with a leakage path to earth. Thus, a fixed condenser is included between anode and earth. It is sometimes assumed that the reaction circuit (*via* the reaction condenser) offers this alternative path, but when the condenser is at minimum there is insufficient capacity to act in the designed manner. A differential condenser is employed so as to maintain a constant capacity between anode and earth. In the ordinary arrangement, when the reaction condenser is at minimum the by-pass capacity is that provided by the fixed condenser, and the reaction condenser is in parallel with it, thus providing a variable by-pass capacity as it is adjusted for reaction purposes.

Using an Energised Speaker

"I am thinking of building the A.C. Superhet 4. Can I incorporate a mains energised speaker (6,500 or 7,500 ohms) in place of the specified model?"—S. J. P. (Enfield).

THE usual position for an energised speaker field is in the H.T. positive line, where it provides smoothing for the H.T. supply. The total anode current of the Superhet 4 is in the neighbourhood of 55 m/A. You could not, therefore, include your speaker field in the positive line in view of the large voltage drop which would be obtained. There is no other point in this circuit where sufficient energising current could be passed to provide sufficient field-strength to enable you to use the speaker. Furthermore, as we are continually pointing out in our pages, we cannot give instructions for using alternative components in our circuits.

Tantalum Strip

"Having been looking through some back numbers of your paper I have decided to make a trickle charger, but am unable to obtain the tantalum strip. Can you give me the address of a firm from whom I shall be able to obtain this material?"—W. F. (Northampton).

THE tantalum strip may be obtained from Messrs. Blackwell's Metallurgical Works, Ltd., Speke Road Works, Garston, Liverpool.

Crystal Sets

"I am experiencing difficulty in obtaining crystal set units. Can you supply me with the address of one known to you?"—A. C. E. (Paulsgrove, Cosham).

CRYSTAL detectors may be obtained from various sources and your local dealer should be able to supply one. Ex-Government detectors and other similar types may be obtained from Electradix Radios, 223, Upper Thames Street, London, E.C. Messrs. National Radio Service Co., of Alfred Place, Tottenham Court Road, W.C., can supply a complete crystal receiver.

Transformer Windings

"I am building a transformer for charging and similar purposes. I require varied outputs and should like to know whether it is possible to arrange for tapping points without having various unwanted ends or windings in the air. I wish to avoid losses and obtain various current ratings."—G. T. (Hull).

YOU do not give exact data and we are therefore rather at a loss for a suitable reply. However, it is quite permissible to design the secondary in several sections and to take a terminal to each end of each section, so that they may be included in series or in parallel.

A Faulty Condenser

"I have built a mains receiver but experienced terrible hum. After some careful tests I found the following peculiarity, which I am at a loss to explain. I wonder if you can see through it. When all valves are out of their sockets, and the rectifying valve is left in, I switch on with a milliammeter in the H.T. negative lead. There is an immediate high current reading, which gradually falls back to a reading of 15 milliamps. I have examined every part of the circuit thoroughly but there is no potentiometer or resistance across the H.T. positive and negative leads and I cannot see where the current comes from."—F. W. (Harrow).

IT should not be difficult to explain this trouble. We imagine that you are using electrolytic condensers for H.T. smoothing, and when switching on the initial high current is due to the leakage current of the electrolytics, plus an additional amount of current caused by a leaky or defective condenser. When the voltage has been applied for a very short time the current should fall to an extremely small value (dependent upon the leakage current of the electrolytics) and the fact that it remains at 15 m/A indicates that one of the condensers is faulty.

Variable-mu Modification

"I am using a circuit which is practically identical with your original Fury Four receiver. I have obtained great satisfaction from this during the years in which it has been in service, but now wish to obtain new H.F. valves. I am thinking of getting variable-mu S.G. types to avoid the expense of new valve-holders required for pentodes, and should like to know the cheapest and simplest way of incorporating the variable-mu control."—G. Y. (Winchester).

THE simplest method of introducing the control is to connect a small fixed condenser between the grid of each H.F. valve and the tuned circuit now joined to it. From the grid a grid leak should be connected to the arm of a volume control potentiometer, and this should be connected across the G.B. battery.

