SECOND COMBINED ISSUE OF "Practical Wireless" & "Amateur Wireless"

Practical and Amateur Wireless

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EVERY WEDNESDAY
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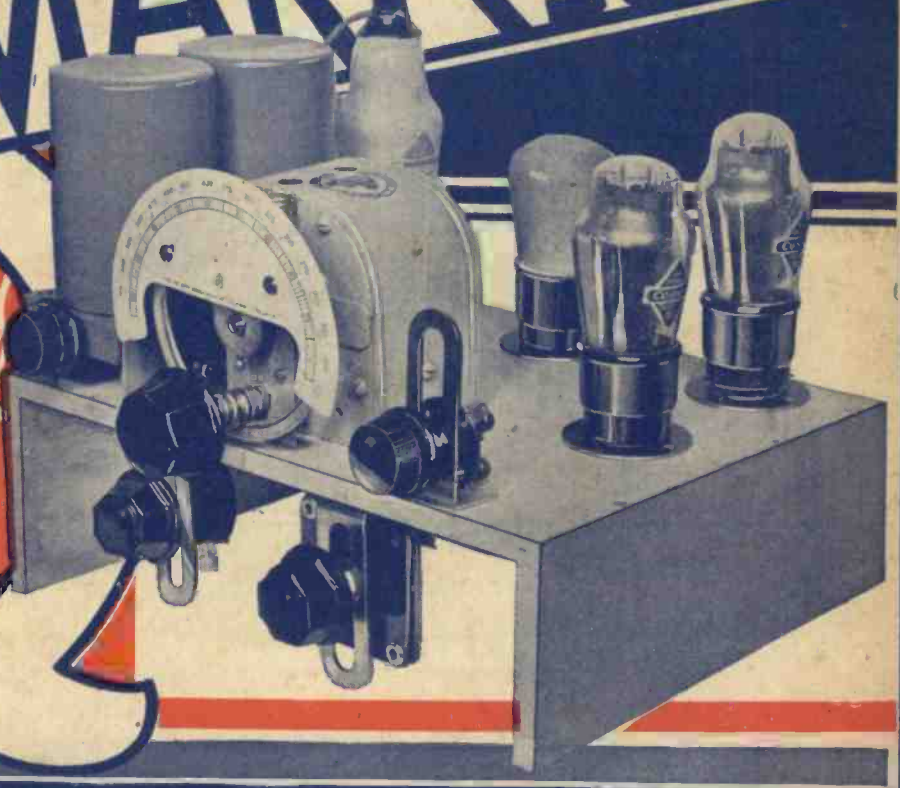
The Push-Pull "HALF-MARK" Series

A.C. Battery and Universal Models



CIRCULATES IN EVERY COUNTRY IN THE WORLD !

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. V. No. 124. FEB. 2nd, 1935.

ROUND *the* WORLD *of* WIRELESS

Our Second Combined Issue

THIS is the second combined issue of those two famous journals, "Practical Wireless" and "Amateur Wireless." Just as we go to press we learn that the first issue is completely out of print, and letters from the readers of both papers are pouring into these offices bearing messages of congratulation on our important amalgamation, which, coming as it does in what promises to be the most important period in the history of wireless—for television is imminent—provides a most powerful force in radio journalism, destined to play a vital part in the perfecting of the new science.

This journal has, during the whole of its career, enjoyed a world-wide reputation. It circulates and is keenly read in every English-speaking country in the world. More, its contents have been translated and published in practically every country in the world!

An Enlarged Short-wave Section

And so "Practical and Amateur Wireless" will lead the way in the short-wave field. In anticipation of the turn which television developments are likely to take, last year we produced a valuable handbook dealing in a popular way with all of the branches of this fascinating new hobby—we refer to our "Television and Short-wave Handbook," many thousands of copies of which have been supplied to our readers. The publication of this book was, indeed, timely, for it is quite obvious that television and short waves will go hand in hand.

It is with especial pleasure, therefore, that we announce as from next week's issue a greatly-increased short-wave section, informative, up to date, and attractively illustrated.

The short-wave section of this journal has always been a popular and keenly-read feature—the best, in fact, in radio journalism; but the needs of this branch of radio telephony have rapidly outgrown the space allocated to it. So we are providing it next week with ampler quarters, enabling our Short-wave experts adequately to deal with all branches of it.

Owing to the Growing Importance of Short-wave Radio, we take pleasure in announcing that as from next week's issue, the Short-wave Section of "Practical and Amateur Wireless" will be developed and enlarged.

A Twenty Hour Day!

THE German high-power long-wave station has extended its transmissions, and is now on the air on most days from G.M.T. 05.00 until 01.00 the following morning. Cologne, Frankfurt, and Stuttgart are now also late birds, and many nights weekly may be heard working long past midnight.

100-Kilowatter for Manchukuo

THE Manchuria Telegraph and Telephone Company has installed a high-power station at Hsinking, the capital city of the new Kingdom of Manchukuo. So far it is the most powerful broadcasting station in the Far East, and is to be used to combat propaganda transmitted to that region by the Soviet transmitters. The broadcasts are regularly picked up in Kharbin, Mukden, and in the later evening hours, in Japan.

New Wireless Electric Clock

IT is reported that at one of the principal New York railway termini, engineers have installed a clock which is entirely controlled by radio transmission. The clock is operated from the Arlington wireless station. All clocks on the railway system are now being set in accordance with this novel timekeeper. If, after several months' testing, the principle gives full satisfaction, similar clocks are to be installed in other public institutions.

Listen to Mexico

NOW that broadcasts from the United States and from the Argentine Republic are regularly heard in the United Kingdom, an effort should be made to tune in some of the Mexican radio entertainments. Stations already logged here are XENT, Nuevo Laredo, 267.7 metres (1,120 kc/s); XEW, Mexico City, 337.1 metres (890 kc/s), and XEPN, Piedras Negras, 508.5 metres (590 kc/s). Broadcasts from XEW are particularly well received on favourable nights between G.M.T. 02.00—04.30. The interval signal is reminiscent of a clock chiming the quarters (four bells). Announcements are made in both Spanish and English.

When You Miss the B.B.C. Weather Forecast

AIR MINISTRY weather forecasts and reports are transmitted daily from Heston Airport (Middlesex) on 1,202 metres (249.5 kc/s) at G.M.T. 08.45, 09.30, then hourly, with the exception of 13.30, until 16.30 during the winter months. Although they are essentially destined to civil aviation, the broadcasts are very useful to the general public.

Holland's Time Problem

THE Dutch Government is considering a proposal to adopt Central European time. The suggestion of making the clocks in that country coincide with G.M.T., as is the case in Belgium, has been turned down. So far, Dutch time is twenty minutes *behind* Central European time, a condition which somewhat complicates railway time tables.

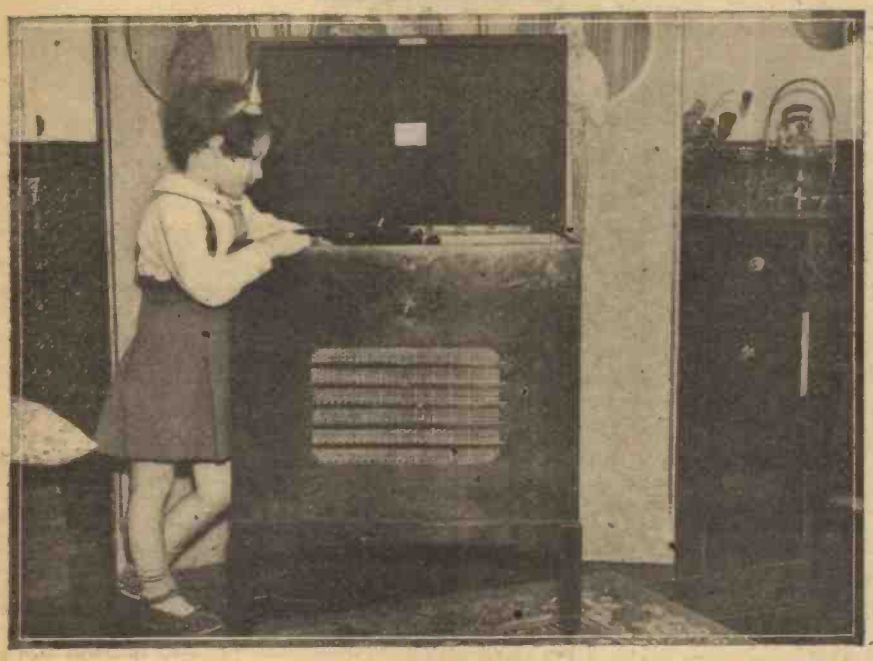
ROUND the WORLD of WIRELESS (Continued)

INTERESTING and TOPICAL PARAGRAPHS

Belgium's Proposed Third Transmitter

ALTHOUGH the idea of a third station for this little Kingdom had been cast aside in favour of an increased power for the twin transmitters at Velthem, near Louvain, which broadcast the Brussels No. 1 and No. 2 programmes, the suggestion has now been revived by one of the political parties, and is receiving serious consideration. A definite proposal has now been put forward to erect a third station on the Eastern frontier.

THE YOUNG IDEA



A small enthusiast preparing a programme to be heard on her "His Master's Voice" "Superhet Fluid-light Autoradiogram."

To Honour the Marchese Marconi

AT the birthplace of this famous radio pioneer, Bologna (Italy), it has been decided to build a 50-kilowatt transmitter entirely of Italian manufacture. It will be run by the E.I.A.R. (the Italian Broadcasting Authorities), and is to be known as the *Stazione Guglielmo Marconi*.

Another Russian Giant

THE Soviet Government, in order to provide adequate service to the Siberian republics, and also for transmissions to listeners dwelling in the Manchuquo and Japanese Empires, have planned a 500-kilowatt transmitter to be installed at Khabarovsk. It is to be built on the same lines as the high-power Moscow station.

Droitwich's Berlin Rival

THE 150-kilowatt transmitter to be built at Brueck, some thirty miles from Berlin, according to a German report, will prove the most up to date of all European stations. A new aerial system consisting of seven pylons, 825ft. high, set in a circle, will, it is stated, prove an effective cure of "fading."

New Polish Broadcaster

TESTS are now being carried out on 304.3 metres (986 kc/s) by the new 24-kilowatt station erected at Mokre, near Torun (Poland). As the transmissions are purely of an experimental nature, the call heard, in the course of the broadcast, may be that of the Warsaw studio from which the programmes are relayed.

The B.B.C. Symphony Orchestra

THE B.B.C. Symphony Orchestra continues its provincial tour, visiting Bristol on February 13th. Its subsequent visits are Birmingham, February 27th; Dundee, April 2nd; and Brussels, March 12th. So much interest has been occasioned at Bristol by the visit of this enormous orchestra, which is the biggest permanent musical combination in Europe, that the B.B.C. has already received an inquiry for a block of tickets of 400 from one school.

"Mother Goose"

ON February 2nd, Francis Laidler's pantomime, "Mother Goose" (founded on the book by J. Hickory Wood), will be relayed to Northern listeners from the Theatre Royal, Leeds. The cast includes Vera Lennox (Principal Boy), Connie Graham (Mother Goose), Albert Modley (Jack, the Widow's Son), and Olga May (Principal Girl). A Flying Ballet, a Rolls Royce Chorus, and a troupe of Little Sunbeams will also take part.

Wagner's Music from Manchester

THE second half of the William Rees Society's Concert will be relayed to Northern listeners from the Milton Hall, Manchester, on February 2nd. Conducted by William Rees, the William Rees Orchestra will play a programme of Wagner's music, including "Forest Murmurs," from "Siegfried," "Dreams," and the Overture to "Tannhäuser." Supported by the orchestra, Frank Titterton, well-known Northern tenor, will sing "The Prize Song" from "The Mastersingers."

Choral Concert from Ulster

TWELVE Belfast choirs, totalling in all something over four hundred voices, will be seen on the platform of the Ulster Hall on February 1st, when they will appear at a concert given in co-operation with the Belfast Corporation.

"Breakfast in Evening Dress"

CHARLES BREWER, one of the producers of the Light Entertainment Department, has written the book of a musical comedy called "Breakfast in Evening Dress," to be broadcast on February 6th. The music is by Alan Paul. The story revolves round the extraordinary steps needed to comply with a most eccentric will. The cast is a strong one, headed by Wynne Ajello. Opposite her will be Michael Cole, while the humour is in the hands of Dick Francis and Claude Hulbert. Supporting these are Gladys Marlowe, Cyril Nash, and Ernest Sefton. Mark Lubbock will conduct the revue chorus and the B.B.C. Orchestra.

Recital of Russian Songs

MADAME SPIRIDOVITCH is giving a song recital in the National programme on February 10th. She is a well-known Russian singer of Russian gipsy and folk songs and has a large public in Paris. In this recital she will include, in addition to Russian songs, a group of Neapolitan folk songs and also a group of songs by Gretchaninoff.

Rugby Male-voice Choir

THIS well-known choir, which was founded over twenty years ago, will give a programme of part songs in a Midland studio on February 3rd. The conductor, Mr. George Pritchard, was responsible for the reorganisation of this choir in 1930, and since then it has won many awards. In the same programme, Winifred Browne, the Birmingham pianist, will play Dr. Byrd's Pavan, "The Earle of Salisbury," and other pieces.

(Continued on page 733)

SOLVE THIS!

Problem No. 124.

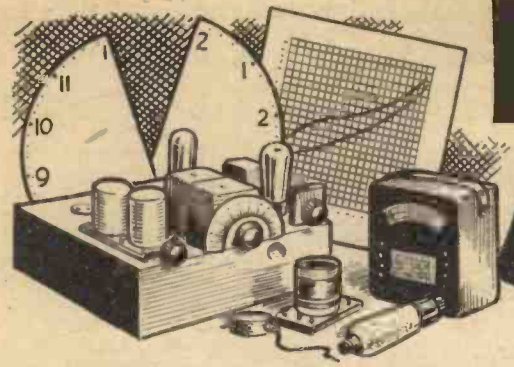
Wilkinson built a three-valve variable-mu battery-operated receiver employing separate dual-range tuners for the aerial and inter-valve circuits. These tuners were not fitted with their own wave-change switches, but a three-point on-off switch was used to short-circuit the long-wave windings of the two coils. On completion of the set it was found that fairly good reception was obtained, but the volume-control potentiometer used in conjunction with the variable-mu valve was inoperative on the medium-wave band. What mistake had Wilkinson made?

Three books will be awarded for the first three correct solutions opened. Mark your envelopes Problem No. 124 and address them to: The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Entries must be received not later than first post on Monday, February 4th.

Solution to Problem No. 123.

The anode resistance in Welbeck's receiver had developed an open circuit, so that there was scarcely any voltage reaching the anode of the detector valve. A very low voltage was passed on to the valve due to leakage, but this was not sufficient to provide reaction.

The following three readers have correctly solved Problem No. 122, and books are being sent to them: J. Orr, 9, West End Place, Edinburgh; W. Shortland, 34, Malvern House, Stamford Hill, N.16; J. Dawney, 39, Courtenay Gardens, Upminster, Essex.



HALF-HOUR EXPERIMENTS

By BERNARD DUNN

SEVERAL readers have expressed interest in the articles in this series that have dealt with the question of taking voltage and current measurements, and have asked for more complete particulars. They have pointed out that although the details given were sufficient to enable them to calculate the values of shunt and series resistances when converting a milliammeter for universal readings, they prefer to eliminate mathematics as far as possible. Even those readers who have no fear of the calculations involved are in many cases "stumped," due to the fact that they are unaware of the resistance of the particular milliammeter that they happen to possess.

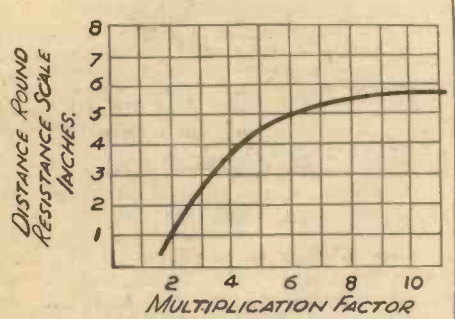


Fig. 1.—A graph can be made to obtain calibration points for currents higher than those for which the battery is suitable by drawing a graph as shown here.

It would therefore seem to be very desirable this week to deal more fully with the matter of making a multi-purpose test instrument, making the information so general that it can be applied in any particular case, and of such a form that mathematics of every description can be ignored. It must be made quite clear that the degree of accuracy to be secured by following the methods to be outlined will not approach the 100 per cent. mark, although it will be adequate for all normal purposes, when a tolerance of, say, 5 per cent. is easily allowable.

A Suitable Meter

The first requirement is a moving-coil milliammeter—this is essential, for a cheap meter of the moving-iron type is entirely unsuitable for our purpose. The meter may be one having a full-scale reading of between 1 and 10 milliamps, and the resistance of this will in all probability lie between 100 ohms (for the lower reading) and 10 ohms (for the higher reading). In the same way it may be considered for the preliminary experiments that meters with other readings will have resistances in the proportions mentioned. That is, a 2-m liamp. meter will have a resistance of about 50 ohms, and a 5-milliamp. meter will have about 20 ohms resistance.

Details are Given for the Construction and Calibration of a Multiple Testing Unit Employing a Moving-coil Milliammeter of Any Type.

Variable Shunt Resistance

For increasing the current reading of the meter it will first of all be necessary to obtain a variable resistance or potentiometer (*not* of the graded type) having a resistance value of about twice that of the meter, and this should be of the type having a definite "off" position; in other words, the slider should leave the resistance element at one end of its travel. Alternatively, the resistance purchased may be of the type fitted with an on-off switch, since this will produce the same effect. Variable resistances with values between 2 and 50 ohms (type FR), or from 50 ohms upwards (type ST5C) are made by Colvern and cost 3s. 6d. each. As an alternative to buying a new component it will often be found possible to re-wind an existing potentiometer with 36-gauge Eureka resistance wire, which has a resistance of approximately 15 ohms per yard, or with 40-gauge Eureka, which has a value of about 37 ohms per yard.

The method of connecting the variable resistance is shown in Fig. 3, where it will be seen that the centre terminal (slider) is connected to one terminal of the milliammeter, and one of the end terminals is joined to the other terminal of the meter. The next task is to calibrate the resistance for various "multiplication factors." This means that a large circular paper or celluloid scale must be made to fit under the mounting nut, and that a corresponding pointer should be fitted to the knob. Another method is to use an old condenser dial, gluing a ring of white paper round its bevelled edge.

Current Calibration

Now connect the meter in series with a battery and fixed resistance, as shown in Fig. 3, the resistance being of such a value that the meter shows practically a full-scale deflection. This means that, assuming the use of the 6-volt tappings of an H.T. battery, the resistance should be 6,000 ohms for a 1-m.a. meter, 3,000 ohms for a 2-m.a. meter, about 1,200 ohms for a 5-m.a. meter or 600 ohms for a 10-m.a. meter. The full-scale reading should be obtained when the variable resistance is in the "off" position, or is disconnected. Make a very careful and accurate note of the exact reading, and then rotate the knob of the variable resistance until the current passing through the meter is exactly halved; that setting of the resistance will give a "multiplication factor" of 2, or, in other words it will double all the scale readings obtained. Therefore make a mark on the resistance scale and place a figure 2, 4, 10 or 20 beside it, according to whether the meter normally reads up to 1, 2, 5, or 10 milliamps.

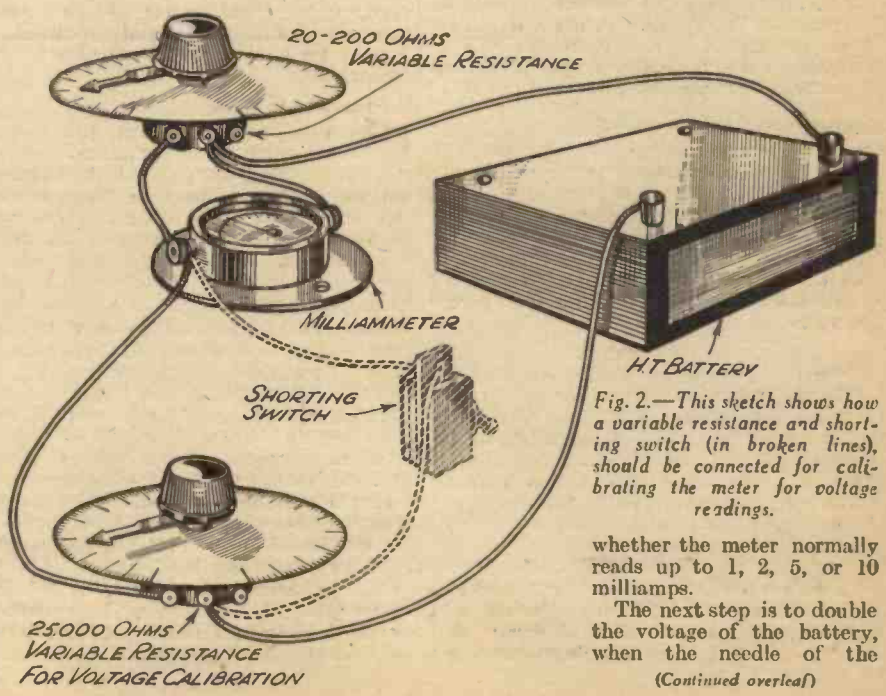


Fig. 2.—This sketch shows how a variable resistance and shorting switch (in broken lines), should be connected for calibrating the meter for voltage readings.

The next step is to double the voltage of the battery, when the needle of the

(Continued overleaf)

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meter should return to its first position. The process previously described should then be repeated to determine the setting of the parallel resistance that gives a "multiplication factor" of 4. This method of calibration may then be repeated until the "multiplication factor" is such that the maximum current that can be read is about 25 milliamps, although if a super-capacity H.T. battery, or a set of H.T. accumulators, is available it may be continued up to 100 milliamps or so, taking care that this heavy current only flows for a second or two.

It might seem that the limit of calibration has been reached at much too low a value, but further calibration points can be obtained by drawing a graph showing the positions of the resistance pointer that have been located. For instance, if the distances of the marks around the circumference of the scale are measured—by means of a tape measure, say—and plotted on a sheet of squared paper against the "multiplication factors," as shown in Fig. 1, a variety of other calibration points can be located with fair accuracy.

Measuring Voltages

Having made the current calibrations, it will next be necessary to provide for voltage measurements, and this can be done by connecting a variable resistance in series with the meter, as shown in Fig. 2. The resistance in this case should be of much higher value than before, the resistance being approximately 25,000 ohms to give a maximum reading of 100 volts with a 5-milliamp. meter, or with the parallel resistance set to ensure a full-scale deflection of this amount. If the meter gives a maximum reading of 10 milliamps., the same value of resistance can still be used, but the adjustments to be described will then be made until the meter shows a reading of only one-half of the maximum.

The idea is to connect the meter and series resistance in series with a 100-volt battery (a new one of reputable make is best), first setting the resistance to its "all-in" position. In these conditions a reading of rather less than 5 milliamps. should be obtained, but a slight variation of the resistance should bring the reading to exactly 5 milliamps. A word of warning is necessary here, because if any mistake were made in connecting the series resistance, or if the component were faulty, there would be a danger of damaging the meter. To avoid anything of this kind it is best to start by inserting the wander plug into the 1½-volt socket, advancing it by short steps until the full voltage is reached, if it is found that the meter reading is always below the maximum.

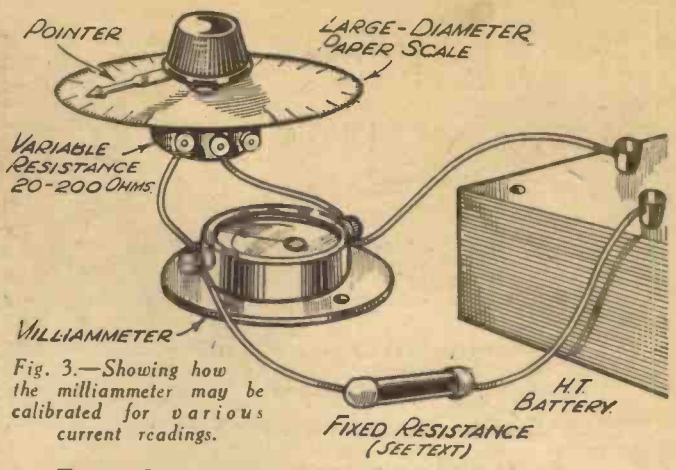


Fig. 3.—Showing how the milliammeter may be calibrated for various current readings.

Up to 400 Volts

Having found that the resistance is of suitable value a scale can be made for it similar to that used for the parallel resistance, and this can be marked with the position of the pointer for the 100-volt reading. Readings up to 200 volts or 400 volts can then be obtained simply by moving the parallel resistance from the 5-milliamp position to those giving 10 and 20 milliamps respectively. On the other hand, the same result could have been achieved by using a 100,000-ohm series resistance and, after finding the setting for 100 volts, rotating the knob until the meter showed a half-scale (200 volts maximum) or a quarter-scale (400 volts maximum) reading. The latter method is better in some respects, because it makes for simplification and avoids the possibility of confusion between the two controls.

It is not satisfactory, however, when voltages lower than 100 are to be measured, and it will generally be desirable to calibrate the meter for reading up to 10 volts or so. When using the 25,000-ohm resistance, this can be done by reducing the voltage of the H.T. battery to 9, and then setting the resistance until a reading equal to nine-tenths of that of the whole scale is obtained. Other scale readings can be obtained by following the same idea.

Mounting the Parts

It is scarcely necessary to give practical details concerning the assembly of the two variable resistances and the meter in a box, since every experimenter will be able to devise a suitable arrangement. A cigar box, however, might be suggested as a container for the components, and a long flexible lead, or plug sockets, can be fitted for connection purposes. A switch will be required for cutting out the series resistance when taking current measurements, and this will be connected as shown in broken lines in Fig. 2.

Short Wave Notes

LONG-DISTANCE DAYLIGHT RECEPTION

Stations to Search For During the Hours of Light

HAVE you tried your receiver out during daylight? If so, you were doubtless surprised at the number of stations which provided loud-speaker reception. If not, you have a pleasant surprise awaiting you. During the mornings, Hilversum, Fécamp, Breslau, Berlin, Langenberg, Athlone, Rome, and a host of other stations provide good loud-speaker reception upon the average receiver. Many distant stations are also audible.

For instance, Budapest provides a good programme during the afternoons, and this station can frequently be heard well as early as 1 p.m. In roughly the same direction, but farther afield, Ljubljana, the well-known Yugo-Slavian station, provides a moderately powerful signal upon many occasions.

Russian Stations

Special attention should be given to Russian stations, for many of them are audible during daylight. Perhaps you have heard RW39, Moscow-Stalino, which operates upon 386.6 metres. If not, I certainly recommend you to tune to that wavelength upon some afternoon—this station provides an astonishingly good signal upon most occasions—when, unless conditions are bad, you will hear Moscow. Because Toulouse PTT and Fredrikstad operate upon its wavelength during the night this station is best heard during daylight. If you are fortunate you may hear Astrakan, RV35, which, although located near the Caspian Sea, provides a good signal upon many occasions.

Some persons—the writer among them—consider that long-distance reception is unobtainable from Europe. In short, we feel that any part of Europe is too near to be labelled "DX."

Asia During Daylight

Therefore DX enthusiasts will be interested to know that what is termed "DX" reception is forthcoming during daylight. Tashkent, on 1,170 metres, provides a good signal upon most afternoons despite the fact that it is just north of India. Even more remarkable is Alma-Alta. This station, which is situated north of Burma, may be heard around 410 metres on most nights after 11 p.m. More remarkable still is the fact that it provides a fair signal during the daylight.

Other Russian stations worth looking for are: RW49, Tomsky, which operates upon 554 metres; Makhatch, 563 metres, and either Nijni-Novgorod or Gorki (RW42) which both operate upon 598 metres. All the above, and many others, are audible during the afternoons unless conditions are particularly bad.

America in the Afternoon

Occasionally one or more American stations can be heard during the afternoon, but this is uncommon. When American stations do come in they are generally situated between 200 and 220 metres. On one or two occasions, however, WBZ, Boston, on 301 metres, has been heard as early as 1 p.m., and it is quite possible to hear this station at fairly good volume around 7 p.m.

On occasions WKBW, Buffalo; WGAR, Cleveland; WLAC, Nashville; and WJSV, Washington, are audible at moderate strength. However, the reception of America during the afternoon is, as remarked above, rather rare. Between the hours of 6 and 9 p.m. many American stations can generally be heard and, because many are low-powered stations broadcasting DX programmes, are generally worth receiving.