The coupon on page 469 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

PREMIER SUPPLY STORES

OFFER the Following Manufacturers' Brand New Surplus Goods at a Fraction of the Original Cost. All goods guaranteed perfect. Carriage paid over 5/-; under 5/- postage 6d. extra; I.F.S. and abroad carriage extra; orders under 5/- cannot be sent c.o.d.

PLEASE Send 3d. Stamp for Large New Illustrated Catalogue, also December Bargain Supplement.

WORLD Famous Continental Valves, mains type 4/6 each H.L., L.; screen-grid; variable mu screen grid; 1, 3 and 4 watt A.C. output directly heated pentodes; 250-volt 60 m.a. full wave rectifiers, V.M.H.P., D.D.T., diode tetrodes; A.C., D.C. types, 20 volts, 0.18 amp., filaments; screen grid; variable mu screen grid; H., H.L., power and pentodes.

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

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

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

RELIABLE Soldering Irons, 200-250 volts, 2/6, consumes 0.2 amps.; super type, 3/9.

PREMIER Short-wave Tuning Condensers (S.L.F.), complete, ceramic insulation, silver sprayed, brass vanes, noiseless pigtail, 0.00015, 0.00016, 0.0001, 2/9; double spaced 0.00005, 0.000015, 0.000025, 3/- each.

BRASS Reaction Condensers (S.L.C.), with integral slow-motion, 2/9; mica condensers, 0.00002, 0.00005, 6d.

PREMIER Short-wave Coils, with circuit, 4- and 6-pin type, set of 4, 13-170 metres, 7/-; for either type; Lowloss formers, 4- and 6-pin ribbed, 1½in. diameter, 1/-; short-wave valveholders, 4-, 5- and 7-pin chassis type, 6d.

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

MAGNAVOX Moving Coil Speakers, 6 volt fields, handles 5 watts, 12/6. State transformer required.

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

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

BLUE SPOT 29 P.M. Moving Coil, multi-ratio transformer, 15/-; handles 4 watts; Sonochorde ditto, ideal for battery sets, 10/6.

ELIMINATOR Kits.—120v. 20 m.a., 20/-, trickle charger, 8/- extra; 150v. 30 m.a., with 4 v. 2-4 amp. C.T., L.T., 25/-, trickle charger 6/6 extra; 250v. 60 m.a., with 4v. 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a. with 4v. 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER L.T. Charger Kits, input 200-250v. A.C., output 8v. ½ amp., 14/6; 8 v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Truspeed Induction Type, A.C. only, gramophone motor, 100-250v., 30/-; ditto D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 100-250v., high quality pick-up and volume control, 45/-; motor only, 30/-.

EDISON Bell Double Spring Gramophone Motors, including turntable and all fittings, 15/-.

WIRE-WOUND Resistances, 4 watts, any value up to 50,000 ohms, 1/-.

MAGNAVOX Speakers.—144 Magna, 25/-; 152 Magna, 37/6; 154, 12/6; 152, 17/6; all 2,500 ohms. Energising kits, 10/-; permanent magnet, 7in. cone, 16/6; permanent magnet, 9in. cone, 22/6; state transformer required; all other types in stock.

AMERICAN type, 250 valves, 9 watts, in push-pull; matched pairs, 9/-.

12-2,000 metres, without coil changing. Lissen All-band 2-gang screened coils, for screened grid H.F. stage (tuned), screened grid detector type receiver, circuit supplied, giving complete details, 12/6.

BRITISH-MADE Meters, moving iron flush mounting 0-10, 0-15, 0-50, 0-100, 0-250 milliamps, 0-1, 0-5 amps., all at 6/-; read A.C. and D.C.

1,000 Ohm 150 milliamp., semi-variable resistance 2/-; 1,000 ohm, 250 milliamp., tapped for any number 0-18 valves, 3/6; 800 ohms 350 mA., tapped, 2/-.

COSMOCORD Pick-ups, with arm and volume control, wonderful value, 10/6; super type, 12/6.

THE following lines 6d. each or 5/- per dozen: 4-, 5- or 7-pin baseboard or 4-, 5- or 7-pin chassis mounting valve holders, American valve holders, 1-watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 3 amp., 2- or 3-point switches, Cyldon double trimmers, 6 yds. Systoflex, 1, 1.5, 2 or 2.5 mm. 1 yd. 7-way cable, 9ft. resin cored solder, 6 yds. push-back connecting wire, 2in. knob.