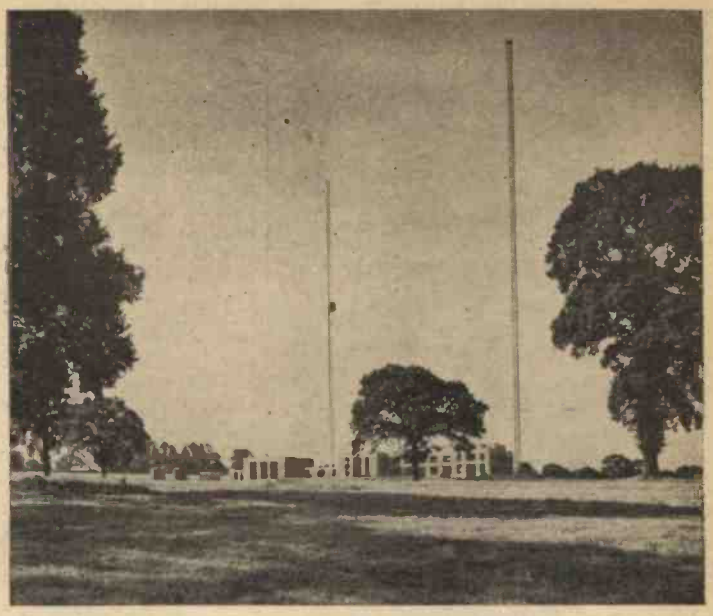
Africa Also

In conclusion, another station may be mentioned which is heard best during daylight. It is Cairo, on 480 metres. During the evening it is interfered with by Brussels, but during daylight it provides a passable signal on most occasions.

MAKING A DROITWICH SUPPRESSOR

Full Constructional Details are Given in this Article of an Easy-to-make Wavetrap for Cutting Out Interference from the Powerful Droitwich Station.

By W. B. RICHARDSON



A general view of the Droitwich transmitting station from the north side.

SINCE the opening of the new high-power transmitter at Droitwich many listeners are experiencing considerable interference on the long-wave bands. In fact, in some cases this station spreads over practically the whole of the dial and renders the reception of other stations almost impossible.

In such instances the usual dodges for increasing selectivity are entirely inadequate. For example, the use of a small condenser connected in series with the aerial, or the employment of a smaller aerial would only sharpen the tuning at the expense of volume. In most cases the degree of selectivity required is such, that the loss in sensitivity attendant upon these methods would be too great. In other words the weaker stations would probably disappear altogether. A better solution is to be found in the use of a wavetrap. This consists of a small unit which is connected between the aerial and the receiver. The unit comprises a tuning coil and a variable condenser, and can quite easily be made up from odds and ends obtained from the average constructor's junk box.

How It Works

Before engaging on the construction of the actual unit it is just as well to have some idea of the principle on which it works. Reference to Fig. 1 will show that the coil and condenser are connected in parallel in just the same way as an ordinary tuning circuit. Actually there are two condensers shown—one fixed and one variable—but this is done for practical reasons. Theoretically this amounts to the same thing as using one condenser.

The coil and condenser together form what is called a *resonant rejector circuit.* The action of this will no doubt be clearer from a study of Fig. 2 which shows the basic circuit. Such a circuit will *resonate* at a certain frequency dependent on the values of the inductance (coil) and the condenser. This means that if an alternating voltage of this particular frequency be applied to the circuit at the points A, B, it will set up an oscillating current in the circuit as indicated by the arrows. This oscillation gives rise to an alternating voltage at A, B, which absolutely coincides in point of time and magnitude with the applied voltage (this is assuming that the circuit has no resistance). Therefore no current can flow through the circuit from outside. It is this property which is made use of in a wavetrap. If a resonant rejector circuit of this type be connected between the aerial of the receiver, as in Figs. 2 and 3, it will prevent any alternating current flowing through it which has the same frequency as the resonant frequency. Of course, by the choice of suitable values for the inductance and the condenser the circuit can be made to resonate at any desired frequency. In the case of Droitwich, therefore, the wavetrap is designed to resonate at 200 kilocycles. It thus acts as a barrier to signals from this station. Actually is does not offer a *perfect* barrier, although it allows only a very small current to pass. This is because in practice the rejector circuit always contains some resistance.

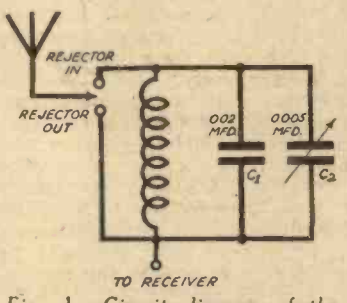


Fig. 1.—Circuit diagram of the eliminator.

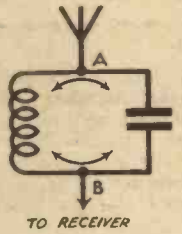


Fig. 2.—A simple rejector circuit.

In the rejector shown here, approximate values are chosen for the inductance and condenser and the final adjustment is made by means of the variable condenser C2. When the eliminator is connected to the receiver its effect is to reduce the sensitivity of the latter to practically nil at 200 kilocycles. However, the sensitivity increases rapidly on either side of this point, and thus other stations can be received on other parts of the scale. Incidentally the selectivity of the unit is an important point, since it is highly desirable to confine the rejector action to just the frequency of Droitwich and for it to pass all frequencies on either side of this point. If the tuning is flat the rejector action will decrease only slowly on either side of the 200 kilocycles point and thus other stations nearby will be also reduced in strength.

The degree of selectivity depends on the ratio of inductance to capacity. Thus with a large inductance and a small capacity the tuning will be comparatively flat while a small inductance and a large capacity will give a more selective circuit. In the unit described here a coil of 100 turns of wire is used in conjunction with a total capacity of about .0025 mfd. On the other hand it would be quite in order to use a coil of 150 turns and a condenser of .0005 mfd. This would have an even more powerful rejector action at the resonant frequency, but there would be some reduction in the strength of nearby stations as well.

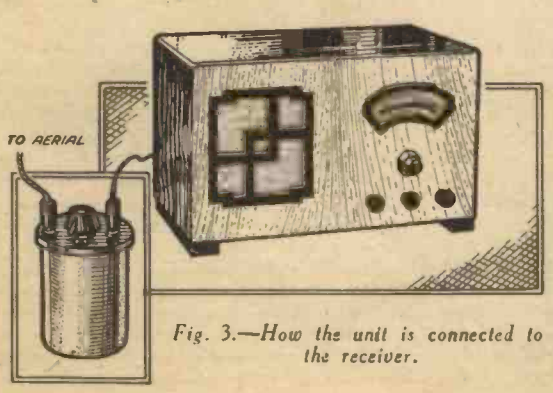


Fig. 3.—How the unit is connected to the receiver.

Constructing the Unit

The Droitwich eliminator consists essentially of a tuning coil wound on a 2in. cylindrical former, a fixed condenser, and a variable condenser for making the final adjustment. The coil consists of 100 turns of 28 gauge d.c.c. wire wound in a single

LIST OF PARTS

One J.B. "Dilecon" variable condenser, .0005 mfd.
One .002 mfd. Dubilier fixed condenser, type 670.
Three Belling-Lee insulated sockets with plugs.
Paxolin former 2in. diam., by 3in. long.
Parts for case as detailed in the text.

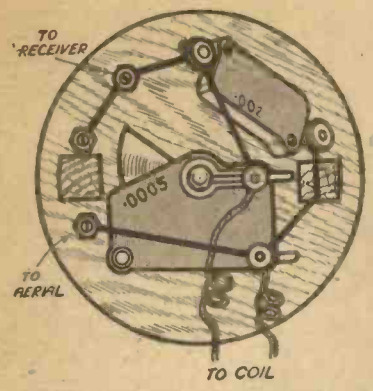


Fig. 4.—Wiring diagram from underside of lid.

layer on a 2in. paxolin former 3in. long. Two small holes are pierced through the former about ¼in. from one end and the wire threaded through in the usual manner, leaving a few inches for connecting purposes. The wire is then wound on tightly and evenly until the 100 turns have been completed, when two more holes are pierced and the wire threaded through as before. The 100 turns should occupy about 2¼in.; thus the winding should end within ¼in. of the end of the former.

When the coil is completed it should be put aside while the other parts are being assembled. The top of the unit consists of a round disc of hard wood. Any local handicrafts shop would be able to turn this up for a few pence, but failing that it could be made in a hexagonal form. This can be cut out quite easily with a tenon saw by the average handyman. When the top is finished it is drilled with the necessary holes to take the condenser and the sockets. These parts are then mounted in position together with the fixed condenser and are wired up as shown in Fig. 4.

The next job is to mount the coil on its base. This latter consists of a wooden disc, which is a push-fit in the end of the 3in. cardboard tube which forms the body of the unit. The method of mounting the coil on the base will be quite clear from a glance at Fig. 5. A wooden strip is bradded and glued in position on the base, and the former is then fixed to each end of this with the aid of brads. The card body of the unit is fixed in position next. One or two fine brads are used and driven through the tube into the base. Before placing the top on the unit the two wires from the coil are connected to the terminals of the variable condenser. The unit should then be tested out before the top is finally secured in position.

To test the wavetrap the receiver should be connected to the aerial in the usual way, and then tuned exactly to the Droitwich wavelength. If, owing to the tuning spread, the exact position is not very definite, then the volume control should be turned right down. This will, of course, reduce the spread and enable the exact wavelength to be determined more easily. These remarks apply to the ordinary type of volume control and not to a combined selectivity and volume control in the form of a variable condenser. This latter type usually alters the tuning slightly when it is turned down. Having tuned-in to Droitwich the set should be switched off and the wavetrap connected up. One socket on the unit is connected to the aerial terminal or socket on the receiver and the other to the aerial. The third socket is left unconnected. The receiver is then switched on again and the volume turned up. The tuning control on the unit is slowly rotated until the signals from Droitwich reach a minimum strength. If the instructions have been followed carefully this will occur at a position somewhere near the midway setting of the condenser. Having found this position, a movement of the condenser knob in either direction should cause an increase in volume.

With the control set to give the minimum volume, a mark is made opposite the pointer of the unit in order to mark the position, and the wavetrap should then be left alone. Tuning of the receiver is then carried out in the usual way. It will be found that the reduction in volume from Droitwich will allow other stations to be received free from interference. There is just one warning. With some receivers the tuning positions will be altered very slightly when the eliminator is in use, but the actual amount depends on the nature of the tuning arrangements employed in

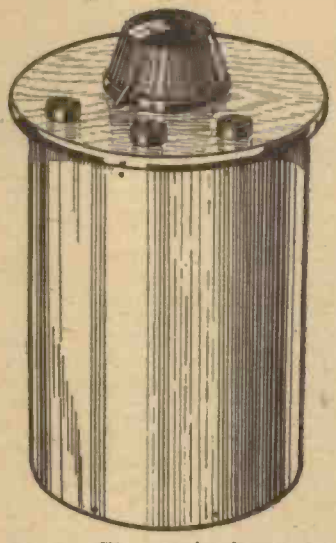


Fig. 6.—The completed wavetrap.

the set. Regarding the setting of the wavetrap, this would normally be left at its original setting, but slight variations can be made to suit particular conditions. For instance, it is sometimes found that a station above the wavelength of Droitwich can best be received with the wavetrap pointer turned a little to one side of the normal position in an anti-clockwise direction. A station below Droitwich, on the

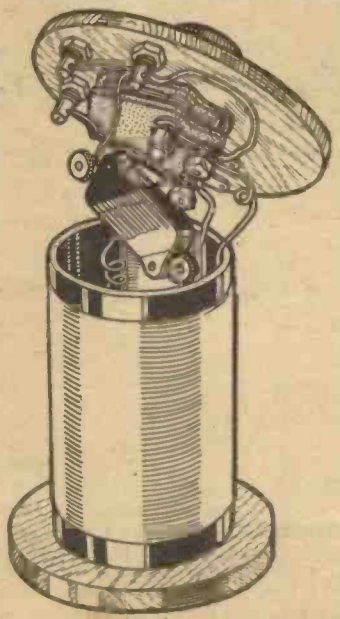


Fig. 7.—How the wavetrap is assembled.

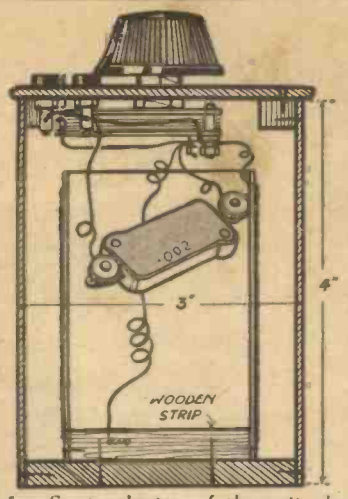


Fig. 5.—Sectional view of the unit showing how the coil is mounted.

other hand, may be found to come through with better strength with the pointer set slightly in the opposite direction. When it is desired to listen to Droitwich there is no need to alter the setting of the eliminator. All that is necessary is to remove the aerial from its socket and to plug it in to the vacant socket. This cuts the wavetrap out of the circuit.

Those who are interested in experimenting may care to try variations in the ratio of inductance to capacity. As an example the fixed condenser might be increased to .004 mfd. when the coil would need to be reduced to about 60 turns. On the other hand, a more powerful rejector action, but less localised, could be obtained by using an ordinary plug-in coil of 150 turns tuned by the .0005 mfd. condenser only.

HIGH-EFFICIENCY VALVES

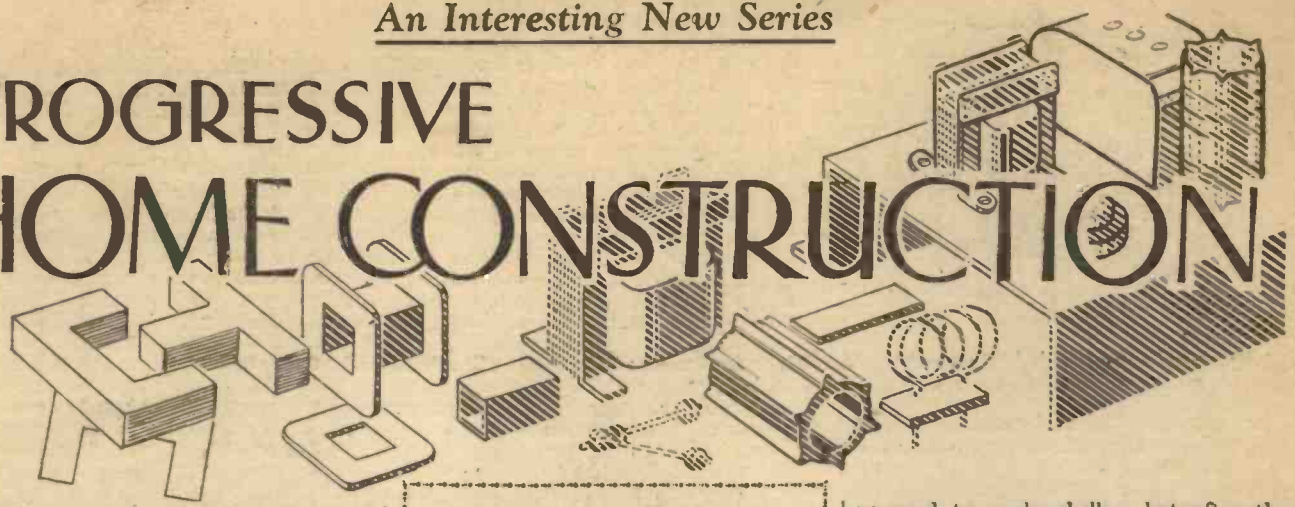
IT is amazing to note the progress that has been made in valve design during the last couple of years or so. We all know of the mains pentode valves that enable a signal output of something like 2½ watts to be

The Valves used in Mr. F. J. Camm's New Receiver—The A.C. Hall-Mark.

obtained with the comparatively small input supplied by the average leaky-grid detector, but I learnt the other day that a directly-heated mains pentode is shortly to be placed on the market that gives an output of 3,800 milliwatts with an input grid voltage of rather less than 6.

An Interesting New Series

PROGRESSIVE HOME CONSTRUCTION



In this Second Article of the New Series the Authors Describe the Construction of the Remaining Parts Required for the Single-valve Home-made Receiver

by The Experimenters

WE hope that you have by now been able to make the coil, reaction condenser, and wave-change switch, for which details were given last week, and trust that no difficulty has been experienced in carrying out the interesting work. Now we must push on and deal with the fixed grid condenser, grid leak, H.F. choke, and on-off switch. Actually, a valve-holder is needed in addition to the components just mentioned, but most readers will prefer to buy that as a ready-made job, since it costs only a

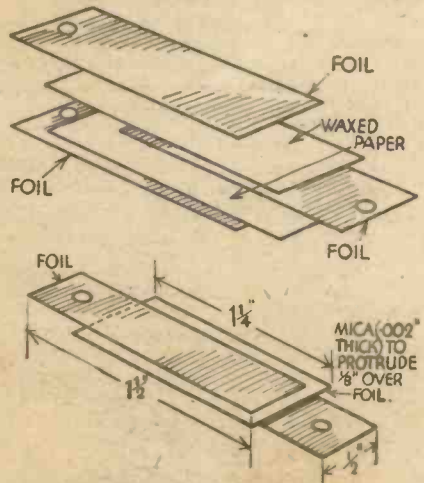


Fig. 1.—Dimensions of the foil and mica for the fixed grid condenser are given in this drawing. Above is shown how the sheets of foil and dielectric are interleaved.

matter of pence, and cannot be made very easily if the sockets are to be a perfectly good fit with the valve pins.

The Grid Condenser

The grid condenser should be considered first, bearing in mind that this component should have a capacity of approximately .0003 mfd. The exact value is by no means critical, but it is possible to work to fairly close limits if the size of the plates, thickness of the dielectric material, and the dielectric constant are known. You probably think that the last remark means that the accurate capacity could be obtained by a physicist equipped with a variety of measuring instruments and having access to an extensive laboratory; anyhow, you need not be discouraged, for we have cut out all the theoretical work for you and simply say that the correct capacity can be obtained by using two plates of tin or copper foil measuring 1½in. by ½in. with a sheet of mica measuring 1½in. by ¾in. separating them. As a matter of fact, this assumes the thickness of the mica to be just two-thousandths of an inch, but this is a standard thickness, and so there is no need to take micrometer measurements. If you have any difficulty in getting hold of the mica you can use thin waxed paper instead, the paper being not much more than tissue thickness. When this is used it is necessary to have about six sheets of foil with a sheet of waxed paper between each (because waxed paper has a lower dielectric constant than mica); the foils (condenser plates) and strips of waxed paper (dielectric) are arranged as shown in Fig. 1.

Just a note about the waxed paper; if you cannot find a piece of suitable material ready for use, just take a short end of clean candle, place it in a small jar, and immerse it in a bath of hot water. When the wax is quite molten put a sheet of thin, soft paper into it and allow it to remain for a short time until thoroughly soaked. After that, lift out the paper and let all the superfluous wax drain off. When the wax has become quite cold the separate sheets can be cut out and the condenser assembled. The method of assembly is shown in Fig. 2, where it can be seen that the set of plates and dielectrics are placed together on a small ebonite sheet fitted with terminal holes, after which washers and nuts are securely tightened over the ends of the foil strips.

An Ebonite Baseplate

Before mounting the condenser proper on to the baseplate, however, care must be taken that the plates and dielectrics are all pressed firmly together. To ensure this when using mica dielectrics it is best to brush a little *very thin* shellac varnish over each surface of the micas, place the foils in position, and then place the whole assembly under a heavy book, leaving overnight until the varnish sets perfectly hard. When using waxed paper there is no need to apply shellac, but after the plates have been interleaved the condenser should be tightly pressed with a *warm* (not hot) iron. When the wax has properly cooled the condenser can be mounted on the baseplate.

Making a Grid Leak

So much for the condenser; and now for the grid leak. This requires to have a resistance of about 2 megohms, but again the exact value is not at all critical. The best and simplest arrangement is that shown in Fig. 3, where a strip of ebonite of the dimensions indicated has a wide pencil line drawn on it. Before making the line the surface of the ebonite should be roughened slightly by rubbing it with fairly fine glasspaper, and the two holes shown should be drilled. Then take a "B" pencil and scribble a ring round the terminal holes, afterwards joining the two rings with a line ¼in. thick. Apply a fair pressure with the pencil, and go over the line a few times until there is a little graphite dust loose on the surface. Then knock off the dust and fit the terminals, placing a large washer between the nut and the pencilled circles. The resistance between the two terminals will now be just about correct, but the graphite might be rubbed off when the leak is in

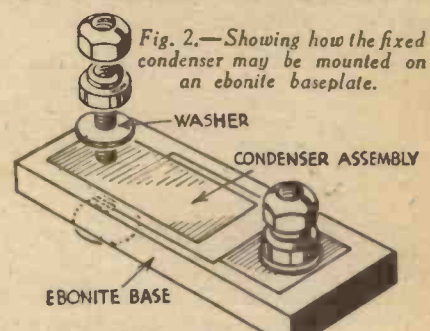


Fig. 2.—Showing how the fixed condenser may be mounted on an ebonite baseplate.

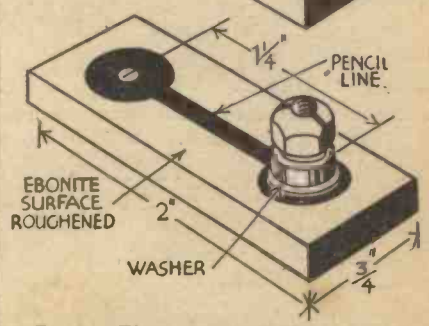


Fig. 3.—The lower sketch shows how the grid leak is easily made.

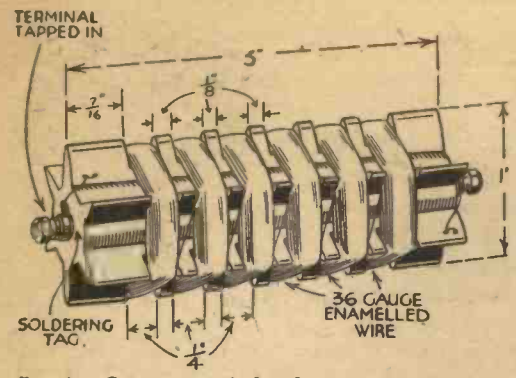


Fig. 4.—Constructional details are given here for the H.F. choke.

use, or alternatively the resistance might vary due to the formation of moisture on the surface of the ebonite. To prevent either of these eventualities the ebonite should be given a couple of light coats of shellac or other varnish.

The H.F. Choke

We have agreed to buy a valve-holder (if there aren't already several spare ones in the junk box), so we can now look to the high-frequency choke. This should have a fairly high inductance if it is going to be of any real value, whilst its self-capacity should be as low as possible. Because of this it is best to divide the winding into a number of separate sections. This can most easily be done by placing the windings on a length of 1in. diameter ribbed coil former, after slots have been made in the ribs in the same way as in the case of the coil described last week. The handiest type of former for the purpose is "Becol" No. 2, which has a ⅛in. diameter hole running through the centre, and which costs 4d. for a 3in. length, such as is required.

The arrangement of the six slots is shown in Fig. 4, where it will be seen that they are each ¼in. wide and about ⅛in. deep. They can be made, as described in connection with the coil, by means of a file, a few broken hack-saw blades clamped together, or in a lathe. When either of the two former methods is to be used it will be found most convenient first of all to make a cardboard or metal template so that the slots in each of the six ribs will be in line and exactly the same distance apart. After the slots have been made, a terminal should be fitted into each end of the former, a soldering tag being placed under the first nut. The correct method of fitting the terminals, of course, is to tap the hole in the ebonite to the same thread as that on the terminal, but when a suitable tap is not to hand the job can be carried out quite easily by using an old terminal of the same size as those to be fitted. First file the end to a taper of square section, then warm the terminal in a gas flame and screw it into the hole, gripping it with a pair of pliers. After forcing it partly into the hole it might be necessary to give the terminal a second warming, but it should soon be possible to tap the hole in this manner for the required distance.

For the windings a little 36-gauge enamelled wire will be required: a 1oz. reel will be ample, and this can be bought from any good wireless shop, or from an electrician. Start by scraping the enamelled covering from one end of the wire, taking care not to cut it, and then solder this to one of the tags provided. Now commence to wind the wire into the first slot, placing the turns as evenly as possible and continue until the slot is full. Without breaking the wire continue to the next slot, winding in the same direction, and so on until all have been filled. Finally cut off the wire, scrape the end clean and solder to the second tag, so completing the choke. A slight refinement on the method just described, and one that produces a more robust finish, is to solder a short length of thicker wire to the end of the 36-gauge material and use this for making connection with the tags, and winding it round the former for a few turns.

The On-off Switch

It is unnecessary to give full constructional details for the on-off battery switch, since this is almost identical with the wave-change switch described last week. The difference is that only two contacts are required, and therefore connection need only be made to the two soldering tags under the screws tapped into the end of the ebonite base. Alternatively, one of these terminal points could be used, the second connection being made to the single screw which serves to anchor the end of the spring contact plate.

Assembling the Components

Now that all the components have been made they can be assembled on a baseboard or chassis and wired up. Most readers will prefer to use a chassis, and this can be made, as shown in Fig. 5, from a few pieces of 5-ply wood, or a metallised chassis can be bought ready made from Messrs. Peto-Scott. The valve-holder, coil, and a couple of small ebonite terminal strips can be mounted as shown, the two variable condensers, on-off switch, and wave-change switch being attached to the ply-wood (or ebonite) panel. The rest of the parts are placed beneath the chassis, the grid condenser and grid leak being mounted near to the grid terminal of the valve-holder, and the H.F. choke being suspended in the wiring.

The connecting wires, by the way, may consist of any form of insulated wire, although the type known as "push-back" —with which the insulation can simply be pushed away from the ends by means of the finger and thumb—will be found most convenient.

Many readers will wish to have until next week before completing the wiring and testing of the complete set, and so the drawing showing the simple connections required is being held over until the next issue, when notes on using the set, and also on adding a few refinements, will be given.

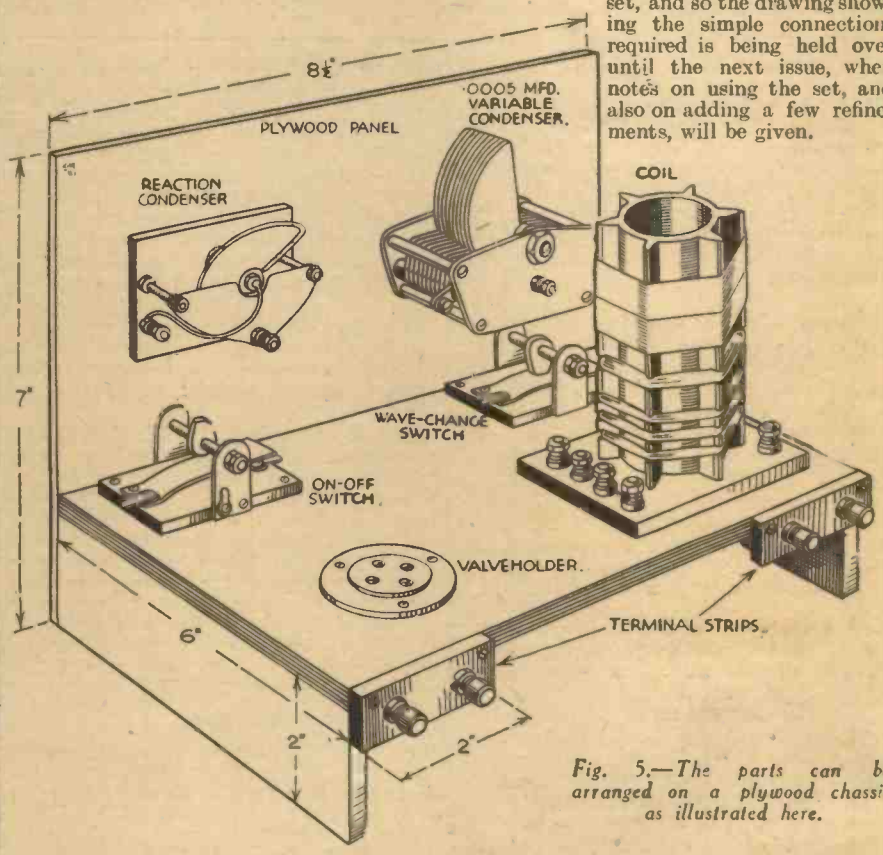


Fig. 5.—The parts can be arranged on a plywood chassis as illustrated here.

New Weather Forecasts

BY order of the Air Ministry, the Marconi Company will erect at the Cranwell (Lincolnshire) Aerodrome a telephony transmitter of which the sole service will be the broadcast of weather bulletins and warnings for aviators. When the station is ready for regular operation the Heston transmitter (1,202 metres) will close down and its duties taken over by Cranwell.

BROADCASTING NOTES

Ultra-short Waves Replace Telephone Cables

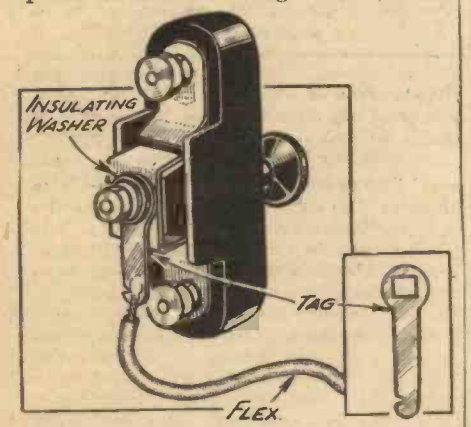
THE new ultra-short-wave service between Portpatrick and Belfast, *viâ* Ballygomartin, has proved an unqualified success inasmuch as it has greatly relieved the pressure on the long-distance telephone traffic between Great Britain and Ireland. The Post Office has already installed five circuits and is using them to their utmost. Across relatively short distances, such as the Bristol Channel, ultra-short waves have proved invaluable. It is expected that a similar service will be shortly tried out with the European Continent, as the system is far less costly than the laying of cables.

READERS' WRINKLES

THE HALF-GUINEA PAGE

A Simple Switch Conversion

HERE is a simple method of converting a two-point switch to a three-point one. First, remove the nut and washers holding the moving switch plate to the spindle of a non-rotating switch of the



A simple switch conversion.

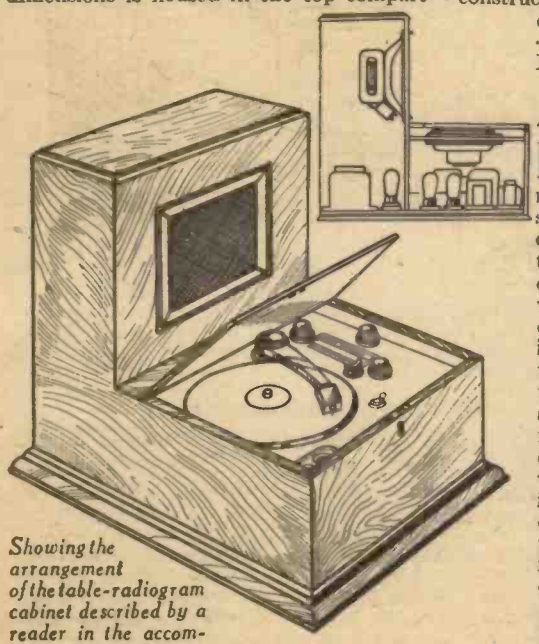
type shown in the sketch. Place a large-size soldering tag, with hole filed square, over the spindle end, replace the insulating washer, ordinary washer, and nut, and tighten up. To the soldering tag solder a length of flex to suit requirements. The same method applies for converting a three-point switch to a four-point one.—R. M. Ross (Alness).

A Novel Table-radiogram Cabinet

THE accompanying sketches illustrate an idea for a compact table-radiogram cabinet. The turntable, pick-up, controls, etc., after adjustment are totally enclosed by the top lid. The speaker of medium dimensions is housed in the top compartment, as can be seen, the front of which is made of thicker wood so as to act as a good baffle. Underneath, and at the bottom of the speaker is conveniently housed the rectifying unit or accumulator and H.T. battery, if a battery-operated set is used. There is ample room. The set is built directly under the controls, and the majority of the components are mounted on the right-hand side, whilst the gramophone motor is fixed underneath the motor board in the usual way.

A manual volume control is placed outside in the centre front, so that the volume may be adjusted without having to open the cabinet. The principal dimensions of the cabinet are: height 18in., length 22in., width 17½in. The height of the front part is 7in. The plinth may be built according to the maker's own taste, and a station chart, etc., may be placed underneath the lid, for quick reference.

I have made a cabinet to the dimensions given, in figured oak, and can thoroughly recommend it to any reader wishing to construct a very compact, efficient and convenient table-radiogram cabinet.—H. J. COLEBROOK (Sandwich, Kent).



Showing the arrangement of the table-radiogram cabinet described by a reader in the accompanying paragraph.

THAT DODGE OF YOURS!

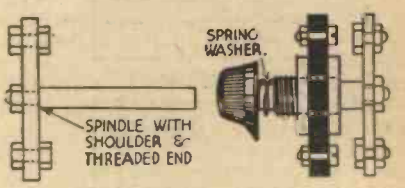
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account 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.

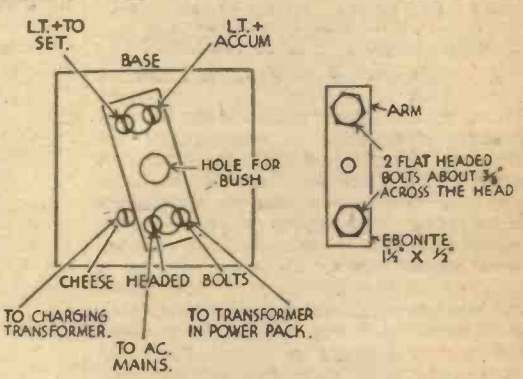
A Condenser Switching Device

IT is sometimes found, when using a dual-range coil, that although reaction on medium waves is quite satisfactory, the set fails to oscillate on long waves. This is probably due to the capacity of the reaction condenser being too small for this waveband, and a method of overcoming the difficulty is illustrated in the accompanying sketch. The wavechange switch, in the long-wave position, presses against a small block of ebonite fixed to a metal strip which, in turn, makes contact with another metal strip, thereby placing the .0002 condenser in parallel with the reaction condenser. For convenience, the theoretical circuit is also shown, as, in the event of a different type of circuit being used, slight modifications may be necessary in the assembly.—F. C. BIDDLECOMBE (St. Margarets).

A Five-point Switch from Junk

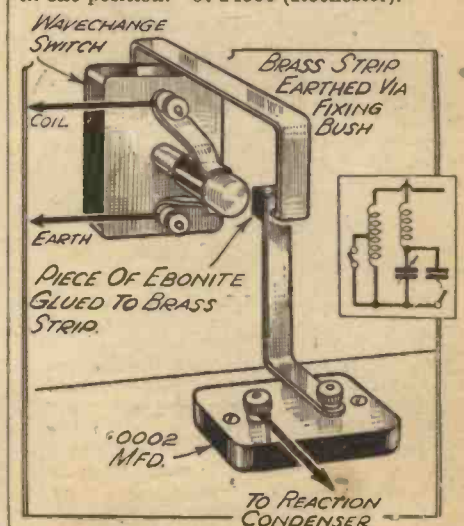
THE accompanying sketches show a five-point switch I have just constructed out of junk. I am using it to switch the power from the power-pack to the charging transformer, and also to break





A five-point switch made with odds and ends.

the connection between the L.T. and the valves in one operation. It is fool proof because the valves cannot be switched on when the accumulator is charging. The parts required are:—1 piece of ebonite 2in. square, 5 cheese-headed bolts about ⅜in. long, 1 piece of ebonite 1½in. long by ½in. wide. The bush and spindle out of an old push-pull switch, or out of an old reaction condenser, and a suitable knob will also be required. The accompanying sketches show clearly how the parts are put together, the small bolts being arranged so the heads of the larger bolts will bridge two of them in one position.—J. PICOT (Rochester).



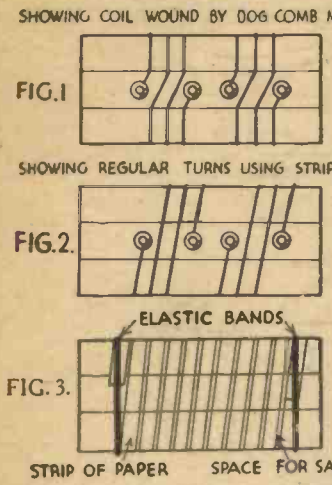
A condenser switching device.

READERS' WRINKLES

(Continued from previous page)

Slotting Ribbed Formers

I NOTICED a rather ingenious method of marking a coil former with a steel dog-comb in the issue of PRACTICAL



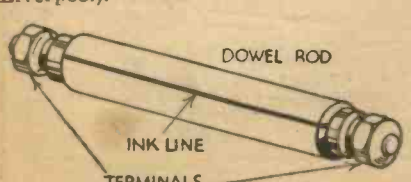
A simple method of slotting ribbed formers.

WIRELESS for January 12th, but the saw-cuts made between the teeth of the comb run parallel to the end of former, and when winding a coil to work on the 15-metre band, on which the windings are approximately ¼in. apart (say, taking two teeth for each saw-cut) the finished coil appears as shown in Fig. 1.

To obviate this, an expedient method of marking a former is to cut a strip of paper with a knife and straight edge, the width of the strip being made according to the distance between the windings desired. Wind the paper strip on the former, leaving sufficient space between each turn to receive a saw blade, and anchor both ends of the strip by fixing an elastic band on each end of the former, as in Fig. 3. The cuts with the saw blade can now be made between each turn. A coil wound by using this method would appear as shown in Fig. 2. Any irregularities in the windings of a short-wave coil are, of course, apt to cause fading.—F. W. RITCHIE (Macduff).

A Simple Grid Leak

THE following method of quickly making a grid leak may interest the wireless constructor who likes to make his own components. It is really practical, is easy to make, and when completed has a real commercial-looking appearance. To make the grid leak, drill a small hole at each end of a piece of ¼in. dowel rod which is about 1½in. long. Having done this, draw a thick line in Indian ink, or with an H.B. pencil, from one hole right along the dowel rod, to the other hole. Now screw two small terminals into the holes drilled in the rod and the grid leak is complete. Its resistance will be about two megohms, but, of course, by drawing two ink or pencil lines on the rod, its resistance may be varied as required.—G. R. WILDING (Liverpool).

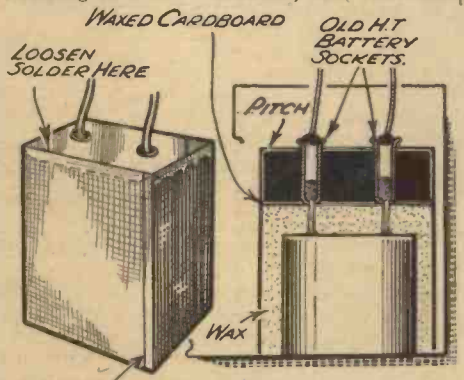


An easily-made grid leak.

Rejuvenating Faulty Condensers

WHEN large condensers of the wax-paper type begin to leak badly they need not be discarded. They can quite easily be rejuvenated by the method described below, after which they will last for a considerable time. A leak is usually caused in a condenser by damp having caused the insulating paper between the plates to become conductive. It is thus necessary to remove this damp, and at the same time to re-insulate.

The top of the condenser may be removed by re-heating the solder, at the same time keeping the whole condenser slightly warm so that the contents slip out easily once the top is removed. When this is done the top is taken off the wires, leaving what looks like a roll of paper with a covering of wax. This is now placed in a tin or can, which must be clean, and gently heated. Bits of clean candle are then added until the condenser is submerged in a bath of molten wax. A piece of thin wood should be placed over the can and the condenser suspended in the wax so that the paper may not be burnt against the hot sides. The heat should then be increased slightly until bubbles are seen coming from the condenser, and when the

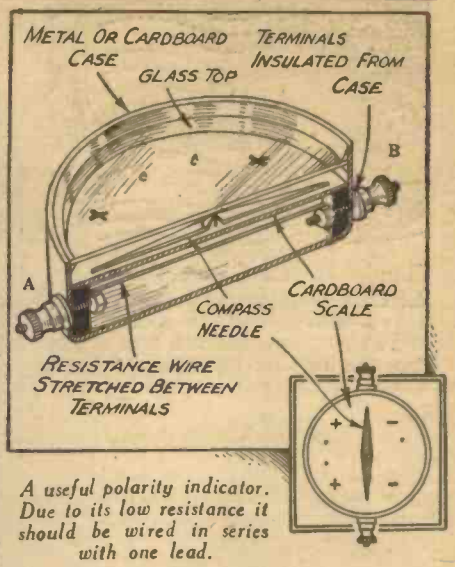


A method of rejuvenating faulty condensers.

bubbles have ceased, the can and contents are removed from the source of heat. The container of the condenser may then be examined for holes, which should then be soldered. The condenser is then lifted out of the wax, placed in its container, and molten wax poured in until the level is as shown in the sketch. A piece of stout cardboard is then waxed and cut into shape, and placed on top of this, two holes being made for the wires to come through. Slightly warmed pitch is then stuffed and packed in tightly after the wax has become cool and firm. This layer should be put on carefully so that no air is admitted to the condenser. The wires are then ready for soldering to the set. If preferred, two sockets from an old H.T. battery can be inserted and soldered to the wires before putting in the pitch. Wander plugs can then be used to connect up.—J. DIAMOND (Greenock).

A Polarity Indicator

A USEFUL polarity indicator, or general-utility current detector, can easily be made from material in the scrap box. The illustration shows the simple construction of the instrument. A wire of moderate resistance is stretched between the terminals A and B beneath a card on which is mounted a compass needle. The card is marked as shown in the sketch. This marking is the most important part of the construction. Four small stops are provided to prevent too violent movement of the needle when the instrument is in

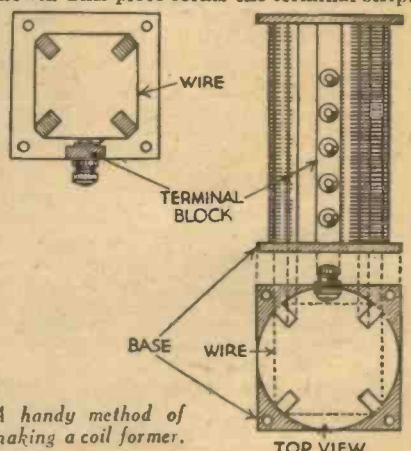


A useful polarity indicator. Due to its low resistance it should be wired in series with one lead.

use. The operation of the instrument is as follows: The case is turned until the needle lies over the one drawn on the card. The wires of unknown polarity are then touched against A and B when the needle at once swings to indicate the polarity of A and B. As previously mentioned, this simple instrument may also be used as a current-detecting device. For small currents the card may be calibrated by means of a standard instrument to read in milliamps. Other possible uses will probably occur to the reader. If any reader does not understand the principle underlying the instrument, it may be noted that it is based on Oersted's Experiment and Ampere's Rule.—H. F. DICKIE (Taunton).

A Handy Coil Former

A HANDY coil former, with connections for tappings, can be made as follows: Cut a square piece of wood or ebonite, about 2in. square, and a circular piece 2in. in diameter. Four pieces ½in. by ½in. by 4in. will also be required. Fix the parts together, as shown in the sketches, the square piece for the base, the round piece for the top, the four pieces at each corner, and another piece about 4in. by ½in. by ½in. along the middle of one of the sides, as shown. This piece forms the terminal strip.

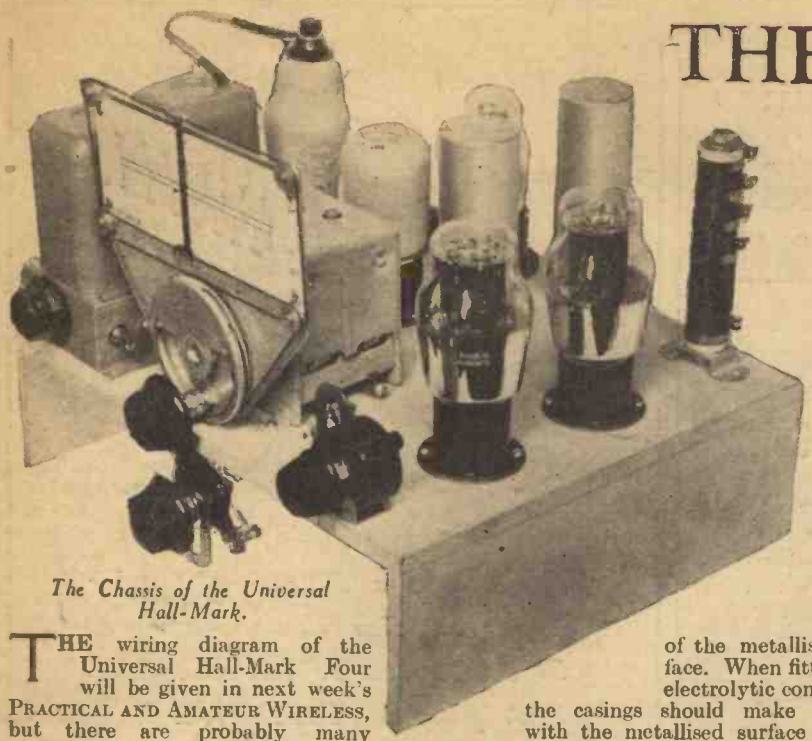


A handy method of making a coil former.

To save filing grooves to take the wire at each corner, four ¼in.-diameter screwed rods can be used instead of the four pieces of wood. These rods should be covered half way round with insulation tape, where the wire rests, the tape being pressed into the threads of the rod to form the grooves. Finally, bore four holes in the projecting corners of the base, for screwing to the baseboard.—J. S. WATTS (Bristol).

THE UNIVERSAL HALL-MARK FOUR

Further Constructional Details and Wiring Diagrams Next Week!



The Chassis of the Universal Hall-Mark.

THE wiring diagram of the Universal Hall-Mark Four will be given in next week's PRACTICAL AND AMATEUR WIRELESS, but there are probably many readers who prefer to build their receivers from the theoretical diagram, and therefore, this week, we propose to give you a few advance constructional details. Most of the instructions for the A.C. Hall-Mark also apply to the universal model, but there is one point that must be particularly stressed in connection with the latter. The earth lead must not be connected to the metallised surface of the baseboard, as this procedure might possibly cause a mains short-circuit in cases where the supply is D.C. with the positive mains lead earthed. For the same reason a condenser is connected in the aerial lead. This component is the pre-set condenser C3, and in addition to insulating the aerial, it may be used for controlling selectivity, in cases where the receiver is used in close proximity to a transmitting station.

A 1¼in. drill should be used for V1, V3, V4, V5 and rectifier valve-holders, and a 1in. drill for V2 holder. As in all receivers employing a Metaplex chassis, care should be taken to keep the valveholder pins clear of the metallised surface. When fitting the electrolytic condensers the casings should make contact with the metallised surface of the baseboard, as the casing is the negative terminal of this type of condenser.

LIST OF COMPONENTS.

One 2-gang set coils, types Q and T.—Wearite.
One 2-gang .0005 mfd. midget condenser with type V P. drive with wavelength scale (C1, C2)—Polar.
One .00015 mfd. reaction condenser (C3)—Graham Farish.
Four .5 mfd. fixed tubular condensers (C6, C11, C14, C15)—T.M.C.
Two .1 mfd. fixed tubular condensers (C4, C5)—T.M.C.
Three .05 mfd. fixed tubular condensers (C20, C21, C22)—T.M.C.
One .0001 mfd. fixed tubular condenser (C7)—T.M.C.
Three .0002 mfd. fixed tubular condensers (C9, C12, C13)—T.M.C.
One 2 mfd. fixed condenser (C10)—T.M.C.
Three 25 mfd. electrolytic condensers (C8, C16, C17)—Dubilier.
Two 8 mfd. electrolytic condensers (C18, C19)—Dubilier.
One .0003 mfd. pre-set condenser (C23)—Formo.
Fourteen fixed resistances, 30,000 (R2), 25,000 (R1), 2,000 (R5), 500,000 (R6), 20,000 (R8), 30,000 (R9), 1,000 (R7), 250 (R12), 250 (R13), 50 (R15), 50 (R.16), 10,000 (R.10), 10,000 (R11), 200 (R3)—Graham Farish.
Two potentiometers 2,000 ohms, type V.C.26 (R4) and 5,000 ohms, type VC.29 (R14)—Bulgin.
One Mains dropping resistance (R17)—B.T.S.
One snap H.F. choke—Graham Farish.
One L.F. choke H.T.11—Wright and Weaire.
One Input push-pull transformer type D.P.36—Varley.
Three potentiometer brackets—Peto Scott.
One Mains on/off switch, type S.80—Bulgin.
Five valveholders, 4, 7-pin, 1, 5-pin—Clix.
Two .5 amp mains fuses—Microfuse.
One mains lead and plug—Belling and Lee.
Five valves, types H.P.2118, R.2018, P.P.4118, P.P.4118, PV3018—Tungsram.
One loudspeaker, type F.R.7. P.M.24—Rola.
One Metaplex chassis—Peto Scott (12 x 10 x 3¼ins.).
A.E. strip and plugs—Belling Lee.
One Hall-Mark Four cabinet.

Mounting the Volume Control

The bracket for the volume-control potentiometer should contact with M.B., but great care should be taken when screwing down the reaction condenser bracket. It is important that the screws do not pierce the metallised surface of the baseboard as this would result in a short-circuit of the reaction winding.

As the smoothing choke partly covers one of the output valve-holders, it will be advisable to fix this component after the valve-holder wiring has been completed.

The Mains Dropping Resistance

This component should be wired to suit the mains supply voltage. The heater pin of V3 should be connected to the lower terminal of the resistance for all supply voltages, but C22 and the fuse terminal should be connected to the second terminal (viewed from the bottom end of the resistance), for a voltage of 200 to 205, to the third terminal for 220 to 230 volts, and to the fourth terminal if the voltage is 240 to 250.

Speaker Leads

The three loud-speaker leads should be soldered to the tags on the Rola speaker transformer, the outer leads (from valve anode) being fixed to the outer tags, and the lead from C18 to the centre tag. A word of warning can be added concerning the speaker. This has a specially selected push-pull transformer attached, and if best results are desired, this must not be substituted. The push-pull valves have an undistorted output of approximately 6 watts, and therefore a small speaker would be hopelessly overloaded.

Further details of this receiver —including trimming and adjusting instructions—and a wiring diagram will be given in next week's issue of PRACTICAL AND AMATEUR WIRELESS.

Using a Pick-up

As this receiver has an undistorted output of approximately 6 watts it is very suitable for gramophone reproduction. Constructors who do not wish to fit a radiogram switch need only fit a pick-up strip at the back of the chassis, and connect the grid of the R2018 (V2) valve *via* a .5 mfd. condenser to one of the sockets, and the other socket *via* a .5 mfd. condenser to the metallised surface of the baseboard. When gramophone reproduction is desired the pick-up leads should be plugged into the sockets, and the volume control on the receiver set at minimum in order to prevent the radio signals from passing to the detector valve.

SPECIAL FEATURES OF THE UNIVERSAL HALL-MARK FOUR

Suitable for all A.C. or D.C. Mains.
Large Output—6 watts maximum.
Wavelength—Calibrated Dial.
Smooth Control of Volume.
Absence of Mains Hum.
Absolute Safety in Use.

Microfuses Ltd.—Change of Address

Readers should note that the address of Microfuses Ltd., makers of the fuse specified for the Hall-Mark receivers, has been changed to 4, Charterhouse Buildings, Goswell Road, London, E.C.1.

Here is the Universal Hall-Mark in its attractive cabinet.

On Your Wavelength

by Thermion

The Modern Tower of Babel

MOST of my readers will be acquainted with the verbose and tergiversatory circumambulation (!) of Dr. Johnson, who, in compiling that ridiculous first English Dictionary, really wrote a satire on the human race. His definition of patriotism, for example, was "The last refuge of a scoundrel"! In his lives of the poets, the following phrase occurred:—

"Let observation, with extensive view,
Survey mankind from China to Peru."

I expect you will also be aware of Coleridge's scathing comment on this: that it really meant "Let observation with extensive observation observe mankind." Now lexicography has been, with me, a *bete noire* ever since I learned to read. I have always been irritated by the fanciful imaginations of those who compile our dictionaries and merely hazard guesses at the derivation and pronunciation of some words. Too long has it been anybody's job to produce dictionaries of the English language. I have no doubt that if a Welsh scholar were given the opportunity to compile an English dictionary it would be smothered with Welsh words and Welsh pronunciations, and really be a piece of veiled propaganda for the Welsh race. In other words, a Welshman (where doubt existed regarding the origin or pronunciation), would quite naturally be tempted to give it to the Welsh. The same argument applies (perhaps with greater force) if you placed the job in the hands of a Scot. A language belongs to a nation, and not to particular individuals, and as such the compilation of a dictionary should be a government job. There is no standardisation about language at all. Anyone can publish a dictionary and invent any sort of pronunciation, word, or meaning, at variance with all the other dictionaries. Once it is in print it has the authority of the printed word. You may observe from this the point to which I am leading. The B.B.C. has its own committee on words and their pronunciations, which I think is all to the good. I do not know the members of the committee or their nationality, but it would be comforting to know that it does not intend to make an effort to upset pronunciations of words on which almost all dictionaries agree. As an Englishman, I am always careful in my choice of dictionaries. I prefer them to emanate from an English publisher and to have been compiled and edited by Englishmen. Confusion will be worse confounded if, in addition to our dictionaries, we are to have a radio dictionary as well. Do you agree? My "Shorter Oxford" is a treasured possession.

Where Are the Aerials?

IT does not seem so many years ago since part of the divertisement of my daily journey to town consisted of observing the various types of aerials and counting the weekly increments. Latterly, I have watched their gradual decline as, paradoxically enough, the number of radio sets has increased. On my twenty-five-mile journey I can now count six aerials where formerly they were uncountable. This is silent tribute to the increased efficiency of modern valves and wireless receiving apparatus. It spells the death of the outdoor aerial, with the possible exception of those small and neat commercial aerials which in most cases are more efficient than indoor aerials, and are also of great use in rooms where an indoor aerial is impracticable. Ten years ago there were dozens of different (and indifferent) types of outdoor aerials—unsightly-looking contraptions which did much to retard the progress of radio because people would not spoliate the appearance of their suburban chateaux. A modern receiver does not require a long outdoor aerial.

Fading

NONE of my quondam critics will disagree with me when I state that fading has nothing to do with the receiver. It is purely a transmitting problem, and as such I have always contended that it should be solved at the transmitting end. I do not see why I or any other listener should buy expensive apparatus in the form of A.V.C. units and equipment, merely to get over a problem which comes strictly within the domain of the designers of transmitting apparatus.

Whatever form of A.V.C. is fitted means a loss of efficiency in the receiver. It would be just as sensible for car manufacturers to make all of their cars to suit one-legged drivers because a few people are deprived of one of their limbs. My advice to commercial set designers is this: Supply your receivers without A.V.C. A station which fades is not worth listening to, anyway, and if customers had the point carefully explained to them, they would not require to listen to a station on which fading is consistently bad. There are other reasons I know which cause fading, and which are quite outside the ken even of the transmitting engineer; but even so, I contend that it is not a problem to be tackled at the receiving end. I always believe in tackling the cause rather than the effect!

A Precocious Schoolboy

I AM reminded of the old quotation:—

"And still he spoke, and still the wonder grew,
That one small head could hold one half it knew,"

by the correspondence I sometimes receive from schoolboys. If, in my urge to feed our panting printing presses I fail to cross an i or dot a t, I am certain to be reminded of it in a voluble fashion from a callow youth in his early teens; which is all to the good, keeps me up to the scratch and all that, and reminds me of the fact that a journalist should write for those who don't know rather than for those who do. The former class will learn something whilst the latter will have their knowledge confirmed and regard the contribution purely as an *aide memoire*. I am always pleased to hear from schoolboys and to advise them. We are apt to forget that a new generation of home constructors enters our ranks every year, and we must not hence shirk the irksomeness of going over the same old ground.

The £5 Three-valve Superhet

I AM always an unwelcome visitor to the PRACTICAL AND AMATEUR WIRELESS laboratory. On those occasions, however, when I pry into that holy of holies, I make it my business to ask the why and wherefore. The other day, a reader had called to make an inquiry regarding the £5 Superhet., out of which he couldn't get a note. One of the technical assistants had connected an oscillator to his receiver, and was busy trimming the I.F. transformers Within five minutes the receiver burst into life, and it was, indeed, a pleasant thing to watch the barometric change on the reader's face—from extreme gloom to the apogee of pleasure! I imagine from the conversation that he had ignored every instruction regarding matching and trimming, and had turned every knob and screw willy nilly, with the net result that he was entirely lost. He walked away another

(*Continued overleaf*)

Members of the staff of Whiteley Electrical Radio Co. Ltd., at the annual works dance recently held at Mansfield.