ELECTROLYTIC Condensers.—T.C.C. 8 m.f. 550v. 4/-, 15 m.f. 50 v. 1/-, 15 m.f. 100v. 1/-; 50 m.f. 12v. 1/-; Dubilier 4 or 8 m.f. 500v. 3/-; 8 plus 4 500v. 4/-, 50v. 50 m.f. 1/9, 12 m.f. 20v. 6d.; U.S.A. 4, 8 or 12 m.f. 550v. 1/9, 100 m.f. 12v. 1/3; 8 plus 4500 v. 2/3, 4 plus 4 2/-, 8 plus 8 2/6. Paper condensers. Dubilier 4 m.f. 500v. working, 4/-; ditto, 700v., 5/-; ditto, 800v., 6/-; Western Electric, 250v. working, 1 mf. 6d., 2 mf. 1/-, 4 m.f. 2/-.

CONDENSER Blocks, 6 m.f. 2/-, 10 m.f. 3/-, 8.5 m.f. 2/6; 250v. working, various taps.

POTENTIOMETERS by Best Manufacturers: 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg., 2/-; 5,000, 10,000, 15,000 with mains switch, 2/-.

PREMIER Mains Transformers, all have tapped primaries, C.T., L.T.s and engraved terminal panel; combined H.T.8 and H.T.9, 2 L.T.s 10/-; rectifier, 8/6 extra; H.T.10. 2 L.T.s, 10/-; rectifier 9/6 extra; 250 plus 250, 60 m.a., 3 L.T.s, 10/-; 350 plus 350, 150 m.a., 3 L.T.s, 12/6.

HIGH GRADE Push-Pull Input Transformers, 4/6. High grade Intervalve Transformers, 3/6.

BAKELITE Reaction Condensers 0.0001, 0.00035, 0.0005, 9d.; Pre-set condensers, any value, 6d.

SHORT-WAVE Ribbed Formers, 4- or 5-pin valve holder fitting, 3 x 2½, 1/-.

BRITISH Radiophone Screened Down Lead, 20 feet. 3/6; Cossor Class B input and output transformers, 2/6 each.

BRITISH Wirewound Potentiometers, 10,000 plus 50,000 ohms, with mains switch, 1/6.

CLARION Moving Light Slow Motion Dial, with 2in. knob, for short waves, 2/-; Simplicon, full vision drive, 2/-; Utility, disc drive, 1/6.

B.T.H. Moving Coil Speakers, 8in. pentode transformer, 1,500 ohm or 7,500 ohm, 8/6.

KOLSTER-BRANDES Moving Coil Speakers, 1,500, 2,000 or 2,500 ohms, 7in. diameter, 7/9.

PREMIER All Brass Short-Wave Condensers, 0.00015, integral slow motion, 3/9; British Radiophone, all brass 2-gang condensers, 0.00015, 5/-; Ormond 0.00025 O.K., for short waves, 1/6; Polar all-brass 0.0005 slow motion, 3/11; Lissen 2-gang 0.0005, front trimmer, disc drive, 5/11; Utility 3-gang, fully screened trimmers, disc drive, 7/6; American 3-gang with trimmers, 3/-.

LISSEN 3-gang Superhet Coils, 6/-; iron core coils, with circuit, 2/11 each; Varley band-pass aerial coils, B.P.5 type, 2/9; ditto band-pass transformers, B.P.8, 2/6; H.F. chokes, Premier, screened, 1/6; Premier short-wave, 9d.; manufacturers' type, 6d.

LISSEN 3-gang Bandpass Coils, complete with switching, 6/11. Complete circuit supplied.

PREMIER Smoothing Chokes, 25 m.a. 20 henrys, 2/9, 40 m.a. 30 henrys 4/-, 60 m.a. 40 henrys 5/6, 150 m.a. 40 henrys 10/-; 60 m.a. 80 henrys, 2,500 speaker replacement, 5/6.

PREMIER Auto Transformer, 10/200-250 and vice versa, 100 watt, 16/-, 50 watt 7/-.