(*Continued from previous page*)

satisfied reader, paying glowing eulogies to the PRACTICAL AND AMATEUR WIRELESS service.

Thanks !

MANY thanks to the many readers who have written to me messages of good will on the transference of my weekly platform. "On your Wavelength" has been a regular feature for many years, and some readers expressed the fear that the amalgamation of the two wireless journals comprised by PRACTICAL AND AMATEUR WIRELESS might see the demise of the feature. Not so! Your unworthy *Thermion* will continue to expatiate on sundry subjects and to hurl his weekly brick bats behind the comfortable anonymity of his pseudonym. Set your fears at rest. All the same, I blush at the soft impeachment!

Anode Connections

I HAVE always loathed the terminal caps fitted to the top of screen-grid and similar valves, and have more than once had the misfortune to find them damaged. But last week I cursed them even more than usual, for they let me down badly just when I wished to demonstrate a new home-made receiver to some friends. The set was a battery-operated one, and I wished to employ the H.F. pentode from a portable that did good service last year. On going to the latter receiver, however, I found that the anode terminal was locked almost solid, presumably due to slight corrosion by fumes from the battery acid. A little hot water was run round the terminal nut, and this appeared to loosen it, but when an attempt was made to remove the terminal the whole cap turned round and parted company with the glass bulb. I blamed myself for my carelessness, and went to the nearest wireless shop to buy another valve. As soon as this was removed from its carton, however, it was discovered that the terminal cap on this valve also was loose—so loose, in fact, that I dare not touch the terminal. The result was that I could not demonstrate the new set after all, and since that time my name has been "mud" with my wireless friends. Some constructors have criticised the new form of metal cap connector, but I am all in favour of it—more so now than ever.

Radio Relays

FROM information that is constantly reaching me, it appears that the wireless relay services that are in operation in various parts of the country are receiving increasing patronage. All those firms who are operating relay stations are reporting increasing business, and appear to be enjoying prosperous times.

I find it difficult to form a reason for this, since relay subscribers are limited to one or two programmes, and must accept whatever the engineer in charge prefers to give them in the way of entertainment. Although I am by no means an "ether-scourer" myself, I do like to be able to turn to the foreign stations once in a while, and, moreover, I frequently enjoy many of the broadcasts from European stations. Admittedly, the bulk of my listening is in connection with the local stations, but even so I often find pleasure in alternative programmes that are sometimes sent out by the Midland and North Regional transmitters. It is therefore hard to understand why other people—and there must be many thousands of them—can be content to have one, or perhaps two, programmes from which to choose.

Notes from the Test Bench

Fitting Variable-mu Valves

A READER who had built the PRACTICAL WIRELESS Leader Three decided to fit a variable-mu S.G. valve and an S.G. bias potentiometer control. He wired the earth end of the grid coil (terminal 3) to the centre terminal of the potentiometer in the usual manner, and connected a .1 mfd. condenser between this terminal and MB. Results were quite satisfactory on the long-wave band but he found that the control did not function on medium waves. This is rather a common fault, and is due to the .1 mfd. condenser being short-circuited by the wave switch when the latter is in the medium-wave position. The remedy is very simple; it is only necessary to connect a .1 mfd. condenser between the switch terminal of the coil (terminal 2) and the switch lead.

Push-pull Output Circuits

WHILE testing an experimental receiver having two pentodes in push-pull, slight distortion was experienced; this was traced to the use of push-pull valves that were not exactly matched. To obtain the full benefit of a push-pull output stage, the same amount of current must pass through each half of the output transformer primary. When this condition exists, the magnetising effect of the direct current on the core is nullified because the direction of current flow in one half of the transformer primary winding is opposite to that in the other half. As it is difficult to obtain two pentodes that pass exactly the same value of anode current, experiments were conducted with various methods of equalising the consumption of the two valves, and it was eventually found that a very good control could be obtained by connecting the priming grids of the pentodes to the end terminals of a 5,000-ohm potentiometer and then joining the centre terminal of the potentiometer to H.T. A rotation of the potentiometer slider increases the voltage on one priming grid and at the same time decreases that on the other priming grid, thus affording the listener a simple means of equalising the anode current consumption of the valves.

Aerial Volume Control

SOME S.G. receivers employing an S.G.-H.F. stage rely on the detector reaction condenser for volume control. This control is not sufficiently effective when the aerial is in close proximity to the transmitter, however. A .0005 variable condenser connected in series with the aerial lead will control the volume, but in most cases this also affects the tuning of the aerial circuit because its operation varies the aerial capacity effect. The following is a simple method of overcoming this effect: connect the terminal of the aerial series condenser to one end of a 50 turn winding of 34 S.W.G. wire wound on a small cardboard former, and connect the other end of the winding to the earth terminal. This former should then be placed inside the existing grid winding former, its best position being found by experiment. The required size of the extra former will be governed by that of the grid winding former—there should be a clearance of at least ¼in. between the two.

Receiver Hire

PERSONALLY, I should have thought that those listeners who are not interested in making a set of their own, or who are not prepared to go to the expense of buying a high-class ready-made receiver, would much prefer to hire a set of reputable make from one of the many firms whose job it is to supply sets on hire terms. I know of several firms who are prepared to loan receivers for quite a few shillings per week, this charge covering all servicing and, in some instances, the replacement of the set by a new model after a certain period.

Interference-proof Receivers

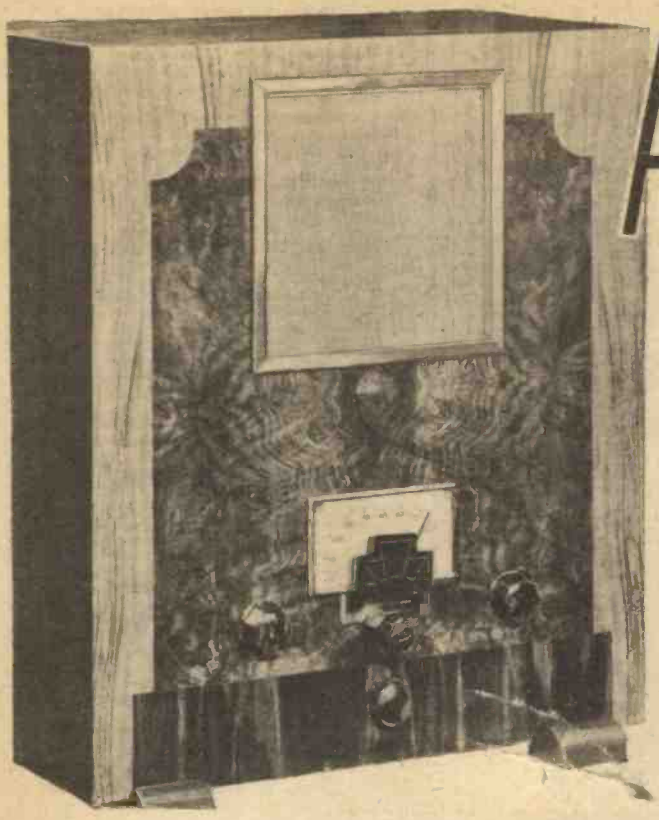
IT was with interest that I read the other day of an appeal made by the section engineer of the Birmingham P.O. Engineering Department to the Midland Radio Luncheon Club. His appeal was to the effect that radio manufacturers should make their receivers static-proof by fitting apparatus that would prevent the set from picking up electrical interference from outside sources. This, to me, seems all wrong, and in my opinion it is the makers of electrical machinery and fittings who should be called upon to fit suppressors to the appliances which they manufacture. It seems rather like "putting the cart before the horse" to allow electrical apparatus to be so designed and made that it constantly radiates interference, and then to attempt to suppress that interference when it is detected by the receiver. The argument in favour of modifying the set will probably be that the set came after the electrical machinery, but surely that is not a good excuse.

If I drive a car the exhaust of which emits an ear-splitting noise when the car is driven down the street, I am liable to be summoned for causing a public nuisance, and yet the maker of, say, an electric hair-dryer, that may be productive of equally ear-splitting noises in the loud-speakers of hundreds of receivers, gets away scot-free.

Wireless Dealers

WHY is it that there is so much incompetence in the wireless trade? At various times I suppose I have been into hundreds of wireless shops, and on only very few occasions have I found that the owner or assistants had any more than a very nodding acquaintance with wireless theory and practice. In one particular instance I found a so-called service engineer carefully "testing" the various components of a simple three-valve battery set which "would not work." At the very first glance it was evident that the constructor of the set had made various "earth" connections to the wooden chassis—which was *not* metallised. And yet this engineer (?) was non-plussed, and could not understand why the set was so absolutely dumb! It is a pity that manufacturers of wireless components and receivers cannot institute some system whereby unqualified people would not be allowed to sell articles of which they have no knowledge. I do not suggest that intending traders and assistants should be compelled to pass a stiff examination, but if they were required to answer a few simple questions put by a competent person a large number of those who are in the wireless business to-day would be compelled to study the fundamentals—or else earn their living in some other manner. A test on these lines would be of considerable assistance to the wireless trade as a whole, and would certainly be to the advantage of the novice and beginner in home construction, as well as to the listening public in general.

TRIMMING, MATCHING AND OPERATING THE A.C. HALL-MARK



Mr. F. J. Camm's Latest Mains Receiver. Battery and Universal Models are Described on Later Pages

EVEN at this early stage it is evident that some thousands of the A.C. Hall-Mark, with its quality and large undistorted output, are in process of construction throughout the British Isles. Aided by the free-gift blueprint which was given last week, the construction presents no difficulty at all and, as a fact, can be accomplished within a couple of evenings. The ample diagrams, instructions, and photographs also included with last week's issue make the position of every component and every wire crystal clear, even to the veriest beginner.

It is not possible to convey by means of diagrams the niceties of adjustments and the fineness of trimming and matching which make all the difference between obtaining perfect results and indifferent results. Even with the most expensive motor-car there are the adjustments to the carburetter, to the driving position, and to the ignition, which differentiate the article as it leaves the workshop from the well-tuned product as it reaches the purchaser.

A home-constructed receiver has that great advantage over the commercial product. It has all the sturdiness and reliability of the hand-made job and the almost inestimable advantage that it does not, like so many commercial receivers, present the appearance of the internals of a telephone switch-box when you remove the back to find out what has gone wrong.

A receiver which you have actually made is known to you in all its constructional elementals, but you must carry out very carefully the matching and trimming operations, and not merely be satisfied that the receiver works directly you attach your aerial and earth to it. For this, of course, it is bound to do if the components and the wiring instructions have accurately been followed.

Final Instructions

Before giving the final instructions, there are a few points regarding the construction to be given. For example, before mounting the ganged condenser and coils, be very careful to ascertain that the underneath surfaces of the components themselves are clean, as it is these surfaces which provide the earth-return path *via* the metallised Metaplex chassis.

Another point: The bracket holding the reaction condenser must not be in contact with the metallised baseboard, and it is particularly necessary, therefore, to ensure that the screws holding this component to the chassis do not make contact with the metallised surface.

I stress this point because I have found in the past that many readers who have failed to obtain successful results have used screws which have passed through and made contact with the metallised surface, thus in many cases completely blotting out signals.

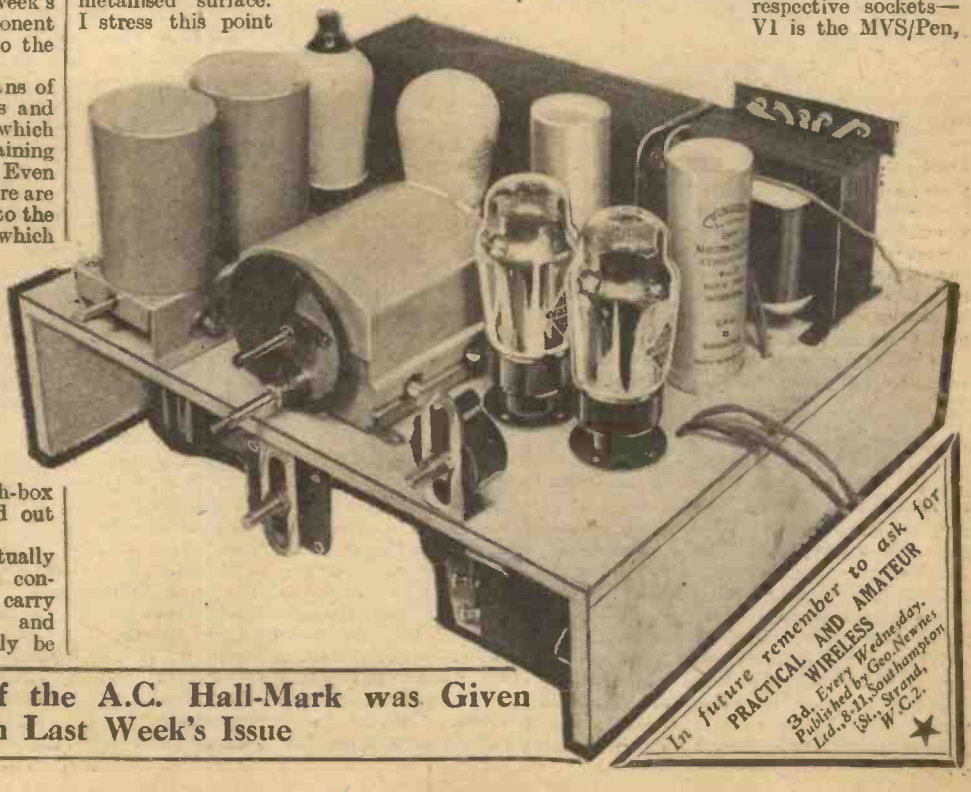
The Electrolytics

The wiring of the electrolytics was mentioned in last week's issue, but as this cannot very clearly be shown on the blueprint, owing to their position, we would particularly emphasise that the casing of C15 (the inner condenser of the two) must not make contact with the metallised baseboard, and the two leads indicated on the sub-baseboard wiring diagram shown connected to the electrolytic condenser fixing nuts must pass through the condenser fixing hole and make good contact with the condenser casing.

The Mains Switch

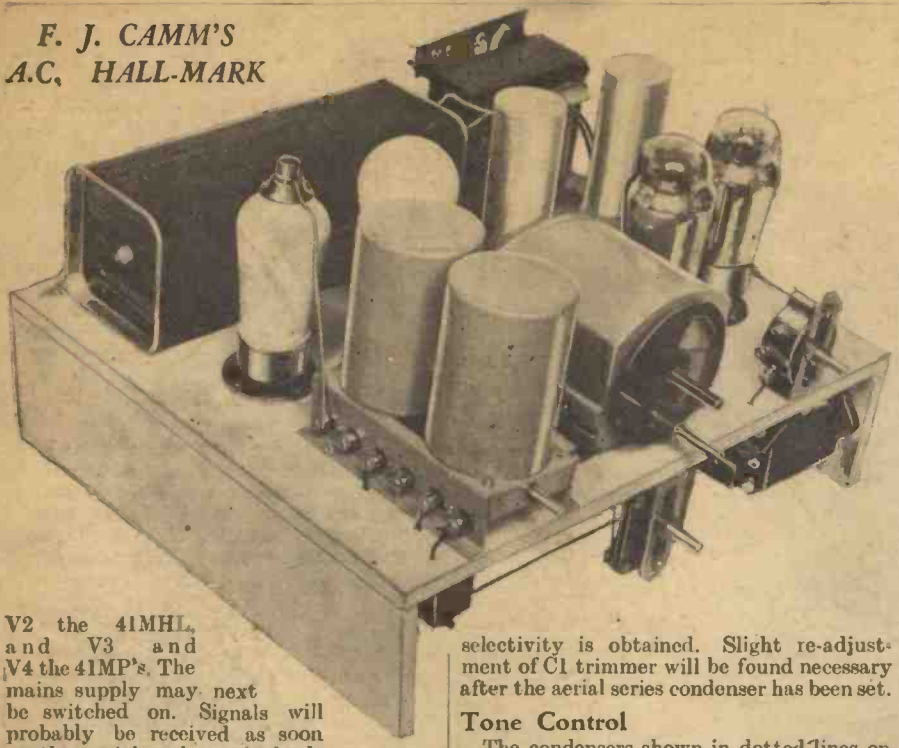
The mains switch has not been attached to the front panel, as this method of connection sometimes tends to produce mains hum owing to the proximity of the main leads and the H.F. wiring.

It is therefore suggested that the switch be connected to the side of the cabinet near the mains transformer. If you have rigidly adhered to the above instructions, the valves may now be inserted in their respective sockets—V1 is the MVS/Pen,



A Full-size Blueprint of the A.C. Hall-Mark was Given Free with Last Week's Issue

F. J. CAMM'S A.C. HALL-MARK



V2 the 41MHL, and V3 and V4 the 41MP's. The mains supply may next be switched on. Signals will probably be received as soon as the aerial and earth leads have been connected and the dial rotated.

Best results, however, cannot be expected unless the gang-condenser trimmers are carefully adjusted. Fortunately, the trimming of a double-tuned-circuit receiver can very easily be effected. First adjust the two trimmers to their mid-way positions. The local station may now be tuned in and the front section (C1) trimmer adjusted for maximum volume. A more distant station should then be tuned in and the two trimmers slightly readjusted for best results. The trimmer position should now hold for stations on all parts of the dial. If this is not the case, it indicates that the coils are not correctly matched.

Selectivity Control

For best quality reproduction from the local station the reaction condenser should be set at its minimum position—this is done by rotating the control knob in an anti-clockwise direction—and volume should be controlled by means of the 2,000-ohm potentiometer. When listening to distant stations, however, sensitivity and selectivity may be improved by rotating the reaction condenser very nearly to its oscillation point. Those who live very near a transmitting station may find that the selectivity does not quite meet with their requirements, and therefore it is suggested that a .0003 pre-set condenser be connected between the aerial terminal and terminal 1 of the coil. The setting of this component may then be adjusted until the required degree of selectivity is obtained. Slight re-adjustment of C1 trimmer will be found necessary after the aerial series condenser has been set.

Tone Control

The condensers shown in dotted lines on the theoretical diagram may be added if more mellow reproduction is desired. These two condensers are connected between G and G.B. terminals of the push-pull transformer.

These tone-compensating condensers simply serve to attenuate the higher frequencies and have no other effect; that is, they do not reduce volume, and their value is sufficiently low to avoid any "boominess" or other unpleasant form of reproduction. As, however, many readers will prefer the rather "crisp" reproduction that the set normally provides, the condensers will not be required in all cases. Much depends upon the position of the loud-speaker and also on the furnishings of the room in which it is situated, for if there is a good deal of upholstered furniture this will itself tend to give a "mellowing" effect.

COMPONENT VALUES

Values of components shown in the circuit given last week are as follows:

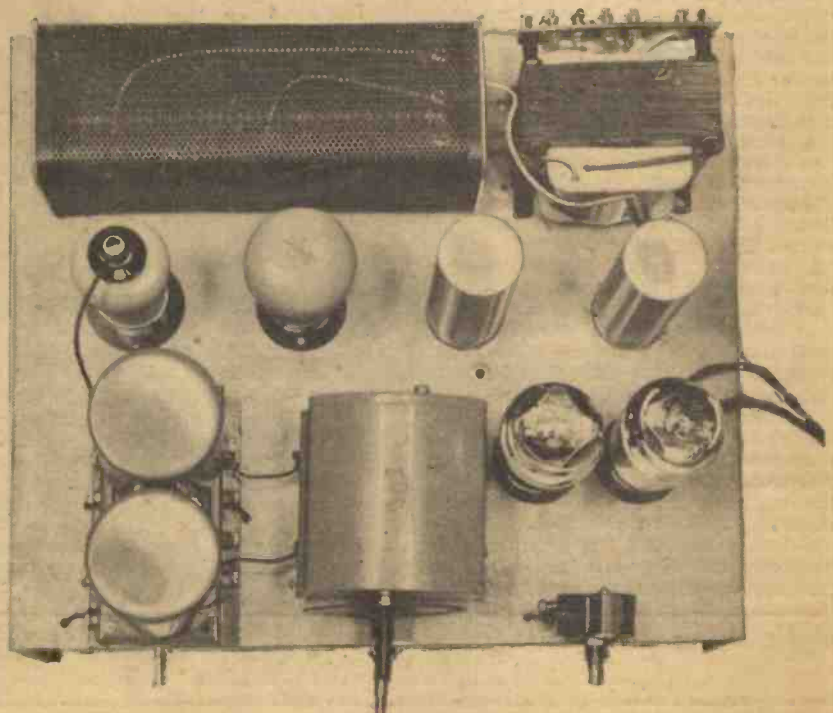
R1, 50,000 *ohms*; *R2*, 25,000 *ohms*; *R3*, 250 *ohms*; *R4*, 2,000 *ohms*; *R5*, 2,000 *ohms*; *R6*, .5 *meg.*; *R7*, 750 *ohms*; *R8*, 30,000 *ohms*; *R9*, 20,000 *ohms*; *R10*, 10,000 *ohms*; *R11*, 10,000 *ohms*; *R12*, 350 *ohms*; *R13*, 350 *ohms*; *C1*, .0005 *mfd.*; *C2*, .0005 *mfd.*; *C3*, .00015 *mfd.*; *C4*, .1 *mfd.*; *C5*, .1 *mfd.*; *C6*, 1 *mfd.*; *C7*, .0001 *mfd.*; *C8*, 25 *mfd.*; *C9*, .0002 *mfd.*; *C10*, 2 *mfd.*; *C11*, .5 *mfd.*; *C12*, 25 *mfd.*; *C13*, 25 *mfd.*; *C14*, 4 *mfd.*; *C15*, 8 *mfd.*; *C16*, 8 *mfd.*

LIST OF COMPONENTS

One A.C. Hall-Mark Four Console Cabinet—Peto-Scott.
One Metaplex chassis, 12½in.×12in. with 3½in. runners—Peto-Scott.
One 2-gang variable condenser, complete with drive—Formo.
One 2-coil assembly, type TDS.—Colvern.
One reaction condenser, .00015 mfd.—Polar.
One input push-pull transformer, type DP.36—Varley.
Twelve 1 watt fixed resistances, 50,000 ohms, 30,000 ohms, 25,000 ohms, 10,000 ohms, 10,000 ohms, 750 ohms, 250 ohms, 350 ohms, 350 ohms, .5 megohms, 20,000 ohms, and 2,000 ohms.—Amplion.
Three tubular fixed condensers, .1 mfd., .1 mfd. (type 4403), .5 mfd. (type 4406)—Dubilier.
Two fixed condensers, .0001 mfd., .0002 mfd. (type 65)—Dubilier.
Three electrolytic condensers, 25 mfd., 25 volt working (type 3046)—Dubilier.
Two electrolytic condensers, 8 mfd. 500 volt working (type 0218)—Dubilier.
One fixed condenser, 500 volt working, 4 mfd. (type LEC)—Dubilier.
One screened H.F. Choke, HFPJ—Wearite.
One QMB. on/off switch, type S.80—Bulgin.
One 10-way group board—Bulgin.
One 2,000 ohm potentiometer, type VC.26—Bulgin.
One mains transformer—B.T.S.
One H.T.10 metal rectifier—Westinghouse.
One .5 amp. fuse and holder—Microfuse.
One twin socket strip, with plugs marked A. and E.—Belling-Lee.
Four valves, MVS Pen., 41MHL, 41MP, 41MP—Cossor.
One mains-energised loudspeaker, type "Practical Wireless"—W.B.
Two fixed condensers, 1 mfd., 2 mfd., type BB—Dubilier.
Two component brackets.—Peto-Scott.
Four valve holders, 1, 7-pin, 3, 5-pin—Clix.

Fitting the Set into the Cabinet

The cabinet is a soundly made job and no difficulty will be experienced in marking out the front for the various spindle holes. An excellent method of doing this is to put a spot of ink on the centre of the projecting ends of the control spindles and then to slide the chassis into the cabinet, so that the longest spindle transfers its ink to the inside of the front of the cabinet. This hole should then be drilled with a wood-worker's centre-bit, drilling through from both sides of the cabinet. Next pass the chassis in again and proceed to mark and drill the other holes in a similar manner.



BUILDING POWER AMPLIFIERS

Practical Details of Two Different Types of A.C. Amplifier Suitable for Outputs of Three and Four Watts are Given

By FRANK PRESTON

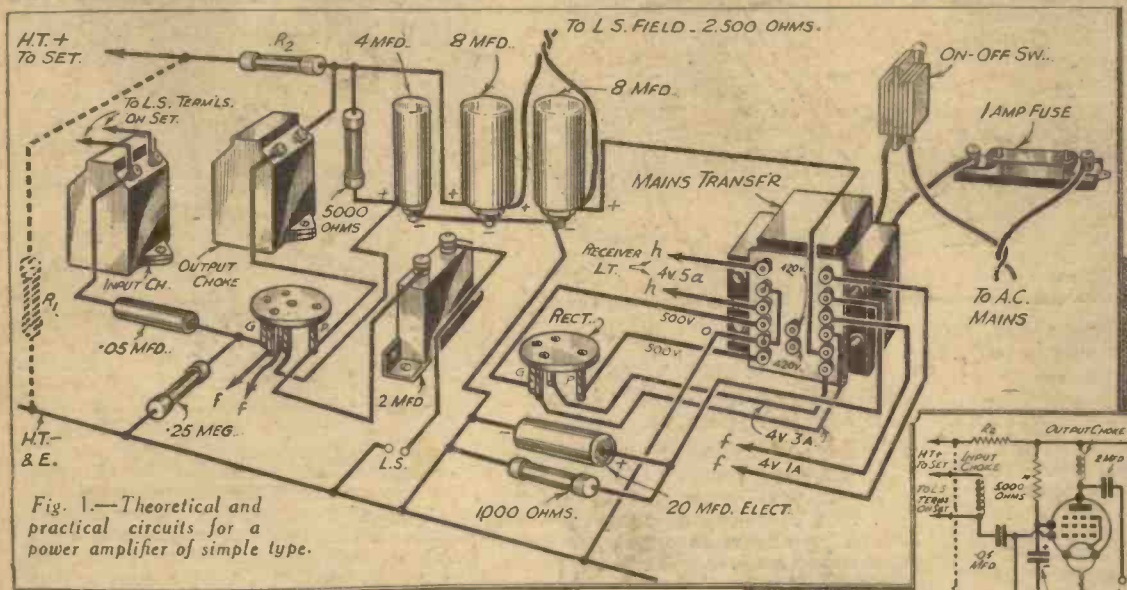
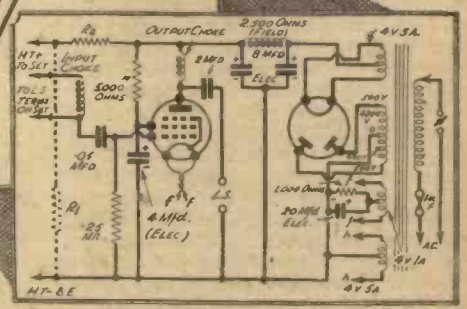


Fig. 1.—Theoretical and practical circuits for a power amplifier of simple type.



THERE are many arguments both for and against the use of high-power amplifiers to feed the loud-speaker, but the fact remains that greater undistorted outputs are coming into wider favour. Whereas an undistorted output of about 1 watt was considered high a few years ago, it is now the rule to find that the average mains receiver has a maximum output well in excess of this; in fact, it is probably true to say that the average output is something like 2 watts. There are many listeners who desire an output higher than this, however, and it is for such people that this article is written. Details will be given of amplifiers suitable for outputs between 2 and 5 watts, so that the units described will be appropriate for use with the average receiver when it is wished to operate a few speakers at full volume or to obtain good reception in a large room. The amplifiers can also be used—in a very limited way—for public-address work indoors, although they are not suitable for use in the open air, when the output should be something like 20 watts.

The Power Supply

The conditions set out preclude battery amplifiers, since to secure more than 2 watts from a battery set it becomes expensive to obtain the necessary current, and the choice of valves is limited.

When it is proposed to fit a power amplifier to an existing mains receiver it is first necessary to decide whether or not the power-supply unit in the receiver has sufficient "reserve" to enable it to feed the amplifier as well. In the majority of cases it will be found that the mains portion has an output only just sufficient for the receiver itself, and it will therefore be necessary to provide a separate unit for the additional amplifier. It will nearly always be found, however, that the new mains unit can be made to give sufficient output for the receiver and amplifier without going to any additional expense. For that reason it might be found convenient to remove the power-supply components from the set and use some of them in the amplifier. The amplifier circuits to be described will be shown complete with power units, and it will be explained how these can be employed to feed the receiver.

A Single-Valve Pentode Amplifier

The simplest possible type of amplifier is that shown in Fig. 1, and this employs a single directly-heated pentode, fed from a choke-capacity filter circuit. This amplifier is well suited to follow a receiver having a small power valve in the output circuit and having only a single L.F. stage. It is not suitable for use after a powerful set, since the pentode would be overloaded in such circumstances. When the Cossor PT 41 B valve is used the undistorted output is over 3 watts. This valve requires an anode voltage up to 400 and consumes 36 milliamps of anode and screen current, so that it is necessary to employ a rectifier valve of the C class, the maximum output from which is 500 volts at 120 milliamps. A 2,500-ohm loud-speaker field winding is included in the positive lead, and this accounts for a voltage drop of 90 at the H.T. current of 36 milliamps. The bias voltage required for the PT 41 B is 40, so that the voltage actually applied between the anode and cathode is 350, allowing for a drop of some 20 volts across the winding of the output choke.

Component Values

The various resistance and condenser values are indicated in Fig. 1, whilst suitable voltage outputs for the mains transformer are marked. It will be seen that the H.T. secondary winding of the transformer is tapped so that voltages of 500 or 420 can be applied to the anodes of the full-wave valve rectifier. When the amplifier only is being fed from the mains equipment the lower tappings must be used to prevent the voltage from rising to a figure in excess of 500, as it would when the total load on the rectifier is only 36 milliamps. When the mains unit is also being used to feed a receiver, however, the maximum (500-volt) tappings can be used, the total load being made up to 120 milliamps by connecting a fixed resistance in parallel with the output, as shown at R1. The value of this resistance can be found by dividing the difference between the total current consumed and 120 milliamps into 500, and the result will be in thousands of ohms. The resistance must, of course, be of large enough power-handling capacity to deal with the current involved.

The resistance shown at R2 is for the purpose of limiting the output voltage to that required by the receiver, and its value may be calculated in the usual manner by dividing the current into the voltage to be dropped.

The mains transformer shown has a separate 4-volt, 5-amp. winding for supplying the heaters of the receiver, but the actual current output for this should be chosen according to the set in use.

With regard to the components required for the amplifier mains unit, it should be stated that these should all be of the best quality obtainable. Remember that high voltages are being dealt with, and act accordingly! The electrolytic condensers used for smoothing the H.T. supply should have a rated *working* voltage of not less than 600, whilst that used in the grid-bias circuit need be rated at 50 volts working. The first L.F. choke, used for coupling the amplifier to the receiver, must have a current-carrying capacity of only about 20 milliamps at the marked inductance, but the output choke should be designed to carry up to 50 milliamps, and should have an inductance of 15 to 20 henries when carrying the maximum current. This choke should have a D.C. resistance of about 400-500 ohms. All other details required can be obtained from Fig. 1.

(Continued overleaf)

AN A.C.-OPERATED PUSH-PULL CIRCUIT

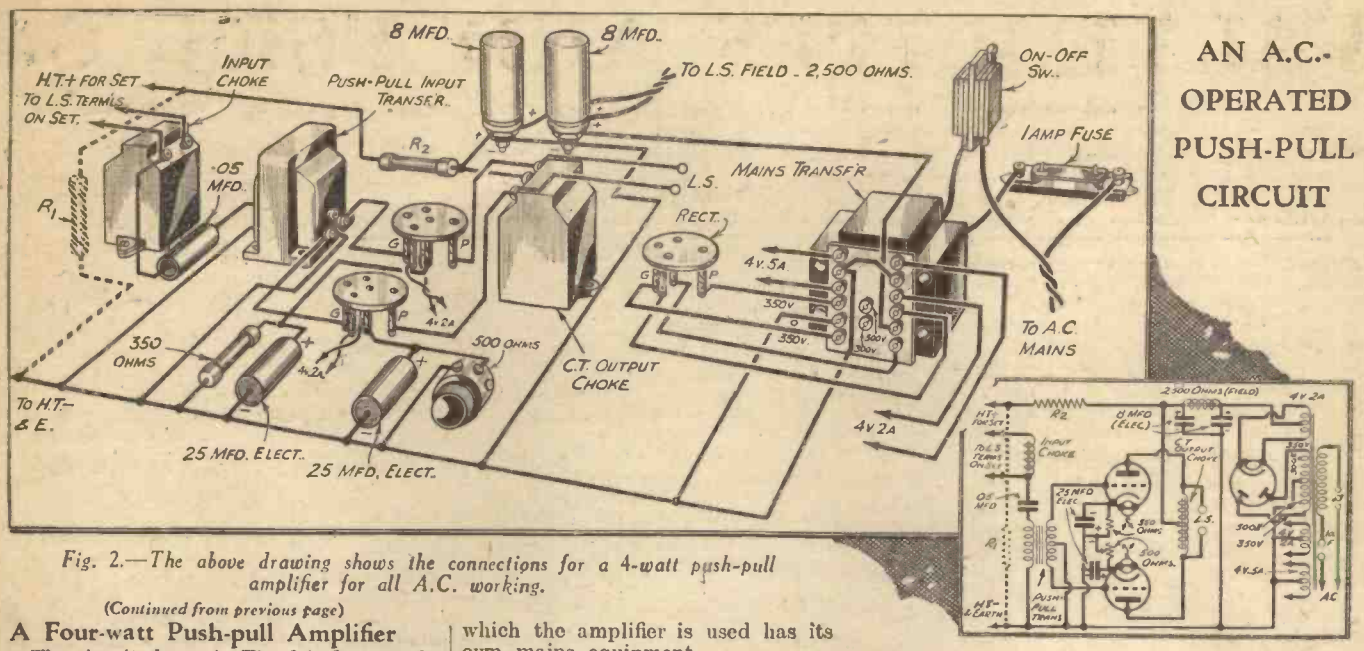


Fig. 2.—The above drawing shows the connections for a 4-watt push-pull amplifier for all A.C. working.

(Continued from previous page)

A Four-watt Push-pull Amplifier

The circuit shown in Fig. 2 is for a push-pull amplifier giving an output of rather more than 4 watts when a pair of Cossor indirectly-heated 41 MXP valves are employed. The component values indicated in the theoretical and practical circuits apply to these valves, but only slight modifications would be necessary if two valves of similar type but of other make were used. This amplifier is suitable for use after a receiver with an appreciable output, since the valves mentioned do not afford such a high degree of amplification as the pentode specified for the first circuit, and are not so easily overloaded. As the valves require an anode voltage of only 200 it is possible to use a rectifier valve of the B type, which gives an output of 350 volts at 120 milliamps, and still to have a sufficiently high voltage to afford the drop occasioned by the use of a 2,500-ohm energised moving-coil speaker.

Directly-heated valves are often specified for push-pull circuits, but by using indirectly-heated ones it is possible to obtain a certain amount of decoupling in the cathode circuits and also to "balance" the two valves, if necessary, by slightly altering the value of one of the biasing resistances; it is for this reason that one bias resistance is shown as being variable. The H.T. secondary of the mains transformer is again shown as being tapped, this time at 300 volts, so that the voltage on the anodes of the valves may be kept down to 200 volts when the receiver with which the amplifier is used has its own mains equipment.

The Push-pull Components

A suitable input push-pull transformer is the Ferranti AF5C, but this should be choke-capacity fed, the choke Ch.1 being chosen to match the output valve in the receiver. Where the receiver is provided with choke-capacity output the choke and condenser may, of course, be omitted. The H.T. smoothing condensers in this case should be rated to work at not less than 400 volts, although the voltage will not rise unduly due to the fact that an indirectly-heated rectifying valve is employed. The bias by-pass condensers should have a working voltage of 25, the bias voltage being 12.5.

If the speaker employed is fitted with its own output transformer this will probably be unsuitable for carrying the full anode current of the two push-pull valves (80 milliamps), and a centre-tapped output choke is therefore shown. Where the speaker is not provided with a transformer, one having a ratio of 40 : 1 can be used in place of the output choke. This ratio is suitable for a speaker having a speech-coil impedance of 5 ohms, but would have to be modified for other speech-coil impedances. For example, if the speech coil were 12.5 ohms the ratio should be 25 : 1, or if it were of 7 ohms, the ratio should be about 30 : 1.

The Choice of a Speaker

It need scarcely be mentioned that the speaker used with an amplifier of either of the types described must be capable of dealing with the fairly large outputs involved. It is useless to obtain a small unit intended for use with an output valve of, say, the 1-watt class. In the case of the first amplifier described the energising wattage available, for a 2,500-ohm field winding, is only about 3½ watts. This is rather low, so that with some speakers it might be desirable to use the 500-volt transformer tappings, and to adjust the parallel resistance to such a value that a sufficiently high current is passed through the field winding. An alternative method, which is often very satisfactory, is to employ a speaker with a field winding designed for use with D.C. mains, and having a resistance of about 6,500 ohms. In this case the winding can be connected in parallel with the smoothed D.C. output, replacing the field winding in the circuit shown by a field-replacement choke. The disadvantage of this method of feeding the speaker is that the energising winding cannot be used as a smoothing choke, and expense is therefore increased to a certain extent. When a permanent-magnet speaker of suitable type is already available this can, of course, be used in either of the circuits shown, simply by replacing the field winding by a field-replacement choke as mentioned in the case of a 6,500-ohm speaker.

Chamber Concert from Midlands

THE second of the Chamber Concerts of music by Midland composers is devoted to Gustav Holst, who was born in Cheltenham and got his early training in choral work in Gloucestershire. The Birmingham Ladies' String Quartet and the Midland Wireless Singers will give a Holst programme on February 4th.

"Ahab and Elijah"

BLACK Country character and humour will be represented in Midland programmes in a short series centring round an imaginary character named Joe Gutteridge. In the first of these series, to be given on February 8th, Joe tells, from inside knowledge, some remarkable stories of experiences during the production of a play called "Ahab and Elijah," which

HERE AND THERE

was written as well as acted by Black Country workers.

B.B.C. Midland Orchestra

MARJORIE WESTBURY is the vocalist with the B.B.C. Midland Orchestra in a programme of Italian music to be given on February 9th. Leslie Heward will conduct. The orchestral works include Corelli's Concerto Grosso in G Minor and Respighi's "Trittico Botticelliano" Triptych.

Saturday Concert from Walsall

LATER in the same evening (February 9th) one of the Popular Saturday Concerts at the Central Hall, Walsall, is to be relayed for Midland listeners. The artists are Essie Ackland (contralto), Albert Hodgson (entertainer at the pianoforte), and Miroslav (violin).

Clearing a Channel

ON 514.6 metres, namely, between Vienna and Stuttgart, you will now pick up a French transmission at fairly good volume; it is Grenoble P.T.T., whose channel has now been abandoned by the newly-reconstructed Radio Agen (France). On the other hand, the position taken up by Agen on 309.9 metres is an unfortunate one, inasmuch as owing to its frequent deviations it is causing interference to Poste Parisien (Paris). It is difficult to understand why these small private stations cannot be made to work on a national common wave.

VALVE TYPES AND USES—6

This Week Three Special Hivac Battery-operated Output Valves Are Considered.

THE output circuit of the battery-operated receiver was revolutionised about a couple of years ago by the introduction of quiescent push-pull, for this form of output made it possible to feed a power of between one and two watts to the loud-speaker. When Q.P.-P. was first introduced there were many snags and difficulties, but these have now been overcome, principally due to the improvements in valve design and manufacture that have gradually been introduced. The result is that to-day the quiescent output stage, in one of the two forms in which it can be provided, is thoroughly reliable and not only permits of ample outputs being economically secured from battery-operated sets, but also ensures high-quality reproduction.

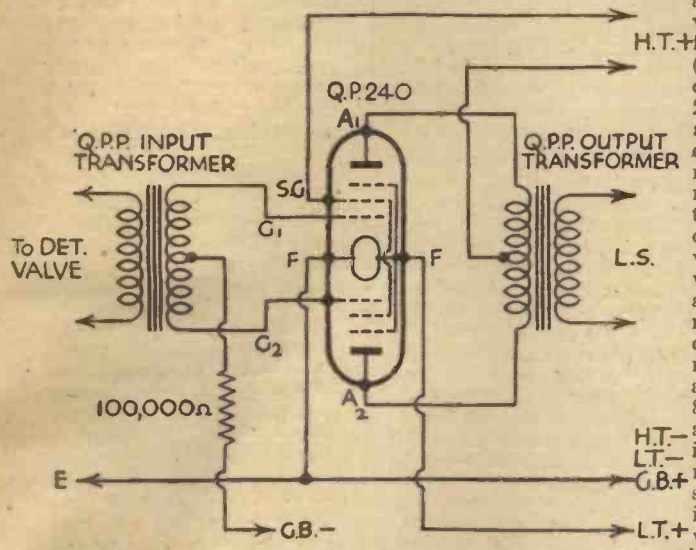


Fig. 1.—This circuit shows how the QP 240 is connected. Valve-base connections are shown below.

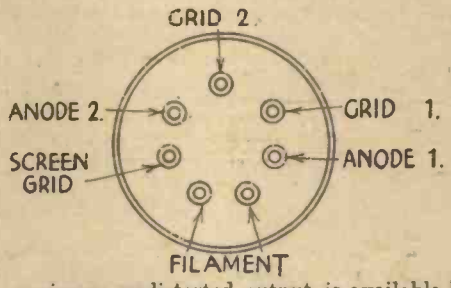
The Development of Quiescent Amplification

It is interesting to recall a few of the developments which led up to the introduction of the economy-with-volume output valves now available. In the first place the Q.P.-P. arrangement was rather unpopular, due to the fact that it was expensive, since two high-efficiency pentodes were required, in addition to a special type of push-pull input transformer, and also a special loud-speaker or output transformer. There was also the difficulty of accurately matching the two pentode valves in working conditions, and this often precluded the satisfactory use of Q.P.-P. by the inexperienced constructor.

Shortly after Q.P.-P. had been introduced in this country, and before it had "got into its stride," the Class B valve came along, and rapidly gained in popularity at the expense of the rather similar previous system. As is generally known, the Class B valve consists of two three-electrode valves in a single glass bulb, and the two halves are perfectly matched by the manufacturers, thus entirely removing this difficulty so far as the user is concerned. The chief objection to Class B amplification, however, is that the output (Class B) valve requires to be preceded by a driver valve, so that, although the output valve itself is cheaper than the two pentodes at first used in Q.P.-P., the cost of the output valve and the driver together, with the additional L.F. transformer required to feed the driver, is nearly as great as that of the two pentodes for quiescent push-pull.

A Double Pentode

Because of the facts enumerated above, Class B came into wider use than the previous system, and it is only within fairly recent times that Q.P.-P. has begun to stage a "come-back." The reason is that several makers have produced a double pentode especially designed for Q.P.-P. The two halves of the valve are accurately balanced, and the combination valve can be bought for as little as 19s. 6d. (which is the price of the Hivac QP 240, of which details are given in a panel on this page). As may be seen, the maximum undistorted output to be obtained from this valve is 1,400 milliwatts, which is adequate for most requirements. The quiescent anode current (when no signals are being received) is 8 milliamps, and the average current during reception is 12 milliamps; this assumes that the valve is being employed with the maximum high-tension voltage of 150, and in such conditions that the maximum undistorted output is available on the louder passages. It will be evident that the average anode current is rather higher than that taken by the Hivac B 230 Class B valve, plus that of an L 210 used as driver, but it must also be borne in mind that the maximum output is also greater than that from the Class B. From the point of view of efficiency there is little to choose, therefore, between Class B and Q.P.-P., although the latter has the advantage that it may be used directly after a detector valve, whereas the former must be preceded by an L.F. stage.



Using the QP 240

The connections for the QP 240, which has a 7-pin base, are shown in Fig. 1, where it may be seen that one terminal only is provided for the screening grid of both pentode sections. This is an extremely likable valve, and when used in the correct conditions it is capable of extraordinarily good results. The correct conditions can be enumerated briefly as follows: The input transformer must have a ratio of between 1 : 8 and 1 : 10 (overall); the valve must follow directly after the detector (if an L.F. stage were interposed there would be a risk of overloading); the G.B. battery should have a maximum voltage of not less than 18; the output transformer must be of the special Q.P.-P. type, having a primary resistance of not more than about 300 ohms; the H.T. supply must be well "regulated" and capable of supplying a "peak" current of, say, 40 milliamps.

All except the last condition will doubtless be quite easily understood, even by the beginner, but further information may be desirable concerning the matter of H.T. supply. It is not the purpose of this series of articles to deal with the theory of valves, but it can be stated briefly that the whole principle of quiescent working is that the anode current passed by the output valve(s) is proportional to the volume of sound being reproduced at any instant. Thus, although the average anode-current consumption of the QP 240 is only 12 milliamps, it might well rise, for very short periods, to 35 or even 40 milliamps, after which it might fall immediately to 8 milliamps. If the valve is to function correctly the anode voltage must remain constant irrespective of the

(Continued on page 729)

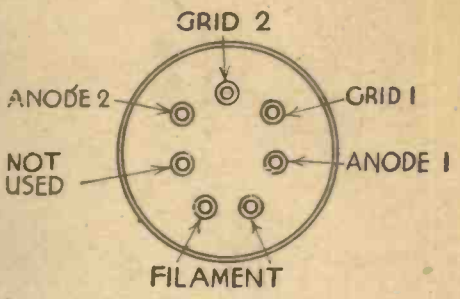


Fig. 2.—Valve-base connections for the B230 Class B valve.

VALVE TYPES AND USES.

HIVAC QP 240 (Double Pentode for Q.P.-P.)
Chief Characteristics:—

Filament Voltage	2
Filament Current	.4 amp.
Maximum Anode Voltage	150
Quiescent Anode Current	8 milliamps
Average Anode Current (for full output)	12 milliamps
Grid Bias (for max. anode voltage)	18 volts
Optimum Load (anode to anode)	14,500 ohms
Maximum Output	1,400 milliwatts

HIVAC B 230 (Class B)
Chief Characteristics:—

Filament Voltage	2
Filament Current	.3 amp.
Maximum Anode Voltage	150
Quiescent Anode Current	2.5 milliamps
Average Anode Current	5.5 milliamps
Optimum Load (anode to anode)	14,500 ohms
Maximum Output	1,250 milliwatts

HIVAC DB 240 (combined Driver and Class B)
Chief Characteristics: As B 230, excepting the following:—

Filament Current	.4 amp.
Total Quiescent Anode Current (Driver and Class B)	5.5 milliamps.
Average Anode Current (driver and Class B)	8.5 milliamps.
Driver G.B. Voltage (for max. anode volts)	4.5

Here is the battery model of the Hall-Mark Four in its attractive cabinet.

THE BAT HALL-MAR

Constructional Details for This Fas Given Here. Operating Notes w

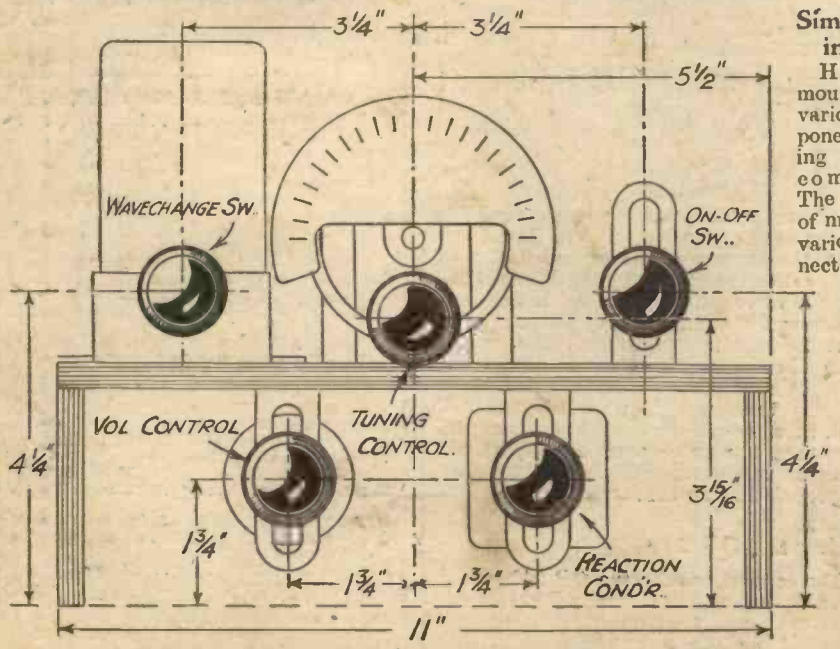
LAST week we gave some brief particulars of the circuit and general arrangement of the battery-model Hall-Mark Four, and from the letters we have since received it is evident that there is a large number of readers who contemplate the construction of this set. In the first place we would say that the constructional work involved is of an extremely simple and straightforward nature, as may be gathered by examining the photographs reproduced on this page. The components are few in number and are easily accommodated on the small metallised chassis. Even though the chassis is small there is no crowding and every terminal to which connection has to be made is easily accessible.

Preparing the Chassis

Some readers may prefer to purchase the chassis ready drilled, but those who prefer to drill it themselves should start by marking out and drilling the four holes for the valve-holders. These are all 1in. in diameter, and their positions can readily be determined from the scale wiring plan given. After mounting the valve-holders it will be found most convenient to fix in place all those components that are situated underneath the chassis, starting with the push-pull input transformer. After that, the two component brackets can be fitted and the reaction condenser and volume-control potentiometer attached to them.

It will be seen that the fixed condensers and fixed resistances are not attached to the chassis, but are supported by their connecting wires. The next step is to mount the third component bracket, variable condenser, and coil assembly on the upper surface of the chassis. Again the correct positions (which are not too critical, by the way) can be found by making reference to the wiring plan. One point that should be watched, however, is that the condenser must be exactly in the centre, so as to make the drive central. It should also be noted that the end of the condenser spindle should be in line with the front edge of the chassis—not overhanging, as might be supposed. This is because the collar on the slow-motion drive has to fit over it, the spindle from this actually passing through the front of the cabinet.

The position is rather different in the case of the wave-change switch rod on the coil assembly, since this must project, and the coil base is so placed that it just lines up with the front of the chassis.



Front view of chassis, giving dimensions for drilling the cabinet.

Simple Wiring

Having mounted the various components, wiring may be commenced. The method of making the various connections calls for little explanation, since it is evident from the wiring plan, but it should be explained that several wires pass through the chassis from components mounted on the upper surface to others that are underneath. The holes through which the wires pass are numbered on the two wiring plans, so that the "run" of every wire can easily be traced. It will also be observed that two "earth-return" leads are attached to a wood screw fitted into the chassis just beside the on-off switch; one of the leads is from the on-off switch and the other is from the volume-control potentiometer.

Three-quarter front view

To those who are conversant with theoretical circuits it might appear that there are more terminals on the coil assembly than are actually required, and that some of the connections are duplicated. This is explained by the fact that certain of the coil connections are brought out to two terminals, one situated on each side of the coil base. There is a very good reason for this, which is that it ensures short, direct connections to the fixed vanes of the variable condenser and also to the grid circuits of the first two valves.

"Earth-Return" Connections

In making the connections to the components on the underside of the chassis it will be seen that several leads are taken to a bolt (marked M.B.). These are "earth-

LIST OF COMPONENTS FOR TH

One Metaplex chassis, 10in. x 8in. with 3in. runners—Peto-Scott.
One 2-gang condenser, Baby type with dial—J.B.
One 2-coil assembly, type T.D.S.—Colvern.
One reaction condenser, .0003 mfd. (C3)—Graham Farish.
One pre-set condenser, .0003 mfd. (C4)—Formo.
Four fixed condensers, two .5 tubular (C7 and C10), two .1 tubular type 250 (C5 and C6)—T.C.C.
Four .0002 fixed condensers, type "M" (C8, C9, C11, C12)—T.C.C.
One 50,000 ohm potentiometer (R1)—B.T.S.
Four ohmite resistances, 1 meg. (R2), 30,000 (R3), two 10,000 ohms (R4 and R5)—Graham Farish.
One input push-pull transformer, type DP36—Varley.
One H.F. choke, type H.F.8—Bulgin.

TTERY
K FOUR

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be Given Next Week

return " leads, and it is therefore important that the head of the bolt should make good contact with the metallised upper surface. To ensure this it is well to fit a large washer under the bolt head, and also to place a similar washer over the looped ends of the wires before fitting the nut.

It is most unlikely that any reader will experience difficulty in following the wiring diagrams, but anyone who does should remember that our Advice Bureau is open to them free of charge, and that we shall be glad to assist any constructor who is in difficulty. But do not do as a few have done when building previous sets described by us and employ parts different from those specified. The receiver has been designed to give perfectly satisfactory results when certain components are used—it may, or may not provide good reception if alterations are made.

of the Battery Hall-Mark Four.

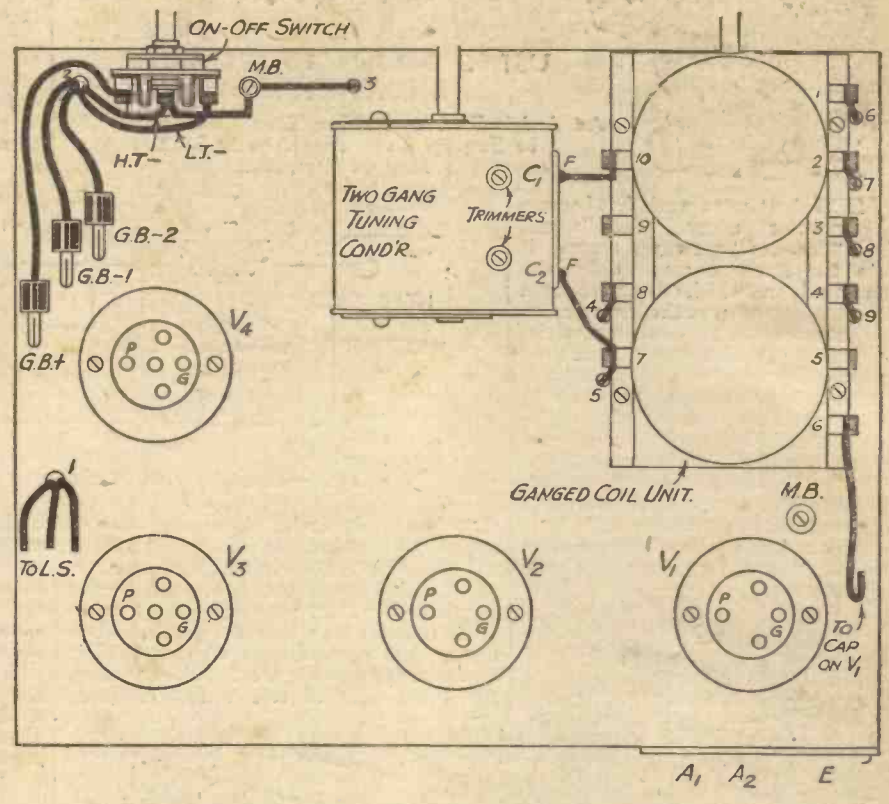
The Output Valves

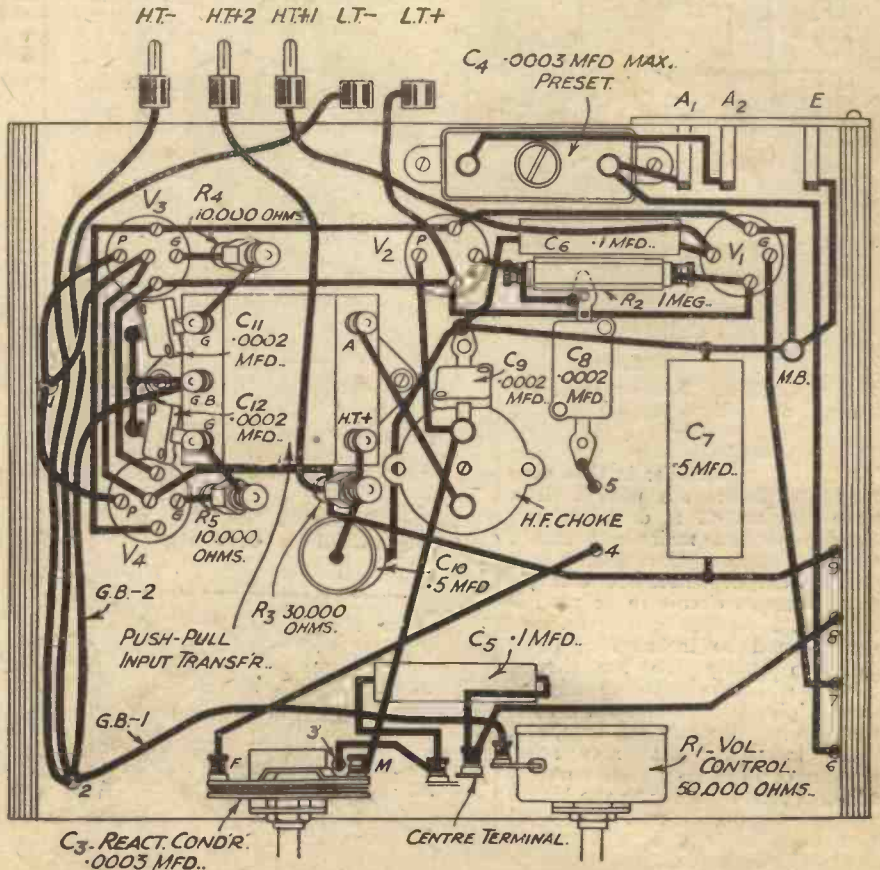
It will have been noticed by readers that in the circuit diagram given last week the output valves in the push-pull stage are represented as power triodes, whilst in the list of components these valves are listed as pentodes. The point is that the extra volume available by employing pentodes fully justifies their slightly greater expense; and for this reason these valves are recommended. Triodes, such as the Cossor 220 PA, can, however, be used if desired.