MANUFACTURERS' Type Mains Transformers, 350/350 120 m.a., 3 L.T.S., 10/6; 500/500 150 m.a., 4 L.T.S., 19/6.

PREMIER Super Public Address Amplifier, incorporating the new 6B5 valve (see "Wireless World," July 15), 10-watt model, all A.C., enormous gain, phase inversion, £7/7, with valves; 20-watt model, 10 guineas; suitable speakers in stock. Microphones, 3-guinea model with stand and transformers, single button type, 19/6; Western Electric type on base with transformer, 4/6.

TELSEN 5-1 Radiogram Transformers, 2/9; 1-1 coupling unit, 2/9; Class B driver, 2/9.

RELIABLE Morse Keys with Code Engraved on Base, 2/-. Reliable Headphones, 3/6 per pair.

SPECIAL Offer.—Set of 3 short-wave coils, 4-pin type, covering 14-150 metres, with circuit, 4/-.

PREMIER SUPPLY STORES

20-22, High St., Clapham, S.W.4 ('Phone: Macaulay 2381), and 165, Fleet St., E.C.4 (next door to Anderton's Hotel). 'Phone: Central 2833.

CRYSTALS.—Russells genuine Hertzite, complete with super crystal circuit, 1/2, post paid.—Radiomail, Tanworth-in-Arden, Warwickshire.

HEADPHONES.—Brown, Siemens, Ericsson, B.T.H. G.E.C., etc. 2,000 ohms, 2/6 pair; 4,000 ohms, 5/-; ditto, new, 5/- and 7/6, Special Brown, Type "A," 1,000, 2,000, 4,000 ohms, 15/-. Telefunken, 4,000 ohms, 7/6. Satisfaction guaranteed. Postage 6d.—Kodesh, 56, Barnsbury Street, London, N.1.

RESISTANCES, 1 dozen good sizes, 1 watt metalised, 1/6; 2 mfds. 1,000v. Helsby, 3 for 2/-; screened H.F. chokes, 1/-. Post Free.—FLEMING, 115, Ridley Road, E.8.

STAR Microphones complete with Circuit and transformer, 3/6; Western Electric Microphones (list, 21/-), 1/9; transformer to match, 1/3.

B.T.H. 2,500 ohms Speakers, 7/9; Mazda Power Valves, 3/-; Polar 2-way Short-wave Coil Holders, 9d., and 500 clearance lines. Catalogues 3d. each. All the above items, Post Free. J. Bearfield, 105, Upper Street, London, N.1.

RADIO CLEARANCE,

63, HIGH HOLBORN, W.C.1.

Tel. :—HOLBORN 4631.

Owing to increase of business we have found it necessary to remove to larger and more spacious premises at Number 63, High Holborn. All orders in future should be sent to this address.

"SPECIAL" "SPECIAL"

57/6 31 ONLY.—LISSEN 7-VALVE SUPERHET SKYSCRAPER CHASSIS, complete with Valves, aerial tested.

105/- 4-VALVE A.C. SET, 200/250 Volts, by well-known proprietary manufacturer. Mullard Valves, Moving-coil Speaker, Band-pass Tuned, in handsome Walnut Cabinet, brand new, boxed. H.P. terms can be arranged on application.

115/- 4-VALVE UNIVERSAL A.C./D.C. SET by well-known proprietary manufacturer. Mullard Valves, Moving-coil Speaker in handsome Walnut Cabinet, brand new, boxed, A.C. or D.C. 200/250 Volts. H.P. terms can be arranged.

32/6 LISSEN SKYSCRAPER 3-VALVE BATTERY CHASSIS, aerial tested with Valves.

21/- LISSEN SKYSCRAPER BATTERY CHASSIS, aerial tested, less Valves.

135/- CROSSLEY EUROPEAN 7 A.C. SUPERHET. Amazing 7-Valve American Superhet. 3 Watts Output, Sensitivity Control, Noise Suppressor, Pick-up connections, etc. An amazing bargain. 5 only in stock.

2/6 LISSEN 2-VOLT BATTERY VALVES, L.F. Metalized, brand new, boxed.

4/6 LISSEN 2-VOLT CLASS B VALVES, brand new, boxed.

4/6 LISSEN 2-VOLT PENTODES, brand new, boxed.

3/- LISSEN 2-VOLT POWER VALVES, Type P220, brand new, boxed.

10/11 LISSEN RECTIFYING UNITS for working D.C. Moving-coil Speaker off A.C. Mains, complete with U650 Rectifying Valve in sealed cartons.

4/6 L.F. CHOKES, 20 Henries 100 Mills.

3/6 BRITISH RADIOPHONE 2-GANG SHORT-WAVE CONDENSERS, .00016 per section all-brass vanes on Steatite base.

5/11 UTILITY 3-GANG CONDENSERS, Midget Type Straight or Superhet with 110 k/c Section fully screened.

2/11 BRITISH RADIOPHONE 3-GANG SUPERHET CONDENSERS with 110 k/c Oscillator Section, unscreened. Wonderful bargain.

2/6 8 MFD. AND 4 MFD. ELECTROLYTIC CONDENSERS by well-known manufacturers, 450 Volt working 500 Volt Peak, brand new.

6d. DRILLED METAL CHASSIS, 3 and 5-Valve Type.

4d. 1 WATT RESISTANCES, all sizes, by well-known manufacturer.

3d. TUBULAR CONDENSERS, all sizes up to .1.

4/6 LISSEN HANDSOME WALNUT TABLE CABINETS with provision for Speaker, cut out front made for Lissen Band-pass 3 Kits. A wonderful bargain.

3d. 5-PIN PLESSEY CHASSIS MOUNTING VALVE-HOLDERS.

2d. PLESSEY 4-PIN CHASSIS MOUNTING VALVE-HOLDERS.

1/6 LISSEN INTERVALVE SMOOTHING CHOKES, 60 Henries at 60 Mills, brand new, boxed. List price 7/6.

10d. LISSEN H.F. BY-PASS UNIT. List 5/6, brand new, boxed.

1/11 LISSEN CENTRE-TAPPED OUTPUT CHOKES, brand new, boxed. List price 7/6.

2/11 LISSEN 3-GANG SUPERHET COILS mounted on base complete with Switch, unscreened.

1/6 BLOCK CONDENSERS, 4+2+1 Mfd., 350-Volt Working.

1/- BLOCK CONDENSERS, 1+1 350-Volt Working.

HIVAC VALVES. Complete range in stock. Send for Lists.

1/- 4 MFD. POST OFFICE TYPE MAINSBRIDGE CONDENSERS, 250 Working Voltage.

RADIO CLEARANCE,

63, HIGH HOLBORN, W.C.1.

Tel:—HOLBORN 4631.

BIRMINGHAM RADIOMART

W. NIGHTINGALE (G5NI)

ANNOUNCES

quality goods at lowest prices consistent with a square deal.

RADIOMART.—Bargain parcel value 30/-, containing binocular HFC, 4 750v. test condensers, 6 resistances, 4 valveholders, .0003, .0005 variable, electrolytic condenser, etc., 5/-. Traders' parcel, £4/10/0 value, 10/-.

RADIOMART.—Garrard new Gramotors, double spring, 12/6, single 7/6. Handles, 1/6. Soiled turntables, 1/6 extra.

RADIOMART.—Non-inductive condensers by leading makers, T.C.C., Dubilier, etc., 0.5, 0.25, 0.1, 0.02, 0.005, 3d.

RADIOMART.—Condensers by world's finest manufacturers, ¼in. or ⅜in. shaft, 3-gang, 4-gang, 3-gang superhet, 1/11.

RADIOMART.—Astounding offer electrolytic condensers, world-famous maker, 4+4 mfd. (separate) 500v. working, 1/6.

RADIOMART.—Genuine 15/6 Frost potentiometers, wire-wound, tapered, 10,000 ganged to 50,000 ohms, 1/6.

RADIOMART.—Lissen 2-gang coils, 12-2,000 metres, switched and screened, nothing else required to convert SG3 to all-wave, 12/6.

RADIOMART.—Lissen 3-gang bandpass superhet coils, 4/6; 3-gang bandpass Tuned grid, 6/11. All with circuits.

RADIOMART.—Amplion, 3/6; screened H.F. choke, 1/11. Iron-cored binocular, screened, 2/3. Climax binocular, 1/3. Telsen, 1/11.