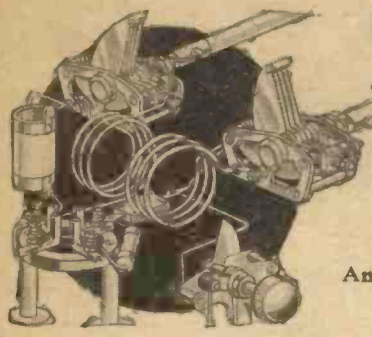
8 BATTERY HALL-MARK FOUR

Three potentiometer brackets—Peto-Scott.
Two terminal strips, A., E. and L.S./P.U.—Clix.
Six plugs, G.B.—1, G.B.—2, G.B.+, H.T.—, H.T.+1, H.T.+2—Clix.
Two spade terminals, L.T.+ and L.T.—.—Clix.
Four valves, 210 VPT, 210Det., and two 220HPT—Cossor.
Loudspeaker—W.B.
One on-off switch (three point)—Graham Farish.
Two five-pin valve-holders—Clix.
Two four-pin valve-holders—Clix.
One Hall-Mark cabinet—Peto-Scott.
One 120-volt H.T. battery.
One 9-volt G.B. battery.
One 2-volt accumulator.

Top and Sub-chassis Wiring Diagram of the Battery Hall-Mark Four







Short Wave Section

USING MAINS UNITS WITH SHORT-WAVERS

An Article Explaining How They Can Successfully be Employed, and How Any Difficulties May be Overcome

WHEN short-wave work first became popular many "fads" and "fetishes" grew up around it owing to the frequent small difficulties which occurred, and which often were cured by some strange and unorthodox arrangement. Because of the immense difficulties which always seem to have been considered to surround their use with short-wavers, mains-units have never, until perhaps very recently, come into favour with the short-wave experimenter. The writer is convinced that, provided a little care is taken in the first setting-up of the combination, a short-waver and a mains-unit can form a very successful arrangement. It is hoped in this article to show how such can be arranged and how likely snags that arise may be overcome.

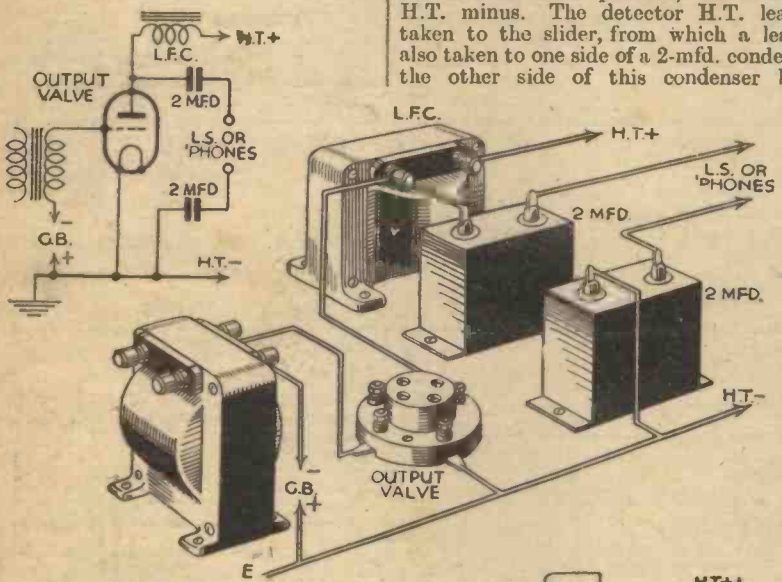


Fig. 1.—Showing how 'phones can safely be used with a mains receiver.

Curing Instability

The first point to consider is that very frequently headphones are used with a short-wave set, and it is definitely not recommended that a mains-unit should be used with 'phones unless with a safe and efficient output filter. A diagram showing the correct circuit to be used is given in Fig. 1. Note that both 2-mfd. fixed condensers should be included in order completely to isolate the headphones. Indeed, this addition is to be advised even though 'phones are never used, as it greatly assists in smoothing out hum, and curing any instability that may arise. The question of instability is the second point which occurs, as, owing to the higher resistance of the mains-unit compared with that of a battery, even a simple two-valver which is not decoupled is liable to become unstable and difficult to handle. If decoupling is to be added, and if it is already included, an alteration is suggested, the circuit shown in Fig. 2 being advised. A 50,000-ohm potentiometer is wired right across the H.T. supply—one terminal to H.T. positive, the other to H.T. minus. The detector H.T. lead is taken to the slider, from which a lead is also taken to one side of a 2-mfd. condenser, the other side of this condenser being connected to earth. Decoupling has now been effected and a variable arrangement for detector H.T. voltage provided at the same time. This has thus overcome what was one of the difficulties of using a mains unit with a short-waver, for critical control of detector H.T. is often necessary in order to obtain smooth reaction. Besides the detector valve an intermediate L.F. valve may also be found to require decoupling, whilst if an output pentode is being used, decoupling of its auxiliary grid may be useful. These suggestions having been carried out it may be found that, although the set works quite successfully,

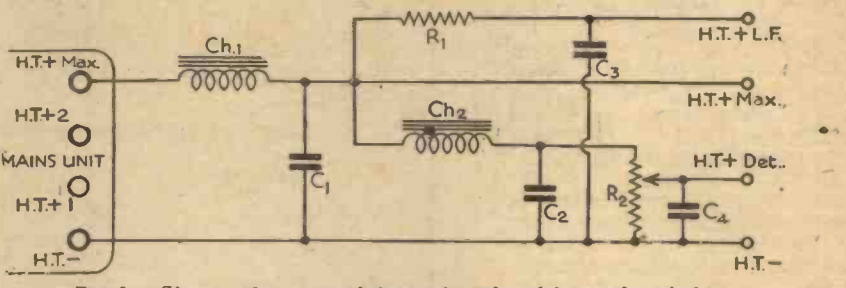


Fig. 3.—Showing the circuit of the simple and useful unit described.

with the mains unit a troublesome percentage of hum and, perhaps, other noises are heard. It is the writer's opinion that some of the mains units on the market are not suitable for immediate use with a short-waver without the addition of smoothing, and Fig. 3 shows a small unit which it is advised should be made up and used between the set and the unit.

Ch.1 should be a good L.F. choke of about 20 henries inductance at the current required. Ch.2, which feeds the detector only, may be the primary or secondary of an old L.F. transformer, or, better still, a high-inductance L.F. choke (about 100 H.) such as used to be used for L.F. coupling when choke-capacity coupling was popular. There are many such chokes on the market which can be purchased quite cheaply. Condensers C1, C2, C3, C4 should be 2 mfd. each and R1 should have a resistance of 20,000 ohms. R2 is a 50,000 ohms variable potentiometer which, together with C4, makes up the variable detector tapping mentioned earlier in this article. The position shown in Fig. 3 is correct for these components when this smoothing unit is used. This unit is applicable to either D.C. or A.C. mains units and should be connected right across H.T. + maximum and H.T. —, all intermediate tappings on the mains unit being ignored. Residual hum should now be nil, or else

(Continued on page 724)

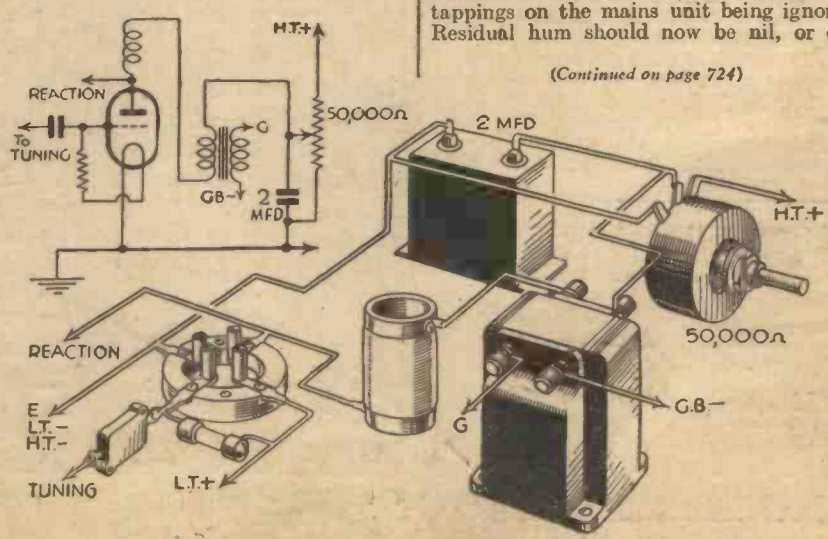


Fig. 2.—This circuit shows how the output circuit can be decoupled, as described in the text.

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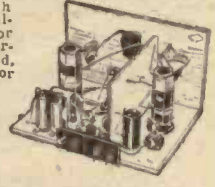

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USING MAINS UNITS WITH SHORT WAVERS.

(Continued from page 722)

very small indeed, and may either be due to interaction between the mains unit and the set, or else due to H.F. on the mains. In the former case the remedy is obvious—separate set, mains unit and additional smoothing unit from each other as much as possible and always, in any case, keep aerial and speaker leads well away from mains equipment. If it is found that even with it at the most reasonable distance away from the set hum is still picked up by the latter from the mains-unit, complete screening of the unit should effect a cure. This screening must be carried out with iron or tin, and must be earthed. A large biscuit tin forms a very good screening box, but care must be taken to see that the lid makes efficient contact with the rest of the box.

H.F. Hum

With regard to H.F. creeping through from the mains, a remedy that is fairly simple may first be tried. It is merely to connect a .001 mfd. condenser between one side of the mains and earth, reversing the plug once or twice to see which way round gives the least hum. Failing this, two .01 mfd. condensers in series across the mains with the mid-point earthed should effect a cure. In the event of still troublesome H.F. hum and noises on the mains, two H.F. chokes specially designed for mains working may be added as shown in Fig. 4. Reducing the value of the grid leak frequently assists in eradicating

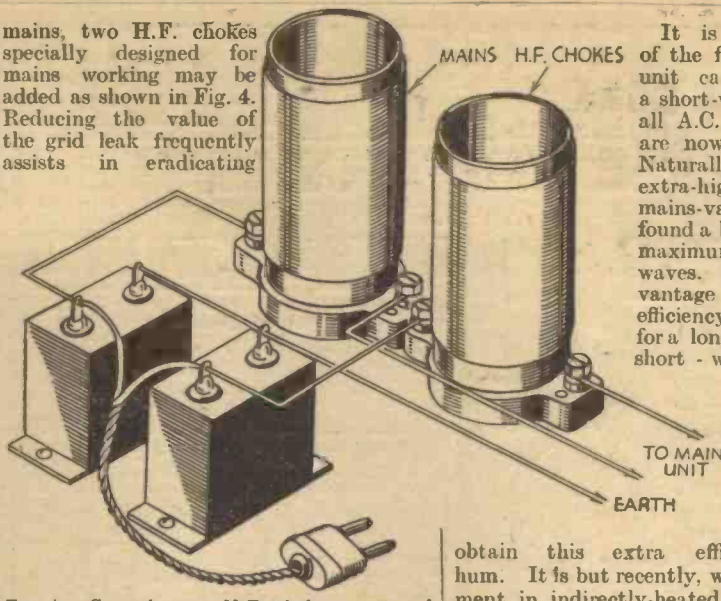


Fig. 4.—Special mains H.F. chokes, connected as shown here, will often prevent mains interference.

hum, and it is obvious that all grid leaks, condensers and resistances must be in first-class order, for with mains working the slightest variation is liable to cause crackle or hum.

It is sufficient proof of the fact that a mains-unit can be used with a short-waver to say that all A.C. short-wave sets are now being designed. Naturally enough, the extra-high efficiency of mains-valves has been found a boon in obtaining maximum results on short waves. Indeed, the advantage of this extra efficiency has been realised for a long time, as many short-wave experimenters have been using indirectly-heated A.C. valves run off batteries in order to obtain this extra efficiency without hum. It is but recently, with the improvement in indirectly-heated valves, as well as in mains components and the provision of high-capacity electrolytic condensers for smoothing, that all A.C. short-wavers have come into their own. The ease and reliability of mains working are great assets well worth the slight effort required to put the few foregoing hints into practice.

METAL SHIELDING AND SHORT-WAVE RECEIVERS

THE keen amateur who, as a rule, studies commercial and sponsored designs is quick to realise the advantages to be derived from efficient screening. After carefully studying the fundamental principles followed by a series of practical experiments, the advantages of screening properly and correctly applied are obvious.

Unfortunately many experimenters are less thorough, and regard screening as but a simple undertaking—simply the placing of screens around coils and between stages, and using a metal chassis foundation. Practical experiments on the above lines, as is to be expected, usually end in dismal failure.

Do not imagine, however, that screening is best left alone; this is by no means the case, because screening when correctly applied is a definite advantage. Quite apart from technical considerations, experimental screening will prove of interest to the amateur, who naturally wishes to obtain the maximum efficiency from his receiver.

As previously mentioned, the fundamental principles must be understood in order to reap the benefits of screening, and avoid snags and consequent disappointment.

The purpose of this article is to deal with various points, advantages and snags, all of which are associated with screening and the design of screened short-wave receivers.

This Article Deals with the Various Points, Advantages and Snags Associated with Screening, and the Design of Screened Short-wave Receivers

Chassis Construction

The foundation of a modern receiver is the chassis. Aluminium is the most common metal used for chassis construction. It is, of course, by no means cheap to buy and must be of a rather heavy gauge in order to avoid whip or fracture. This point is worth remembering. If the chassis is of light-gauge material it is absolutely useless because power transformers, chokes and gang condensers are heavy components which require a solid foundation. To handle a flimsy chassis upon which components of the above nature are mounted is simply asking for trouble, which will undoubtedly be experienced sooner or later.

One of the chief objections to the use of aluminium as a material for chassis construction is that it cannot be soldered. Commercial practice is to solder tags to all leads at earth potential and bolt them to the chassis. This method is quite satisfactory.

The Use of Sheet Steel

The steel chassis is rapidly gaining favour, steel, of course, being cheaper than aluminium. Many experimenters will undoubtedly fancy this steel-chassis idea as sheet steel, in addition to its relative cheapness compared with aluminium, is available in most places. It should be remembered, however, that the shielding efficiency of steel is less than that of aluminium owing to its greater resistance, and much greater losses are to be expected.

It is possible to build a satisfactory receiver into a metal or steel cabinet, but there is no doubt that a cabinet made of sheet aluminium would provide better screening. This, of course, does not mean that to use the former type of cabinet or screening box is definitely bad. As a matter of fact, the best and most sensitive 0—v—2 receiver the writer has ever built is housed in a cabinet of this type. The main point is to know exactly what to avoid and, so far as construction is concerned, act accordingly.

Commercial practice, it will be noticed, is to use steel chassis construction in some instances, but this is not just a case of buying sheet steel in bulk, cutting and pressing to shape and finally arranging various components on both sides. Examination will show that the chassis is either cadmium plated, or copper plated, and later painted. By adopting these methods the skin effect is taken into consideration, for, as is well known, H.F. current travels on the surface. (Incidentally, the same applies to the metallised wooden chassis.) It will be seen, therefore, that cadmium plating is not carried out merely for the sake of appearance, but to increase the shielding efficiency of the steel chassis.

Coil Screening

Next, let us consider coil shielding or screens. Which, quite apart from space, is the most efficient and satisfactory type of coil screen, large or small; that is, of course, relative to the size of the coil to be used in conjunction with it?

For example, our H.F. transformer or coil is 1½in. diameter, and we have choice of two sizes of screening can; one is 2in. diameter and the other 3in. diameter. We may try each in turn, but as the bases must be bolted or riveted to the chassis we cannot entertain the idea of drilling extra holes.

The first point to remember is that if coil shields, or screens, are to be used the coils must be wound suitably in order to cover the desired wave range. By screening

(Continued on page 727)

THE EASY ROAD TO RADIO.

THE BEGINNER'S SUPPLEMENT

ELECTRIC CURRENTS IN WIRELESS

(Part I)

A Clear and Concise Explanation of the Various Currents which Traverse the Circuits of a Modern Radio Receiver, with Particular Reference to the Oscillatory Currents of the Tuning Circuits and the Currents Within the Valves

A WIRELESS set is essentially an electrical machine, and to understand its working it is necessary to understand something about electricity.

Electricity may remain static or it may move in the form of current. In wireless we are chiefly concerned with current electricity. Perhaps one of the simplest illustrations of an electric current is afforded by the working of an electric torch. Current from the battery passes through the fine wire filament of the lamp and causes it to become white hot. The current in this case consists of a steady flow from one pole of the battery, through the lamp, to the other pole.

Fig. 1.—A simple example of the flow of a direct current is provided by this torch battery and bulb. The arrows show the path of the current.

Electricity a Fluid

From the fact that an electric current is always spoken of as "flowing" from one point to another it would naturally be assumed that electricity is a fluid. This is correct, but it should be explained that it is a fluid in the same sense that the sand in an hour-glass is a fluid, the sand being formed of individual grains. In the case of an electric current the "grains" are electrons or negative particles of electricity, and as a collection these electrons constitute a fluid. It does not mean to say that the electrons themselves are necessarily fluid. Modern theory explains that all matter is composed of electricity. Each little atom of substance is composed of a collection of positive and negative particles of electricity. In the ordinary way these protons and electrons, as they are called, are kept in place within the atom by mutual attraction, and the substance displays no electrical properties. However, some of the electrons are very loosely linked to the rest of the protons and electrons, and under certain conditions can be made to travel about between the atoms. It is the movement of these electrons which constitutes an electric current. If a number of them can be made to leave the atoms to which they are attached and to travel through the substance, say a piece of wire, until they arrive at the other end then that end is said to be *negatively* charged with electricity, while the other end, which is left with a deficiency of electrons, is said to be *positively* charged. It must be emphasised that it is not the atoms themselves which move, but only the electrons. They can move in the spaces between the atoms and can also join up with, or leave, the atoms.

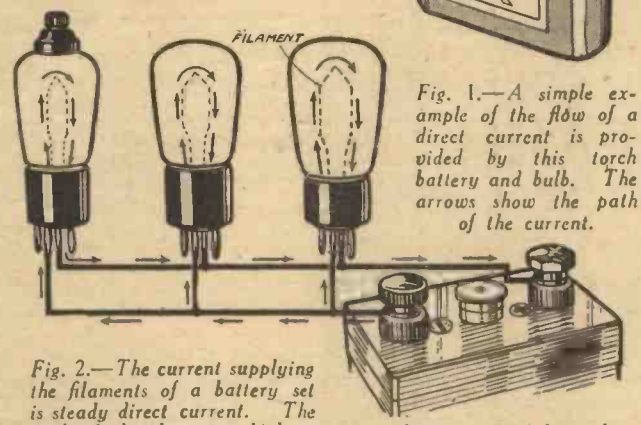


Fig. 2.—The current supplying the filaments of a battery set is steady direct current. The path of the electrons which constitute the current is shown by the arrows.

Different Kinds of Current

We have stated that the current flowing through the filament of an electric torch consists of a steady flow of electrons passing in one direction only. It is, in other words, a steady *direct current*. The currents in a wireless receiver are, however, of a more complex nature than this. Practically the only part of the circuit in which pure direct current is met with is in the filament circuit of a battery set. Here a steady current passes from the accumulator through each of the valve filaments (see Fig. 2) in the same way that the current from the torch battery passes through the bulb. The valve filaments become hot through the passage of the current (although it is not necessary in this case to bring them to white heat), and this causes some of the electrons in their jostling struggle through the restricted path of the filament to be thrust out into space. In other words a shower of these crowded-out electrons flies off in all directions.

The current flowing through the torch bulb or through the filament of a battery-operated valve may be compared with an even flow of water through a pipe. However, the flow need not necessarily be steady. The current from a dynamo, for instance, is never as steady as that from an accumulator. It fluctuates slightly all the time, one moment rising and the next moment falling. This is a fluctuating or impure direct current. The third type of current is one which flows first in one direction and then in the other. This is called an *alternating* current, and according as the alternations are slow or rapid it is known respectively as a *low-frequency* and a *high-frequency* current. A good example of a low-frequency alternating current is provided by the house lighting supply. If the house is supplied with "A.C.," it means that the current when it passes through a lamp, for example, flows first one way through the filament and then the other way, this change of direction taking place about 50 times per second. This is so rapid that the cooling down of the lamp filament as the current dies down between each change of direction of the current is not perceptible to the eye. The lamp appears to give a steady light as though it were fed with a pure direct current. Of course, 50 cycles is not the only speed at which a low-frequency current can alternate and currents which change their direction of flow as many as 10,000 times or more in a second are still considered to be "low-frequency" currents.

High-frequency Current

The best example of a high-frequency alternating current is provided by the current which traverses the aerial circuit of a wireless set when it is tuned to a broadcasting station. This is produced by the wireless waves which strike the aerial in rapid succession. It is an alternating current because it travels first in one direction and then in the other, but the speed or frequency with which it

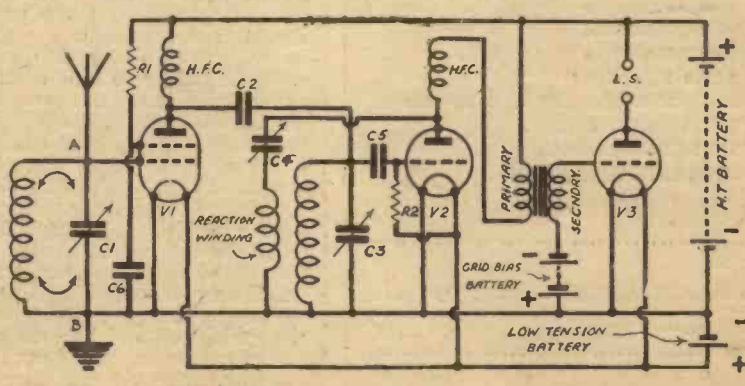
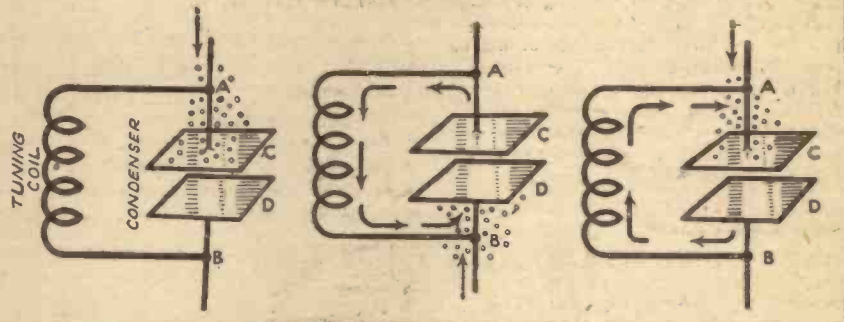


Fig. 3.—The three-valve circuit referred to in the article. The thick arrows show the path of the H.F. currents in the aerial circuit.

changes its direction is colossal—a million or more times per second!

From this very brief description of some of the forms which an electric current may take we can proceed to the study of the wireless receiver itself and analyse the currents in the various parts of the circuit. The circuit illustrated in Fig. 3, which is necessarily made as simple as possible for the sake of clarity, represents a typical three-valve arrangement. Starting from the aerial we come to the aerial tuning circuit. This is also shown separately in Figs. 4-6. The point A is connected to the aerial and the point B to the earth. The incoming waves on striking the aerial set up a high-frequency current which surges up and down it. If the aerial were connected direct to the earth instead of having the coil and condenser interposed these currents would simply flow direct to earth and back again. However, the introduction of the tuned circuit offers an opposition to the passage of the current. The amount of opposition offered depends on the size of the tuning coil and condenser. By using the right number of turns of wire and by adjusting the condenser to just the right size it is possible for the circuit to provide almost a complete barrier to the flow of current through it.



Figs. 4-6.—Diagrams illustrating the movement of the high-frequency currents in the aerial circuit of a wireless set.

When these conditions are arrived at the circuit is said to be "tuned" to the incoming waves.

H.F. Currents and Tuning

It must be explained why the tuning circuit opposes the passage of the aerial current through it. It is due to the combined action of the condenser and coil, which forms an *oscillatory circuit.* The current induced in the aerial by the incoming waves takes the form of electrons passing up and down it at a very high speed. When they come down the aerial they arrive at the point A (see Fig. 4) and immediately pour into the condenser and fill up the plate C. This action is similar to that of filling a toy balloon with air. However, as soon as the electro-motive force which has sent the electrons into the condenser dies down, as it naturally does before the current changes its direction, the electrons are ejected from the condenser like air from a collapsing balloon. These electrons, or at any rate some of them, instead of going up the aerial again, travel on round the circuit as shown by the arrows in Fig. 5. They pass through the tuning coil and into the other plate of the condenser. In the meantime the current flowing up and down the aerial has reversed its direction and electrons are travelling up the aerial. This means that a collection of electrons attempts to flow into the circuit at B from the earth direction, but they are here met by those which have just travelled round the circuit to D. Incidentally, from an electrical point of view, B can be taken as being contiguous with D and likewise A with C. Since like repels like the newcomers are repelled by the electrons which have collected on D and thus they are unable to pass through to A and up the aerial.

By the time the aerial current reverses again the current in the circuit has also reversed, the electrons having been ejected by D and sent bouncing round to A to meet and oppose the aerial current at this point. This process goes on all the time the circuit is tuned to the incoming waves, the electrons flowing from C, through the coil, to D and back again continuously. This oscillation set up within the circuit is called the *circulating current.*

It must be understood that the arrival of the electrons at each end of the circuit coincides exactly in point of time with the arrival of those forming the aerial current, and thus the latter are met and opposed every time they try to pass through the circuit. However, if the circuit conditions are altered by, say, increasing or decreasing the effective size of the condenser then this balanced state will be disturbed. The circulating current will oscillate slower or faster, as the case may be, than the aerial current, and thus some current will be allowed to pass through the circuit. In this case the circuit is said to be detuned.

This brief explanation of the action of the oscillatory circuit is of necessity not absolutely complete, nor as regards the building up of the circulating current is it strictly accurate since other factors, such as the effect of the inductance of the coil, to avoid confusion, have not been mentioned. However, the ultimate effect is, as we have described, the production of an oscillating current resulting in the piling up of electrons alternately at A and B.

(To be concluded.)

METAL SHIELDING AND SHORT-WAVE RECEIVERS

(*Continued from page 724*)

a coil we automatically reduce its maximum tuning range. If our shielding can is too small in diameter the spread over of the magnetic field produced by the tuning coil is very restricted, and thus the overall efficiency of the tuned circuit or circuits will be considerably reduced. To counteract this defect a large screening can with low resistance is required, therefore it is necessary to use a stout gauge of aluminium, or better still, copper.

When purchasing a coil can remember that if it is of stout gauge, and is fitted with a detachable bottom and spigot for chassis use, it is quite suitable. Do not attempt, however, to make a steel chassis and use open-ended cans or nothing but trouble will result. Quite definitely, unless a steel chassis is plated as outlined previously it is better not to use it at all. The writer is strongly in favour of the metallised or copper-foil-lined wooden chassis, for cheapness and efficiency together with ease of construction.

The experimenter with considerable experience may wish to build a receiver which has a professional appearance, and no doubt will make a good job of it. The beginner should not be too hasty and attempt to design before he can construct. Better far to have an amateur-looking receiver which works like a professional job and gives results, than to build a rather professional-looking job which refuses to function. When choice between steel and aluminium chassis is to be made the latter is to be recommended.