RADIOMART.—Utility 2-gang .0005 Uniknob with large disc drive, 3/11. Ditto, single, with disc, 2/3.

RADIOMART.—Lissen 30hy., 40 ma., chokes, 2/-; 20 hy., 100 ma., 2/11. Lissen eliminator chokes, 1/3.

RADIOMART.—Igranic tapered potentiometers ½-meg., 1-meg. with 3-point switch, 2/-. Centralab, ½-meg., 1/6.

RADIOMART.—2 gross roundhead woodscrews assorted, 9d. Solder tags, 6d.; resincore solder, 9ft., 6d.

RADIOMART.—Pushback connecting wire, ready tinned and sleeved, 6yds., 6d. Heavy, for heaters, 9d.

RADIOMART.—Screened iron-cored selective dual-range coils, with reaction; circuit diagrams, 2/11.

RADIOMART.—Non-inductive tubulars, 1,500 v., 0.01, 0.02, 0.04, 0.05, 0.1, 6d.; 0.2, 0.25, 8d.; 0.5, 9d.

RADIOMART.—Lissen 6-way battery leads, with plugs, 6d. Belling-Lee safety mains plug and socket, 6d.

RADIOMART.—Insulated terminals, Belling-Lee, black, Telsen, red, black, 1d. Telsen 0.0003 presets, 9d.

RADIOMART.—Transformers: Igranic parafeed; manufacturers, push-pull, all 1/11. Electric Soldering Irons, 2/6.

RADIOMART.—Fuses, Telsen ½-amp., 1-amp., 3-amp., 2d. Telsen, 100 ma., 2d.

RADIOMART.—Telsen latest differentials, .0003, 1/3; .00015, 1/-. Radiogrand transformers, 3/6.

RADIOMART.—Special. Four assorted Telsen grid-leaks, 5d.; twelve various wire-ended resistances, 2/6.

RADIOMART.—Milliammeters; flush 2½in., 5/9; 2½in., 6/9. All ranges above 25 m.a.

RADIOMART.—T.C.C. bias electrolytics, 50 mfd., 50 v., 1/9; 25 mfd., 25 v., 1/3; 15 mfd., 100 v., 1/-; 6 mfd., 50 v., 6d.

RADIOMART.—Caution: Beware of coilforms, etc., moulded in cheap bakelite. Our coils and formers are guaranteed efficient.

RADIOMART.—4-pin interchangeable short-wave coils; set 3. Cover 15-100 metres, latest ribbed former, 7/9.

RADIOMART.—1½in. ribbed short-wave coil forms; valveholder type, loloss, 4-pin, 1/6. 6-pin, 1/9. Threaded for winding, 2d. extra.

RADIOMART.—Utility 8/6 microdisc dials, fitted famous micro high reduction, only perfect short-wave dial, 3/11.

RADIOMART.—Short-wave H.F. chokes, 9d. *Wireless World* states: "Very efficient—100 to below 10 metres."

RADIOMART.—Utility microvariables 15, 40 mmfd., 1/-; 100 mmfd., 1/6; 465 kc/s litz wound I.F.'s, 5/6.

RADIOMART.—Radiophone super ceramic insulated short-wave condensers, .00016, 4/6; series gap, 5/-.

RADIOMART.—Continental A.C. valves, 4/6, VMPT, HPT, VMSG, ACSG, ACH, ACHL, PT4. Most American types, A.C.Pen., 5/6.

RADIOMART.—2 v. types, H.F. detector, L.F., 2/3; LP2, P2, 2/9; Supower, 3/3; VMPT, HPT, 5/6; Class B, 4/6; S.G., VMSG, 5/-.

RADIOMART

Orders over 6/- post free. Enquirers must enclose stamp.

Catalogues; general catalogue gives hundreds of bargains; short-wave illustrated catalogue also gives diagram of efficient transmitter and receiver; each 1½d. Pair 3d., post free.

THE SQUARE DEALERS

19, John Bright St., 22, Summer Row; mail orders: 44, Holloway Head, Birmingham. Telephone: Midland 3254

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

SOUTHERN RADIO'S WIRELESS BARGAINS. ALL GOODS GUARANTEED NEW AND SENT POST PAID.

SPEAKERS.—Blue Spot 1935 Series, with Universal Transformers to match any circuit. 99 P.M., 24/6; 45 P.M., 20/-; 32 P.M., in exquisite cabinet, 42/6 (List, 87/6); 22 P.M., in attractive cabinet, 28/6; Mains Energised 2,500 and 6,500 Ohms, 14/6; Celestion Soundex Permanent Magnet, 11/-; Telsen Permanent Magnet Speakers, 16/-; Telsen Speaker Units, 2/9.

LISSEN KITS, ALL NEW IN SEALED CARTONS AND COMPLETE. With Specified Valves. Lissen Skyscraper 3-Valve Battery Kits, 42/- each (List, 77/6.) Lissen BAND PASS 3-Valve Battery Kits, 62/6 (List, 99/6). Lissen ALL-WAVE Four-Valve Battery Kits, 65/-. (List, £5/12/6).

DEEMARK SHORT-WAVE ADAPTOR KIT. Complete with all accessories for adapting set for 14-150 Metres, 20/-. Superhet Short-Wave Convertor Kit, 20/-.

MULLARD M.B.3 THREE-VALVE BATTERY SETS (Decontrolled). Complete with 3 Mullard Pentode Valves. Permanent Magnet Speaker Batteries and Accumulator. Contained in handsome walnut cabinet, £5/7/6 (List, 8 guineas). In original sealed cartons.

HOUSE TELEPHONES. A SPECIAL BARGAIN. BRAND NEW ONE-HAND TELEPHONES. Complete on stand, with or without Automatic Dials. Cost £4 each to manufacture, 10/- each.

ELIMINATORS.—Regentone 1935 Series. A.C. Mains, 200/250 volts, Type W5a, complete with trickle charger, 39/6; WIa (less trickle charger—carries 30 milliamps), 33/-; WIc (less trickle charger), 30/-. All in sealed cartons.

CONDENSERS.—Lotus 0.0005. Fully screened, with trimmers, escutcheons, dials and knob. 3-gang, 11/-, 2-gang, 7/3. DYBLOCK SINGLE 0.0005, complete with all accessories, 4/-. TELSEN SINGLE VARIABLE CONDENSERS, 0.0005, 2/3; Plessy 4-gang Superhet, fully screened with trimmers, 7/3. Igranic, 1 mfd., 1/3, 2 mfd., 1/9.

COILS.—Igranic Superhet, Coil, set of four (1 Osc., 2 I.F. with Pigtails, 1 I.F. plain), 9/- per set (List, 50/-). Varley Square Peak Coils, B.P.5, complete, 2/3. Telsen Iron-core Coils, W349 midget size, 4/6 each.

THE following Telsen Components in original sealed cartons at sacrifice prices:—

ACE I.F. TRANSFORMERS.—5/1, 2/9; Binocular H.F. Chokes, 2/-; Standard Screened H.F. Chokes, 2/-; ACE MICROPHONES (P.O.) with Transformers, 5/- each. This Microphone can be used with any radio set and is a very efficient article.

AMERICAN VALVES.—A full range of valves for all American sets at 7/- per valve.

SOUTHERN RADIO BARGAIN PARCELS.—We are offering the following parcels of mixed components at a fraction of their value. The items comprise up-to-date Radio parts, new and perfect, which are too varied to be advertised individually:—

5/- PARCEL.—Contains modern components valued at 20/-, including Resistances, Condensers, Coils, Wire, etc. Circuits of modern Receivers included with each parcel.

20/- PARCEL.—This is known as the "small trader's" parcel, and contains a wonderful selection of components valued at 85/-. We have supplied this parcel to hundreds of Traders for re-sale at a profit.

SOUTHERN RADIO, 323 EUSTON ROAD, LONDON, N.W.1 (near Warren Street Tube). 'Phone: Museum 6324.

SOUTHERN RADIO Branches at 271-275, High Road, Willesden Green, N.W.10; 46, Lisle Street, W.C.2. All Mail Orders to 323, Euston Road, London, N.W.1.