Tuning Condensers

Variable condensers especially designed for short-wave work are available. Gang condensers are, however, expensive, and for experimental work readers may wish to use a broadcast type which will allow of the number of plates being reduced to suit requirements.

A condenser of this type, if well made mechanically, will be quite satisfactory, provided that trimmers are fitted on the top, and each unit is shielded from the other, with a separate connection provided for wiring each unit of moving vanes to chassis.

Chassis-type valve-holders should be of reputable make, as flimsy affairs will most likely cause crackling and various other troubles. Make quite sure that the chassis and panel are effectively earthed, and mount the earth terminal directly on the chassis.

All leads which are at earth potential go to the chassis. Do not, however, take three or four of them to the same point, but to the chassis at separate points, which will allow a short and direct lead, remembering that a potential difference exists at different parts of the chassis, panel, and screens.

In modern tuning condensers, metal frames and end plates are used. In these, the moving vanes are earthed (except in trick circuits) by mounting them directly on the metal panel or, in the case of a gang condenser, on the chassis.

Chassis construction reduces the amount of wire required in a receiver and may make a difference of many inches. The writer remembers rebuilding a baseboard short-wave receiver on chassis lines, which reduced one lead previously a foot in length to one inch, and readers who adopt the same methods will be surprised at the amount of connecting wire they have left over.

SUPPLEMENT TO "PRACTICAL AND AMATEUR WIRELESS"

AMATEUR TELEVISION

TRANSMITTING "STILLS"

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

THERE are many amateurs who have carried out a number of experiments in connection with the reception of television, but only a few have turned their attention to the question of providing their own television signals for test purposes. While admitting that the outlay incurred for apparatus would be somewhat high if everything that was required was purchased brand new, it will be found frequently that much of the material is available in experimental apparatus which every wireless enthusiast collects over a period of time.

Apparatus Required

The best way to make a start is in the transmission of "stills"; that is, magic lantern slides or single-frame pictures selected from any standard 16- or 35-millimetre film suitably mounted. The first requirement is some form of projector; that is, a housing for a source of light (arc or metal-filament projection lamp fed from A.C. mains through a step-down transformer), together with a focusing lens. (An old magic lantern outfit will do quite well here.) Next is needed the single spiral apertured scanning disc together with the driving motor. In the case of the disc, a standard twenty- or sixteen-inch receiving disc is quite satisfactory, provided it is free from mechanical errors, primarily in connection with the positioning of the holes. Naturally, the correct type of heavy fly-wheel scanning disc is best for transmitter work, but the substitute suggested is capable of giving results far in excess of what may be anticipated originally.

Assuming that the television signals generated will be observed on the standard type of television receiver built or purchased for looking in at the B.B.C. transmissions, then the square holes need to be of the correct size and appropriately positioned to give the seven-by-three ratio picture having a thirty-line dissection. Designs for discs of this character have been described from time to time in this supplement, or alternatively a ready-made disc can be purchased for a sum as low as 12s. 6d.

Setting Up

The motor should be of good quality and capable of running at a dead steady speed of 750 revolutions per minute. If preferred, a synchronous A.C. motor can be used, but failing that, use a motor with a smooth form of speed control and stroboscopic speed observation to ensure correct running.

Employ a light source as intrinsically brilliant as possible, and position this together with the lantern slide or film still and focusing lens, so that the resultant picture projected on to the disc is properly focused and bright. The exact size of the picture on the disc will depend on the disc diameter, but it should have dimensions which will allow it to be just scanned by the first and last holes of the disc. An arrangement suitable for amateur use is one consisting of the parts previously referred to, the light source and photo-cell being mounted with their axes in line, and one on each side of the disc. Lamp projector and focusing lens are mounted on the left, while the scanning disc is driven by a mains fed motor having a belt drive.

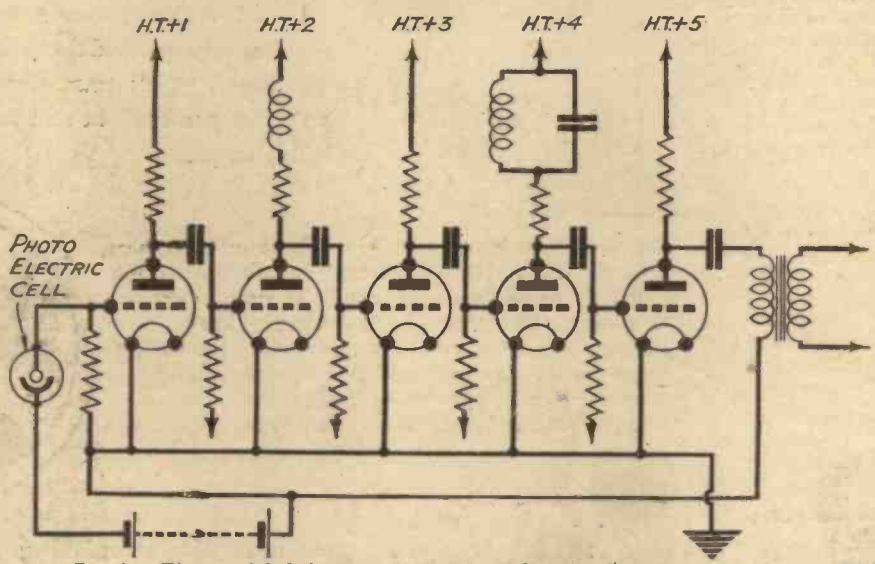


Fig. 1.—The simplified diagram of the photo-electric cell or "A" amplifier.

As the disc revolves the individual apertures dissect the projected picture into the thirty strips as they pass across. Since the picture is made up of various light and dark shades this process of scanning will cause varying small quantities of light to pass through the holes to the other side. These light signals must then be made to influence a single photo-electric cell mounted immediately behind the disc and in the correct optical path of the penetrating light. It is often desirable to have a focusing lens between the back of the disc and the photo-electric cell (the cell being enclosed in a light-screening box with a small window aperture of just sufficient size to take the whole of the scan) and placed opposite to the light source.

Cell Amplifier

The rapid light variations activating the electrodes of the single photo-electric cell produce corresponding voltage variations of equivalent amplitude. Quite a wide choice of cells are open to the experimenter, but a very efficient one for the purpose is that designated the C.M.G.8 and made by the G.E.C. Full details for operating the cell are furnished by the makers, so this question need not be gone into here.

The voltage variations produced by the cell are very minute and need amplification in what is commonly termed an "A" amplifier. This is a resistance-capacity-coupled amplifier having, for the best results, a reasonably low gain per individual stage. Furthermore, this amplifier must be quite clear of parasitic noises, otherwise the picture signal will not be considerably above the "mush" level, and imperfect images will result.

One circuit diagram for an amplifier of this type is given in simplified form in Fig. 1, battery fed valves being used for simplicity and stability, each anode being supplied by a separate H.T. feed. The cell is connected direct to the grid of the first valve with the appropriate battery voltage in series. Another point to notice is the inclusion of "boosters" in the second and fourth valve anode circuits. The first is a single inductance, while the second is a similar inductance tuned with a fixed condenser. The values of these components must be chosen to suit individual conditions, but they serve the purpose of maintaining a level frequency response up to well over 10 kilocycles.

The layout of an amplifier of this character is very important, as stray capacities and long leads must be reduced to a minimum. In Fig. 2 is shown one design which proved particularly efficient for some initial thirty-line television experiments of this nature. The valve-holders are partly stripped and mounted on a central platform, while the output transformer is an O.P.2 (step-down).

The resultant vision signals from this amplifier are passed to the normal power amplifier associated with the vision receiver, so that the images can be watched and very many interesting tests made by the experimenter. The effects of using film stills of varying densities can be tried and the limiting factors associated with the detail permitted by thirty-line scanning observed.

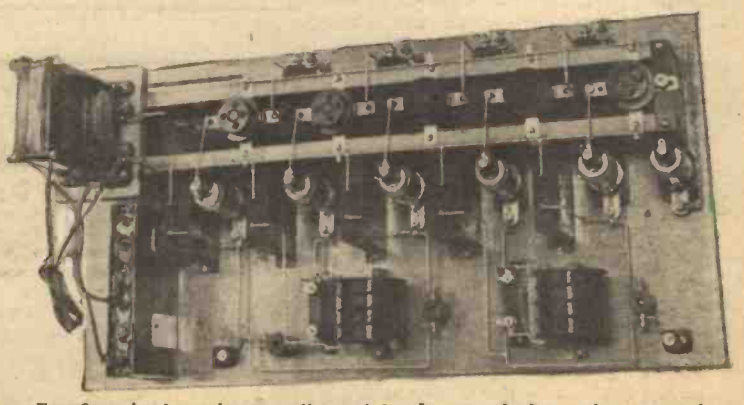


Fig. 2.—A photo-electric cell amplifier layout which avoids unwanted capacity and keeps connecting leads short.

VALVE TYPES AND USES

(Continued from page 719)

current "load," and, therefore, the H.T supply must be capable of providing up to the maximum current taken by the valve without its voltage dropping.

The High-tension Supply

There is no difficulty in securing this result when using a large-capacity H.T. battery or an H.T. accumulator, but conditions are vastly different when a standard-capacity battery or an eliminator is concerned. The small battery will certainly give the maximum current, but in doing so its voltage will drop appreciably, especially when the battery has been in use for a short time. It will be evident, therefore, that the very efficient QP valve is wasted if the H.T. supply is inadequate; in addition to this it must be pointed out that small batteries would prove very expensive, whereas the cost of H.T. current is extremely moderate where a super-capacity battery is employed.

The average eliminator is even worse than a small battery with regard to the voltage output in various conditions of "load," so that if this kind of unit were employed reproduction would be terribly distorted,

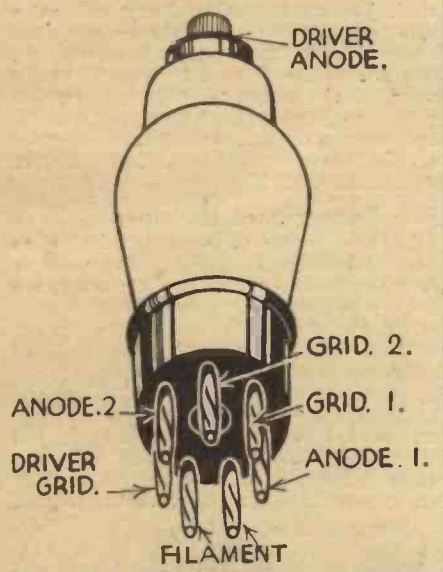


Fig. 3.—This sketch shows the connections for the driver and Class B valve.

and the user might condemn Q.P.-P. as unsatisfactory—which it certainly is not. Eliminators especially suitable for Q.P.-P. working are available and cost little more than those of normal type, whilst an existing unit can be modified by connecting a neon stabiliser across its output terminals. Actually there are a few simple points to be considered in doing this, but these were clearly explained in an article in PRACTICAL WIRELESS dated November 18th, 1933.

Little has been said in this article concerning Class B amplification, chiefly because class B is so well known and has been adequately described in many previous issues of both of the journals which have now come together under the name of PRACTICAL AND AMATEUR WIRELESS. The connections for a Class B and driver stage are shown on another page in this issue under the heading "Valve Couplings," whilst the connections for the 7-pin base are given in Fig. 2 which accompanies this article.

The Hivac B 230 Class B valve, of which characteristics are given in an accompanying panel, is particularly economical in

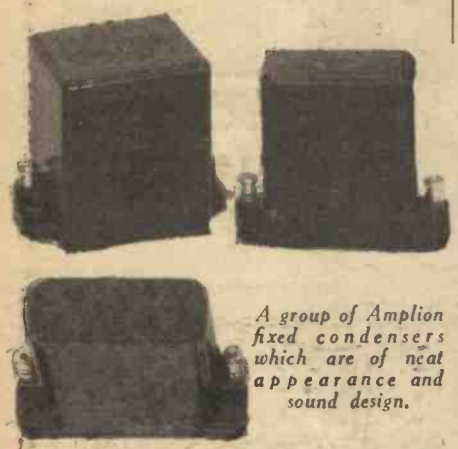
(Continued on page 733)

FACTS & FIGURES

Components tested in our Laboratories

Amplion Fixed Condensers

WE have recently had under test a number of fixed condensers made by Amplion (1932) Ltd. Of neat appearance they are certainly a very workmanlike job, which is the keynote of components turned out by this well-known firm. Obtainable in four types, TB, SH, RH and PH, respectively, they range from .1 mfd. to 4 mfd., at varying prices. Type TB (700 volts D.C. test, 350 volts D.C. working) range in price from 1s. 10d. to 5s. 6d.; type SH (1650 volts D.C. test, 600 volts D.C. working) 2s. 6d. to 10s. 6d.; type RH (2,000 volts D.C. test, 800 volts D.C. working) 2s. 9d. to 15s., and type PH (2,500 volts D.C. test, 1,000 volts D.C. working) 3s. 6d. to 19s. 6d. Under test they were found to give very good results under their stipulated working voltage and their capacity ratings were within a small percentage margin of the measured values.



A group of Amplion fixed condensers which are of neat appearance and sound design.

A General-purpose Triode

THE range of Mullard "Universal" (A.C./D.C.) valves has recently been augmented by the release of a general-purpose triode, known as type H.L.13. The principal application of this valve will be as low-frequency amplifier following a diode detector, in which position it may also be employed as first low-frequency amplifier for gramophone reproduction. It can also be used as speech detector in cases where an amplifying detector is required, and in such instances, also, the valve can be used as the input valve for gramophone reproduction. Like the other valves in the Mullard A.C./D.C. range, the H.L.13 has a heater rated at 0.2 amp., the heater voltage being approximately 13. The characteristics at anode volts, 100, and grid volts, zero, are: anode impedance 10,000 ohms; amplification factor 40; and mutual conductance 4.0 mA./V. The price is 13s. 6d. This valve is available with metallised bulb only, and has the standard Mullard side-contact base, the control grid being connected to a top thimble terminal.

A High-class Radiometer

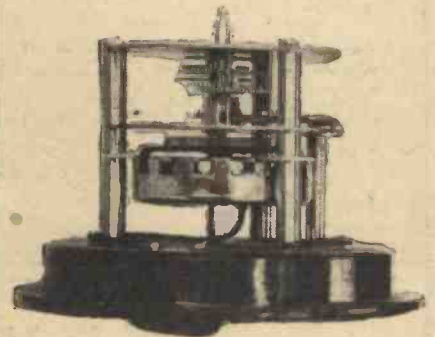
THE "Pifco" de luxe model "All-in-One" radiometer is a moving-coil instrument suitable not only for testing battery receivers, but also for testing all-mains sets. It is suitable for voltages up to 250 and shows 500 ohms resistance per volt. The diameter of the dial is 2½in. The instrument is finished in mottled bakelite, and is sold complete with velvet-lined case at £2 2s. Adaptor sockets for use in testing 7- and 9-pin valves are available at 3s. This is a most useful instrument for the dealer, the experimenter, and the electrician. Particular care has been given to finish, accuracy, and high-class workmanship. In short, this expertly-designed instrument is suitable for the accurate testing of all classes of electrical and radio apparatus.

A New H.T. Battery

THE Fuller Accumulator Co (1926) Ltd., are now manufacturing a new Fuller "Sunbeam" high-tension battery, supplies of which are now on the market. The prices are: 60 volt, 3s. 6d.; 100 volt, 5s. 6d.; 120 volt, 6s. 6d. Samples of these batteries have been subjected to various tests in our laboratories and have proved to have a capacity fully equal to that of the average standard-capacity battery.

A Synchronous Clock Movement

WE show on this page a scientifically designed electric-clock movement recently produced by the Automatic Coil Winding Co., which can easily be fitted into an ordinary clock in place of the clockwork movement. The movement is fitted with a 15 per cent. cobalt-steel magnet, and the epicycloidal cut gears ensure silent running. Of robust design it is mounted on a mottled bakelite back, through which project a knurled knob for starting the motor when connected to the mains, and a second knob for adjusting the hands. Below these knobs are fitted two pins, with the necessary plug for facilitating connection to the mains supply. Three fixing holes are drilled in the back, thus making it possible to fix it securely inside the desired clock case. Selling at the reasonable price of 15s. it will keep very accurate time, and is certainly a useful appliance.

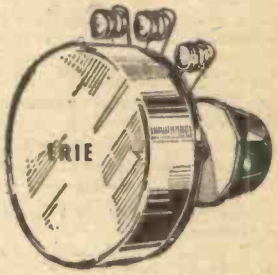


Of efficient workmanship, this synchronised electric-clock movement can be fitted to an ordinary clock in place of the clockwork movement with which it was originally fitted.

The Erie Volume Control

THE Erie volume control, which is fitted with a composition type resistance element, is available in five standard sizes, ranging from 25,000 ohms to 500,000 ohms in value. A thin bakelite disc 1½in. in diameter forms the body of the component, and to this are attached the three soldering tags, a single-hole fixing bush, and the metal protecting cover.

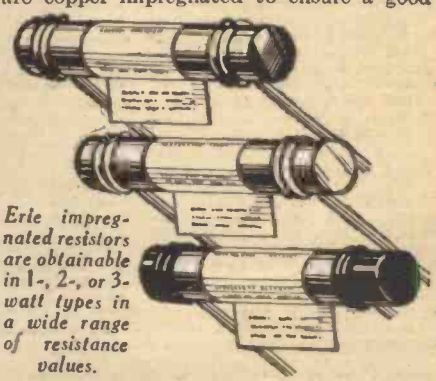
The moving contact is insulated from the spindle and fixing bush, and consists of a light spring terminating in a small graphite stud. The movement is quite smooth, yet a sure contact is made throughout, the pressure being just sufficient to ensure this, but not so heavy that it imposes undue wear on the element. The resistance is graded to give a smooth and even control, and is quite silent in operation. The price of the Erie volume control is 3s. 6d., or with mains switch, 5s.



An Erie volume control which is available in five standard sizes ranging in value from 25,000 ohms to 500,000 ohms.

Erie Impregnated Resistors

ERIE resistors, which are suitable as grid leaks as well as for voltage-dropping and grid-bias purposes, are made of a composition of carbon and rare earth, the resistance depending upon the quantities of the minerals. Stability of resistance is obtained by a special process by which damp is expelled, after which the resistors are specially impregnated to ensure that variation of humidity in the atmosphere does not affect the resistance value. The tips of each carbon resistor are copper impregnated to ensure a good soldered joint for the lead which makes contact with it. They are obtainable in one-, two-, and three-watt types in a wide range of resistance values.



Erie impregnated resistors are obtainable in 1-, 2-, or 3-watt types in a wide range of resistance values.

Erie resistors are colour coded, and every genuine Erie carries a label giving the value. Price: 1s. per watt.

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.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

THE midnight radio party held by the West Middlesex and East Buckinghamshire branch of the Anglo-American Radio and Television Society was held on January 18th instead of the 19th.

WCAU was the best station tuned in, although WBZ, WJZ, WTIC, and WBT were good seconds. Among the stations heard were WAAB, Boston (500 watt); WHN, New York; WCCO, Minneapolis; WHAS, Louisville; WGY, Schenectady; WLW, Cincinatti; WEAF, New York; WIOD, Miami; WNAC, Boston; WHO, Des Moines; KYW, Chicago; WABC, New York; WHAM, Rochester; and WTAM, Cleveland. The meeting held on the 17th was also a success.

There are no charges in connection with joining the A.-A.R. and T.S., and particulars may be obtained from Leslie W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

At 8 p.m. on February 6th the Huddersfield branch of the Society is giving a public lecture-demonstration. The lecturer will be Mr. J. Louis Orton, who will describe some interesting radio experiments, using G-5XK for transmission. Full particulars from Mr. Leonard Goucher, 10, West Grove Avenue, Dalton, Huddersfield.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THE London Chapter held a very interesting meeting on Friday, January 18th, at the R.A.C.S. Hall, Wandsworth Road, S.W.8. The first half was given to morse instruction, there being one class for beginners and another for advanced pupils. The second half of the meeting was taken up by a demonstration and description by Mr. W. H. S. Vincent, A.M.I.B., of the "Hyvoltstar" All-wave Superhet 5. The circuit consisted of a heptode frequency changer, var.-mu pentode, I.F., metal oxide second detector, metal oxide A.V.C. rectifier, triode L.F., pentode output, and half-wave valve rectifier. Very good reception was obtained from W8XK, 48.86 metres. The aerial in use at the Chapter is an inverted V.—A. E. Bear, Secretary, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

THE CROYDON RADIO SOCIETY

AT a meeting of this society, held on January 15th, in St. Peter's Hall, South Croydon, Mr. O. Tooth gave a talk on "Modern Gramophone Recording." After showing the meeting a wax disc prior to being recorded upon, he went on to consider apparatus used in recording. First came the microphones which were wired and followed by the amplifier, and ultimately the cutter. He had much to say on microphones, having brought several models with him, and interesting points of such types as the Rein and Condenser microphones were followed with interest.

Cutters came in for much mention, and Mr. Tooth drew sketches of their mechanism, explaining why the cutting edge of sapphire was ground by a specialist.

On Tuesday, February 5th, the vice-chairman, Mr. W. J. Bird, is lecturing on "Electrical Condensers: a brief survey of their theory, manufacture, and application to modern circuits." He is an authority on this topic, and PRACTICAL AND AMATEUR WIRELESS readers are invited to come and hear him.—Hon. Secretary, E. L. Cumbers, Maycourt, Campden Road, South Croydon.

SLADE RADIO

AT a meeting of the Slade Radio Society on Thursday, January 17th, Mr. D. A. Drew, a member of the amateur crew who sailed Mr. Sopwith's *Endeavour* in races against *Rainbow* in America last year, gave an address upon the mechanical and electrical side of yacht racing. Mr. Drew described many of the amusing episodes that happened to him and his colleagues, and gave some very interesting descriptions of the wind-measuring instruments and other mechanical apparatus, such as the capstans, and methods of tensioning the hawsers.

Dr. Ratcliffe loaned and operated his cinema projector, and Mr. Drew had two rolls of films which he obtained from Mr. Sopwith, in London.—Hon. Secretary, Chas. Game, 40, West Drive, Heathfield Park, Handsworth, Birmingham.

SHORT-WAVE RADIO AND TELEVISION SOCIETY (THORNTON HEATH)

A MEETING of this society was held at St. Paul's Hall, Norfolk Road, on Tuesday, January 15th, under the chairmanship of Mr. R. E. Dabbs. Mr. J. L. Hills, of All-wave International Radio and Television Ltd., gave a talk and demonstration on the Allwave international superheterodyne. This receiver tunes from 14–2,000 metres and incorporates high-speed automatic volume control. Two I.F. stages are used, followed by two diode detectors in push-pull, one L.F. stage, and power pentode output. It can be used on either D.C. or A.C. mains, and has provision for an additional speaker. The receiver was then demonstrated and it created a good deal of interest. Particulars of future meetings can be obtained from the Secretary, Mr. Jas. T. Webber, 368, Brigstock Road, Thornton Heath.

PRACTICAL 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).

Listening Conditions in S. Africa

SIR,—As a regular reader of your paper I have been very interested in your £5 superhet, especially the A.C. model. The only snag so far as South African readers are concerned is that the coils are practically no use to us. Our listening is done on the medium band and the various short-wave bands on 16, 25, 31, and 49 metres. On the medium waves our stations lie between 314 metres and 536.

I am therefore writing to ask whether it would be practicable to substitute other coils in place of the coils specified.

We find that the ordinary straight set (I use a four-valver of my own design) gives excellent results so far as power is concerned, but selectivity, particularly on the 25m. band, leaves much to be desired; for example, it is practically impossible to separate DJD and GSD. When one is tuned in there is a background of the other and, if the aerial is swaying at all, they come in and out alternately. This presumably would be largely rectified by using a superhet circuit.

It is for this reason that American sets hold such a prominent place in the market out here. For some time "all wave sets" have been on the market. The British sets, on the other hand, are for long and medium waves, and it is necessary to obtain a short-wave convertor, which many people will not be bothered with.

The British components and valves are recognised as vastly superior, and many more would build sets if they could find a design suitable for the conditions prevailing in this country. The same would apply to Australia and Canada. One dial tuning would be essential to make it a true family set.—GEO. K. MALLORY (King William's Town, S. Africa).

[*An article in our issue dated January 26th, 1935, gives particulars of suitable alternative coils for use with the £5 A.C. Superhet.*—ED.]

Australia and U.S.A. on a "Practical Wireless" One-valver

SIR,—A few weeks ago I wrote to you mentioning the good short-wave reception I had last summer on the s.-wave set that was described in PRACTICAL WIRELESS of April 14th, 1934.

Having become accustomed to the use of a three-valve S.W. set of late, I thought I would give the above-mentioned one-valve set a trial as a change to the more elaborate three-valver. Appended are a few of the long-distance transmissions heard. On Friday, January 11th, at 11 p.m., PRF5, Rio de Janeiro, Brazil (31.58 m.) was a good signal at R8 on the 'phones, when we had a short talk in English on cocoa production in Brazil.

On Sunday, January 13th, at 2 p.m., VK2ME (31.28 m.), Sydney, Australia, was in fine form, opening with the laughter of the kookaburra (transmission 4), then followed the call signal "VK2ME, Sydney, the Voice of Australia," and "Good afternoon listeners in the United Kingdom." Then followed an interesting programme of gramophone records by such well-known bands as the B.B.C. Wireless Military Band, the Regimental Band of H.M. Grenadier Guards, The Australian Commonwealth Band, Eric Coates and the Symphony Orchestra, and organ recitals by Nicholas Robins at the Arcadia Theatre, Chatwood, Sydney.

This transmission was concluded at 4 p.m. The same evening at 5.20 p.m. I located W2XAF, Schenectady, U.S.A., on 31.48 m., coming over with some punch behind it! A talk was in progress by the Federal Housing Committee, and was followed at 5.30 p.m. by a "Watch Tower Hour" service from Los Angeles, California. In conclusion I would like to thank you for the helpful hints and tips about short-wave reception that have appeared in PRACTICAL AND AMATEUR WIRELESS recently.—STEPHEN J. KEEN (Cirencester).

"Admirable and Entertaining"

SIR,—Good luck to your admirable and entertaining journal, which I think strikes the right note every time. When can we expect an A.C. version of the "Hall-Mark Three" *please*?—CHAS. H. WOODS (London, E.).

[*See last week's issue for full particulars of the A.C. Hall-Mark.*—ED.]

A South-African Reader's Thanks

SIR,—I wish to extend to you my sincere thanks for having put me in touch with numerous readers of PRACTICAL WIRELESS, who reside in England. Owing to various reasons, I am unable to communicate with every person who has written to me, but I would nevertheless like to thank everyone who has taken the trouble to write.—H. CROUCH (Ladysmith, S. Africa).

Another Appreciation from S. Africa

SIR,—In connection with your various presentation schemes in *Practical Mechanics* I wish to thank you for the two books and the Wireless Constructor's Tool Kit just received. The books are interesting and entertaining, and the tool kit is very useful, and quite the thing in these out-of-the-way places, where the nearest third-rate shop is over twenty miles away. I see there are two more papers—*Practical Television* and *The Practical Motorist*. Is it possible to get these papers from No. 1, and what is the yearly subscription, please?—[*Yes*—ED.]

As an interested reader of Mr. F. J. Camm's articles in *Work* years ago, and later in the *Motor Cyclists' Review*, I am pleased to see him at the helm of *Practical Mechanics*, and wish it continued success. I have written to Peto-Scott for a 5-valve superhet set, as described in the June issue of *Practical Mechanics*, and will let you have a note regarding its possibilities when I try it out.—GEO. SCHOFIELD (Natal, S. Africa).

Our Short-wave Section

SIR,—As a regular reader since No. 1 I agree with A. Blakeley (Newton-Le-Willows), who asks for one more page on short-wave work. I am writing for myself and four friends. I have all your gift books and they are very helpful. I use an adaptor (2 L.F.) for short waves, and although I have tried many circuits, I do not seem to get satisfactory results. Will you please publish

(*Continued on facing page*)

(Continued from facing page)

a circuit of superhet adaptor using short-wave plug-in coils. I have not built any of your sets yet but hope to when circumstances permit. I live in a swamp area ten miles from Moorside Edge, and get good results using SG., Det. 2 LF. and a wave-trap. I like your superhet 3, and I think that PRACTICAL WIRELESS is the best book of its kind on the market.—H. R. BUTTERWORTH (Oldham).

(*See Special Announcement on page* 701—*Ed.*)

A Super Set

SIR,—With reference to several of your readers' pleas for a super set, may I offer my suggestions? I am of the opinion that a set as outlined below would find plenty of support from your readers, and if the L.F. unit was published first, the total cost would be divided over a period, and so by adding a simple bandpass aerial filter it could easily be made into a high quality local station receiver, besides reproducing records for use with a "mike."