WOBURN RADIO CO., offer the following lines:—

SHORT WAVE CONDENSERS with slow and fast motion, .0001, .00015, .00016, .0002, .0003, .0005, 2/- each. Ormond two-piece dial for same, 1/-. Short Wave Coils, 13-22, 20-44, and 40-90 metres, plug in type, 4 pin, 2/3; 6 pin, 2/6. S.W. Chokes, 10-100 m. 100. Pye S.W. valve-holders, 6d.

ELECTRIC SOLDERING IRONS, 200/250 v., complete with flex and adaptor, copper bit, guaranteed, 1/11. Post 6d. Heavier quality, 2/11, post 6d. Erie resistances, all values to 4 meg., 6d. each.

WESTINGHOUSE H.T.8 and 9, 8/11. Dubilier, 8mfd. 500v. dry electrolytics, 2/9. Tubular condensers, .1, .01, .02, 6d.; .25 and .5, 9d.; .001 to .0005, tubular, 6d. J. B. Aeroplane dials with escutcheon, 3/11; square type, 4/6.

ROLA P.M. SPEAKERS, 7in. cone, with power and pentode transformer, 16/6, postage 1/-.

W.B.C. ELIMINATORS. A.C. Model, 21/-; A.C. with trickle charger, 32/6. Delivery ten days.

TRADE enquiries invited. Send trade heading and stamp for list.

WOBURN RADIO CO., 9, Sandland Street, Holborn, W.C.1.

GRAVES' IRON CORED COILS COST 2D. EACH — SEE LAST WEEK'S ADVERT.

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THE following unused set manufacturers' Surplus; all goods guaranteed perfect; immediate delivery.

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WESTINGHOUSE rectifiers, HT8, 9/6. HT9, 10/-, HT10, LT5, LT4, 10/9. Regentone transformers for HT8 or HT9, with 4v. 4 amp. LT winding, 7/-. Eliminators, first-class make. Outputs 150v. 25 ma., SG and Detector. AC type with Westinghouse rectifier, 25/-. AC type with .5 amp. trickle-charger, 30/-. DC type, 12/6.

DUBILIER or TCC dry electrolytic condensers 8 mfds. or 4 mfds., 500v. working, 50 mfds., 50v., 200 mfds., 10v., 3/3. 50 mfds., 15v., and 15 mfds., 100v., 2/3. 50 mfds., 12v., 2/-. TCC type "M" condensers, any value up to .001 mfds., 6d. Erie resistances, 1 watt type, 7d., 2 watt, 1/2, 3 watt, 1/9. Send for comprehensive list.

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VALVES. By well-known manufacturers. Complete range of Battery, A.C. Mains, Rectifiers. Brand new stock with six months' guarantee. 2 volt. Detector, 2/3; Power, 2/9; Screen Grid, Pentode, H.F. Pentode, 5/-. Write for other prices to: Dulci Electrical Co., Ltd., 7, Lizard Street, London, E.C.1.

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BANKRUPT BARGAINS. List free. All new goods. Amplion 5v. A.C. Superhets, listed 12 gns., for 8 gns. Mullard MB3 battery sets and MU35 6v. mains sets highest exchange offers. Ferguson all-wave 6v. junior £6/10/0, Senior £7/10/0; 8v. 7 watt output 11 gns. All above sets with maker's guarantee. Celestion energised speakers 8in., 10/6. Celestion new 8in. PM type, 16/6; Soundex, 10/6. Truphonic 5v. 10 gn. battery superhet, 7 gns. All types of replacement valves. F.C., S.P., V.P., American types, rectifiers, Battery H.F. pentodes. Write for quotations Very large stock of components. Transformers, 1/6; Dual coils, 1/4; .0005 Telsen condensers, 1/8; 2, 3 and 4-gang condensers, 3/-; Resistances, 6d. All the small parts. Six years advertiser. Get a straight deal with Butlin, 143B, Preston Road, Brighton. 'Phone: Preston 4030. NOTE.—New address early in New Year: Park View, 6, Stanford Avenue, Brighton. (50 yards from old address.)

30/- SHORT-WAVE CONVERTER-ADAPTORS. Guaranteed. Descriptive leaflet free. S.W. KITS, 20/-.—Bennett Television Co., Redhill.

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WANTED, good modern radio sets, parts, etc. spot cash paid; exchanges; bring or send.—University Radio, Ltd., 142, Drummond Street, Euston, London, N.W.1.

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