I am personally anxious to see a circuit published, which with an automatic record changer would make an outstanding set. The features embodied should include a paraphase amplifier of above 5 valves, giving approx. an output of 4/5 watts. Response curve nearly flat from 50 cycles to 6,000 or more. Reproduction as distortionless as possible. Sufficient amplification for use with an average pick-up. Effective volume control, and facilities for high-tension connection to H.F. stage. The circuit for the paraphase amplifier could be similar to the one published on page 101 of the issue for October 6th, 1934.—W. J. ABBOTT (Clapham Common).

A Quality Short-waver

SIR,—With reference to a letter, "A Short-waver Wanted," in your issue of November 17th last, I consider that a short-wave design, with the medium band as a secondary consideration, is what is wanted in Kenya, and suggest a really powerful battery-driven superhet which will enable the most distant stations to be picked up at programme value. Personally, I should like a design that does not try to cut down the initial cost too closely.—D. B. CRAMPTON (Cherangani, Kenya Colony).

CUT THIS OUT EACH WEEK.

Do you know

—THAT electrolytic condensers can be used in a voltage-doubler rectifier circuit?
—THAT the polarity of the voltage applied to certain electrolytic condensers may be reversed without causing damage?
—THAT an earth lead can be used for an aerial by connecting it to the aerial terminal?
—THAT a long earth lead should be insulated?
—THAT the peak-voltage rating of a fixed condenser should be at least twice the voltage normally applied to the condenser?
—THAT the use of a choke-capacity output filter often prevents L.F. instability?

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.

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.

MAGNUM COMPONENTS

WE have received a folder from Burne-Jones and Co., Ltd., giving particulars and prices of this firm's chassis assemblies, coils, switches, etc. Also included in the list are metal screening boxes, solid dielectric variable condensers suitable for tuning, reaction, or series aerial use; a dissolver for controlling the volume of radio-gramophones, or two pick-ups; and a neat and efficient multi-contact switch. Copies of this folder are now available, on request.

BOOKS RECEIVED

BROADCAST TALKS

A BOOKLET containing the B.B.C. programme of talks to be given from Droitwich National and London Regional transmitters during the present session is now available to the public.

The series on India provides the most imposing list of speakers. The talks will be in the National programme at 10 p.m. on consecutive Tuesdays and Fridays until February 5th. The remaining speakers in this series are: Mr. George Lansbury and Mr. Stanley Baldwin.

Details of a further series of talks to be given on alternate Sundays at 9 p.m. are also given. These talks will include news from the Law Courts, headlines from foreign newspapers, extracts from Blue Book publications, important new scientific discoveries, etc. Particulars of other talks to be given for listeners in unemployed clubs and centres are also included. The booklet can be obtained free from the Publications Dept., B.B.C., or any local B.B.C. office.

NEW FEATURES IN THE PRACTICAL ELECTRICIAN'S POCKET BOOK

SOME of the most important of the new sections in the "Practical Electrician's Pocket Book, 1935" are evidence of the rapid changes in the electrical industry. Noise measurement appears for the first time. A complete new chapter on traffic signalling is introduced. The wiring notes are based on the 10th Edition of the I.E.E. Regulations. Trolley buses are discussed in the chapter on tramways.

Complete revision has been made of the sections on the control of lighting circuits, joints, and connectors, measuring instruments, armature construction, and railway signalling.

In addition, Mr. A. P. M. Fleming, C.B.E., M.Sc., M.I.E.E., F.Inst.P., has contributed a valuable twenty-page summary of the high spots of electrical progress in 1934.

The system, introduced last year, of sectionalising the sixty chapters is retained, and rearrangements have been made to give more logical, order and to assist general study of any one department of electrical activity.

By means of the 1,000-subject index any obscure electrical fact can be found in a moment. There is also an extensive guide to mains-voltages in the United Kingdom covering sixty-two pages and indexing 5,000 places. This guide has been fully revised and brought right up to date.

The book is a little giant of information on a wide variety of subjects and well maintains its position as one of the leading reference books of the industry. It is published at the very reasonable price of 2s. 10d. post free by Odhams Press Technical Book Department, 85, Long Acre, London, W.C.2.

THE 1935 BROADCASTER ANNUAL

AN encyclopædic survey of the Radio Industry and its technicalities is given in the 1935 edition of the "Broadcaster Radio and Gramophone Trade Annual," just published by the Broadcaster and Wireless Retailer, of 29, Bedford Street, Strand, London, W.C.2. Much of this work has gone into the technical sections. Radio Servicing, to which thirty pages are devoted, is divided into four "chapters."

Radio design is looked after by two abacs, a section on simplified circuit design, three pages of essential electrical formulæ and data, and a valve chart giving detailed characteristics of every valve on the market.

There are six parts of the Annual which contain directory information. The Directory Section proper has nearly eighty pages. It gives manufacturers' and wholesalers' names, addresses, telephone numbers and telegraphic addresses; an index of trade names in radio, and a section giving the names of all firms making standard types of apparatus.

VALVE TYPES AND USES

(*Continued from page 729*)

respect of both high-and low-tension requirements, but the same remarks apply as in the case of the QP valve with regard to the source of H.T. supply, because the anode current is constantly varying with the volume of reproduction.

A Combined Driver-Class B Valve

Another Class B valve that is made only by Hivac is the DB 240, and this is of particular interest in that it actually consists of three valves in one—a triode L.F. driver and two Class B triodes. The valve can thus be used directly after a detector valve, the usual input L.F. and driver transformers being connected as in the case of a normal Class B amplifier. The driver-class B valve has a 7-pin base, the connections being as shown in Fig. 3, whilst an eighth connection is made to a terminal mounted on top of the bulb; this is in contact with the anode of the driver section. It will be seen from the tabulated details that the total quiescent current passed by the complete valve is 5.5 milliamps, whilst the average working current is 8.5 milliamps. The Class B section is exactly the same as the B 230 and, apart from its external appearance, the valve may be considered as identical in every respect with two separate normal valves of the L.F. and Class B type. It is extremely convenient, especially in portable receivers or others in which space is limited.

ROUND THE WORLD OF WIRELESS

(*Continued from page 702*)

Proposed S.B. Programmes for Morocco and Algeria

WITH the completion of an underground pupinised cable some 2,500 kilometres in length, between Tunis and Morocco, it is hoped in the near future to effect exchanges of broadcast programmes between Radio Maroc and Algiers, and later with the new transmitter to be erected in Tunisia by the French Colonial Authorities. As the power of the Rabat and Algiers transmitters is to be increased, the programmes would be available to listeners in the greater part of Southern and Western Europe.

Broadcast Station for Singapore?

UP to the present, British residents in the Straits Settlements have relied for their radio entertainments solely on a local amateur broadcaster; but it is now reported that an official transmitter is to be owned and operated by the municipal authorities. The station will be built and erected by two British concerns, namely, General Electric Company, Limited, and Standard Telephones and Cables, Limited. When completed this year, it will offer a regular service of radio programmes on a wavelength between 300 and 600 metres.

Solving the Wavelength Problem

THE Soviet Government, in addition to installing high-power stations, has decided to cover the country with a network of small, low-power transmitters, working on channels between 120 and 150 metres. As a start, over two thousand are to be erected in State farms and other agricultural colonies. As their power is low and the effective area covered not greater than about 100 square miles, little interference between stations working on common wavelengths is anticipated. The transmitters will take their main programme from Moscow.

Decca Records

THE new titles for January are not, perhaps, quite so interesting, as they have not become widely popular yet. For that reason I will not attempt to suggest a choice, but leave it to you to select your own. You will not be disappointed in any of them.

Roy Fox, who will in future be heard more regularly on the air, has also given us two new records. He has been touring the country for the best part of the past year, and in the majority of towns his band has played to capacity, beating box office records on all sides. There is no question of Roy Fox's popularity, and the sales of his records alone place him as one of England's greatest attractions.

It is my personal opinion that the singing of Denny Dennis has brought Fox still further friends. Dance vocalists are so few and far between that one only has to listen in to the majority of dance band broadcasts to wish sincerely that Parliament would immediately place a ban on crooners.

An Amusing Record

It is interesting to pause a moment to consider this point. Have you ever heard a really good tenor, or baritone, singing a vocal dance refrain? If not, hear the record *Decca* made two years ago. For a joke, Al Bowlly sang the song selected by Owen Bryngwyn "Glorious Devon" and Bryngwyn sang Al Bowlly's song "Let's put out the Lights and go to Sleep" (*Decca F.*3369). The interesting point was that Bowlly's technique resulted in a really pleasant rendering of "Glorious Devon," whilst Bryngwyn's "crooning" appeared so amateur as to be somewhat amusing (I hope Mr. Bryngwyn will not take offence at my remarks).

This example alone proves my point. Crooners, as such, are born and not made. The chief difficulty a band has to-day is to find a good vocalist, and you may have heard of certain vocalists being shared amongst several broadcasting bands to-day. Musicians can be found with comparative ease, but vocalists have grown to become one of the most important selling factors in a band's success. For instance, when Al Bowlly left Roy Fox to join Lew Stone, Fox searched the country unceasingly, knowing that it would be impossible to get hold of one of the few accepted vocalists, as they were too strongly tied to their respective outfits. It was over a year before he chanced upon Denny Dennis, and he quickly snapped him up and has worked really hard on the boy's development. The result to-day is that Roy Fox has one of the few really pleasing dance band vocalists broadcasting.

It is interesting to look back on this somewhat new development in dance band business. Little did any of us realize the importance that the singing of the chorus would have on the sale of a dance record. Broadcasting has, of course, enhanced this importance.

So Roy Fox, apart from his older stalwarts, such as Peggy Dell, is now a complete and best selling unit, and he is, in addition, one of the most efficient leaders in this country.

"June in January"—*F.*5351—is a title of which great things are expected, and I would like you to hear Fox's record of this, and "Give me a Heart to Sing to"—*F.*5352.

"Be Still My Heart" and "If I Had a Million Dollars," sung by Al Bowlly on *Decca F.*5326, is the first record of Bowlly recorded in America, and very good it is, both sides of it.

Another good record is Tessie O'Shea singing "No One Loves a Fairy When She's Forty" and "Live and Let Live" on *Decca F.*5336.

The Sixteen Singing Scholars

I think that their record, *Decca F.*5359, will become a big novelty seller. Sixteen Welsh scholars have been selected to make this record, one of them, Master Cyril Lewis, having already made solo Welsh records for *Decca*. Two well-known ballads have been chosen, and these boys have performed them both as part songs, and very interesting they are. Whilst they were in London, the B.B.C. put them on the air in "In Town To-night," and I understand that they were very popular.

Brunswick Records

A new star appears in the *Brunswick* list for this month. Lanny Ross jumped into prominence in the film "Melody in Spring," and there were numerous inquiries for his records. He had not, however, made any records until *Brunswick* gave him a contract following his success in "College Rhythm," which is shortly to be generally released in this country. "Stay as Sweet as You Are" and "Let's Give Three Cheers for Love," *Brunswick* 01936, is his first record, and I think you will enjoy it. The numbers are from his new film "College Rhythm."

A splendid record by the Boswell Sisters appears this month; "If I Had a Million Dollars" and "Rock and Roll," on *Brunswick* 01957. The titles should be good sellers, as they are from the film "Transatlantic Merry-go-round," in which the Boswell Sisters make a personal appearance. Incidentally it is the longest part they have ever played in a film, as usually they are only used to sing one or two numbers, which are usually interpolated and have little bearing on the story. The girls are, as I think I have told you, still in Hollywood, where they are broadcasting regularly with Bing Crosby on a "Commercial Hour." This is a typical Boswell Sisters' record.

Connie Boswell gives us another record, too (*Brunswick* 01895), "Lost in a Fog" and "Isn't it a Shame."

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

The coupon on Page 740 must be attached to every query.

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.

Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

Short-wave Coil Construction

"I should be obliged if you could give me some information with regard to the construction of a coil to cover the wavelength range from 140 to 200 metres. I have made several short-wave coils, employing valve bases for mounting purposes, and these have proved very satisfactory on every short-wave range except that mentioned. When I do wind a coil for the higher range (I never use the receiver for wavelengths higher than 200 metres) trouble is experienced due to poor reaction control or lack of selectivity."—K. A. C. (Westcliff-on-Sea).

From the particulars you give it seems that the set you are using is designed essentially for short-wave reception, and it is probable, therefore, that the detector H.F. choke is of the short-wave pattern, and is unsuitable for use on wavelengths above, say, 100 metres. If this is the case, good reception on the waveband you mention could probably be obtained by employing a new choke, of a type suitable for all-wave working, or by connecting a normal reaction choke in series with that already fitted, the new choke being placed between the previous one and the L.F. transformer.

Assuming that your coil is to be wound on a ribbed ebonite former 2in. in diameter approximately 18 turns of 22-gauge d.c.c. wire would be required for the tuned winding, and 30 turns for reaction. Both windings should consist of side-by-side turns, and there should be a space of about ⅛in. between the ends of the two.

Use For a 20-volt Rectifier

"I have just dismantled a mains receiver, and have taken from it a 20-volt, 1-amp. rectifier which was apparently used to supply the field winding of the moving-coil speaker. Could you please tell me of any use to which the rectifier could be put, and advise me if it will be suitable for charging 10-volt, 5,000 m.a.-hour H.T. accumulator units?"—J. A. P. (Liversedge, Yorks).

The rectifier unit (complete with the appropriate transformer) could certainly be used for charging purposes, and you could charge approximately eight 2-volt accumulators at 1 amp. It might also be employed for charging the H.T. units you mention by connecting four or five of these in parallel, and regulating the charging current by means of a 10-ohm variable resistance connected in series with one lead from the rectifier.

Leader Three Coils

"Could you please tell me if the twin-coil assembly recently introduced by Wearite could, with advantage, be used in place of the Wearite "Universal" coils specified in your issue?"—N. C. (Arbroath).

The coil assembly to which you refer is not suitable for the Leader Three, and we strongly advise you to employ the exact parts specified, to ensure the excellent results of which this receiver is capable.

Building A Trickle Charger

"I have recently made a mains transformer giving an output of 12 volts, and as I have a silver-oxide rectifier marked S.C.A.2 I should like to know if I can use these two parts together in order to charge a 2-volt accumulator."—B. M. J. (Swansea).

We regret to advise you that we do not know the type of rectifier you mention, and as you do not state the current and voltage rating it is not possible to say whether or not the component is suitable for use with the mains transformer that you have made. If you can give more complete details of the rectifier, at the same time stating the current output from the transformer secondary, we shall be pleased to give you further assistance.

Preventing Voltage Surge

"As I am using an indirectly-heated rectifier I have been warned that the voltage surge on first switching on is likely to damage the transformer windings. Instead of using a thermal-delay switch I have been considering the possibility of connecting a fixed resistance across each half of the secondary winding of the mains transformer. Will this be satisfactory, or will the resistances interfere with rectification?"—H. G. (Leigh-on-Sea).

It appears that you have been misinformed; the object of an indirectly-heated rectifier is to avoid a voltage surge on the D.C. side, and this it does satisfactorily. There will no doubt be a certain voltage surge across the secondary terminals of the transformer, but this will not cause any trouble provided that the transformer is of sound construction. We do not consider it necessary to fit the resistances you mention, for there will be no harm done by the rising voltage so long as the insulation used in the transformer is adequate.

Coils For The 60/- Three

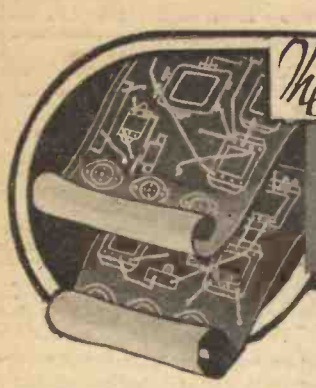
"As I am constructing the 60/- Three described in "Practical Wireless," dated December 2nd, 1933, I would like to wind my own coils and H.F. choke. Could you please supply the necessary constructional data?"—L. R. (Brentford).

We cannot, in the course of a reply through this Free Advice Bureau, give constructional details for components, and in any case would strongly recommend you to obtain the coils specified in making the 60/. Three. We might add, however, that details for making various coils were given in the series of articles published in the issues of PRACTICAL WIRELESS, dated December 9th, 1933, to January 6th, 1934, under the title, "Making Your Own Screened Coils."

A One-Valve Loud-speaker Receiver

"In the issue of your paper, dated October 20th, 1934, there appeared a very interesting article describing the construction of a one-valve receiver for universal operation. It was stated that a 16-volt D.C. valve should be used, and the circuit showed a metal rectifier. Could you please tell me the correct type of rectifier to use in this circuit as I propose to build a receiver round the design given?"—W. L. (Parkstone, Dorset).

The type of rectifier was not stated because it is not very important and there are several Westinghouse units suitable for this circuit. Actually, however, the type H.T.12 is as suitable as any, although the H.T.7 or H.T.8 could be employed.



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

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

PRACTICAL WIRELESS.

Blueprints, 1s. each.

Dolphin Straight Three	24.9.32	PW1
Long-Range Express Three	24.9.32	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	15.10.32	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Argus Three Mains Unit	26.11.32	PW6A
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Autokoll Pentode Two	31.12.32	PW9A
Selectone Battery Three	14.1.33	PW10
Fury Four	28.1.33	PW11
Stand-By Two-Valver	18.2.33	PW11A
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	4.3.33	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	4.3.33	PW22
Double-Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
Class B Detector Two-Valver	17.6.33	PW24A
D.C. Ace	15.7.33	PW25
Arcady Portable Three	15.7.33	PW25A
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
Orbit (Transfer Print)	4.11.33	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	10.3.34	PW35
Pocket Portable	10.3.34	PW35A
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Prima Mains Three	5.4.34	PW35D
Master Midget Two	12.5.34	PW35E
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	27.10.34	PW40
A.C. £5 Superhet Three	24.11.34	PW41
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW43
Universal £5 Superhet	15.12.34	PW44
A.C. Hall Mark	26.1.35	PW45

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	31.3.34	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	27.9.34	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.

B.B.C. One-valver	28.5.32	AW344
B.B.C. Special One-valver	6.5.33	AW387
Twenty-station Loud-speaker One-valver (Class B)	27.9.33	AW449

Two-valvers: Blueprints, 1s. each.

Melody Ranger Two (D, Trans)	13.5.33	AW388
Full-volume Two (SG, Det, Pen)	17.6.33	AW392
Iron-core Two (D, Trans)	29.7.33	AW395
Iron-core Two (D, QPP)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D. Trans)	17.2.34	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	17-2-34	AW338A
Lucerne Minor (D, Pen)	24.3.34	AW426
Family Two (D, Trans)	*Apr.* '32	WM278

Three-valvers: Blueprints, 1s. each.

£8 Radiogram (D, RC, Trans)	21.5.32	AW343
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D. Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	3.3.34	AW422
Cossor Melody Maker with Lucerne Coils	17.3.34	AW423
P.W.H. Mascot with Lucerne Coils (Det, R.C., Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	24.3.34	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)	9.6.34	AW437
All-Britain Three (HF Pen, D, Pen)	6.9.34	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.10.34	AW451
Transportable Three (SG, D, Pen)	*Feb.* '32	WM271
Multi-Mag Three (D, 2 Trans)	*June* '32	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	*Feb.* '34	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

Four-valvers: Blueprints, 1s. 6d. each.

65/- Four (SG, D, RC, Trans)	17.12.32	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	17.2.34	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)	*Feb.* '32	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	*Nov.* '32	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)	*Feb.* '34	WM350

Five-valvers: Blueprints, 1s. 6d. each.

Super-quality Five (2 HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (SG, D, LF, Class B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Consolectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	*June* '32	WM286
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	26.6.34	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	WM333
Six-guinea AC/DC Three (HF, Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers: Blueprints, 1s. 6d. each.

A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	4.3.33	AW380
AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	*Apr.* '32	WM279
All Metal Four (2SG, D, Pen) A.C.	*July* '33	WM329

SUPER-HETS.

Battery Sets: Blueprints, 1s. 6d. each.

1934 Century Super	9.12.33	AW413
Super Senior	*Oct.* '31	WM256
1932 Super 60	*Jan.* '32	WM269
Q.P.P. Super 60	*Apr.* '33	WM310
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets: Blueprints, 1s. 6d. each.

1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	*Feb.* '32	WM272
Seventy-seven Super, A.C.	*Dec.* '32	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.

General-purpose Portable (SG, D, RC, Trans)	9.7.32	AW351
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM287
Two H.F. Portable, (2 SG, D, QP21)	*June* '34	WM362
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM363

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	23.1.32	AW329
S.W. One-valver for America	31.3.34	AW427
Roma Short-waver	10.10.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, RC, Trans)	20.8.32	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Super-hets: Blueprints, 1s. 6d. each.

Quartz-crystal Super	*Oct.* '34	WM372

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.10.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368

Three-valvers: Blueprints, 1s. each.

Emigrator (SG, D, Pen), A.C.	*Feb.* '34	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292

Miscellaneous Advertisements

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PREMIER SUPPLY STORES

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

OFFER the Following Manufacturers' Surplus New 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 for Illustrated catalogue, post free.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v. 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/0.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, condensers, resistances, and diagram, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 250v. 30 milliamps with 4v. 2-4 amps, C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps, with 4v. 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps., 20 hys., 2/9; 250 milliamps, 30 hys., 20/-.

ALL Premier Guaranteed Mains Transformers Have Engraved Terminal Strips, with terminal connections, input 200-250v., 40-100 cycles, all windings paper interleaved.

PREMIER H.T.7 Transformer, output 135v. 80 m.a., for voltage doubling, 8/6; 4v. 3-4a, C.T., L.T., 2/- extra; with Westinghouse rectifier, giving 200v. 30 m.a., 17/6.

PREMIER H.T.8 and 9 Transformers, 250v. 60 m.a. and 300v. 60 m.a. rectified, with 4v. 3-5a, and 4v. 1-2a, C.T., L.T. and screened primary, 10/-; with Westinghouse rectifier, 18/6.

PREMIER H.T.10 Transformer, 200v. 100 m.a., rectified, with 4v. 3-5a, and 4v. 1-2a, C.T., L.T., and screened primary, 10/-; with Westinghouse rectifier, 19/6.

PREMIER Mains Transformer for H.T.11, rectified output 500v. 120 milliamps or 450v. 120 milliamps with 3, 4 volt C.T. Windings, 22/6, with Westinghouse rectifier, 42/6.

PREMIER Mains Transformers, output 350-0-350v. 120 m.a., 4v. 3-5a, 4v. 2-3a, 4v. 1-2a (all C.T.), with screened primary, 10/-.

PREMIER Mains Transformer, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a, 4v. 1-2a (all C.T.), with screened primary, 10/-.

PREMIER Auto Transformers, 100-110/200-250v. or vice versa, 100-watt, 10/-.

WESTERN ELECTRIC Mains Transformers, 300-0-300v. 65 m.a., 4v. 1-2a., 4 v. 2-3a, 6/6; 500-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a, 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6.

SPECIAL Offer of mains Transformers, manufactured by Phillips, input 100-110v. or 200-250v., output 180-0-180 volts 40 m.a., 4v. 1 amp., 4v. 3 amps., 4/6.

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

B.T.H. Truspeed Induction Type (A.C. only), Electric Gramophone Motors, 100-250v., 30/- complete. D.C. model Truspeed, 100/250v., 45/-.

COLLARO Gramo. Unit, consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire-Wound Resistances, 4 watts; any value up to 50,000 ohms, 1/-; 8 watts any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CENTRALAB Potentiometers, 400 ohms., 1/-; 50,000, 100,000, ½ meg., any value, 2/-. 200 ohms, wire wound, 1/-.

SPECIAL OFFER. Kolster-Brandes (shop-soiled) 2-valve Battery Pup, with self-contained Speaker, Valves and Batteries, 27/6.

AMERICAN Triple gang 0.0005 Condensers, with Trimmers, 4/11; Polar bakelite condensers, 0.00035, 9d.

RELIABLE Intervalve Transformers, 2/-; multi-ratio output transformers, 2/6; Microphone transformers, 50-1 and 100-1, 2/6; 1-1 or 2-1 Output Transformers, 2/6.

RELIABLE Canned Coils and Circuit accurately matched, dual range, iron cored, 2/11 each.

POLAR Star manufacturers' model, 3-gang condensers, fully screened, 7/6 with trimmers; unscreened, 5/-.

(Continued at top of column three)

Easy Terms

ALL MANUFACTURERS' COMPONENTS and ACCESSORIES in STOCK. SEND US YOUR ENQUIRIES

W.B. STENTORIAN STANDARD

For Power, Class B. Send 2/6 DOWN. Pentode and balance in 11 monthly payments of 3/-. Cash or C.O.D. Carriage Paid, £1/12/6. W.B. Stentorian Senior. Cash or C.O.D. Carriage Paid, £2/2/0, or 2/6 deposit and 11 monthly payments of 4/-. W.B. Stentorian Baby. Cash or C.O.D. Carriage Paid, £1/2/6, or 2/6 deposit and 9 monthly payments of 2/6.

ROLA F.R5 PERMANENT-MAGNET M. C. SPEAKER

With universal tapped Transformer. Send only 2/6, balance in 10 monthly payments of 3/-. Cash or C.O.D. Carriage Paid. £1/9/6. ROLA FR6 P.M. M.C. SPEAKER Cash or C.O.D. Carriage Paid, £1/19/6, or 2/6 deposit and 10 monthly payments of 4/3.

GRAHAM FARISH RAIDER 3 KIT

Complete Kit of parts for building, less valves and cabinet. Send only 5/-. Balance in 11 monthly payments of 6/3. Cash or C.O.D. Carriage Paid, £3/7/6. If valves and cabinet required, add £2/16/6 to Cash Price, or complete for 11/3 deposit and 11 monthly payments of 11/3.

B.T.S. Universal TELEVISION MOTOR

For both 16in. and 20in. scanning discs. Universal A.C. or D.C. Mains, 200-240 volts. A.C. 40-60 cycles or Battery Model, 6-volt. Send only 5/-, balance in 7 monthly payments of 5/-. Cash or C.O.D. Carriage Paid £1/15/0.

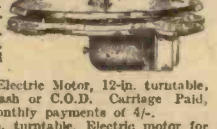
We Stock Everything Television. Send for Television Lists

ATLAS ELIMINATOR

Model C.A.25. For all outputs up to 25 m.a. 100/250 volts A.C. Send only 5/-, balance in 11 monthly payments of 5/6. Cash or C.O.D. Carriage Paid £2/19/6. Model T 10/30. Cash or C.O.D. Carr. Paid £3/9/6. 5/- down and 12 monthly payments of 6/-

NEW GARRARD A.C.6. INDUCTION ELECTRIC MOTOR

Complete with 12" turntable, 12" Unit Plate and fully automatic Switch. For A.C. mains only. Send only 2/6, balance in 11 monthly payments of 4/-. Cash or C.O.D. Carriage Paid £2/2/6.



New Garrard A.C.4 A.C. Mains Electric Motor, 12-in. turntable, motor plate, automatic stop. Cash or C.O.D. Carriage Paid, £2/2/6, or 2/6 down and 11 monthly payments of 4/-. New Garrard Model 202a. 12-in. turntable, Electric motor for A.C. mains. Cash or C.O.D. Carriage Paid, £2/10/0, or 5/- down and 10 monthly payments of 5/-.

SEND FOR LATEST LISTS

New Times Sales Co.

56, (Pr.W2.) LUDGATE HILL, LONDON, E.C.4.

(Continued from foot of column one)

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 magna., 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M. 7in. cone, 16/6. 9in. cone, 22/6.

UTILITY 3-gang Condensers. 0.0005, fully screened, with trimmers, ball bearing straight or superhet, 6/9, complete; with illuminated disc drive, 7/11, the best 3-gang available.

T.C.C. Condensers, 250v. working, 1 mf., 1/3; 2 mf., 1/9; 4 mf., 3/-; 4 mf. 450v. working, 4/-; 4 mf., 750v. working, 6/-; 2 mf., 750v. working, 3/-.

VARLEY Constant Square Peak Coils, bandpass type B.P.7 brand new, in maker's cartons, with instructions and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.S., band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron, flush mounting, accurate, 0-10, 0-15, 0-50 m.a. 0-100, 0-250 m.a., 0-1, 0-5 amps.; all at 6/-.

WESTERN Electric Condensers, 250v. working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 400v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

WIRE-WOUND Potentiometers, 1,000, 2,500, 10,000, 50,000, 500,000, 2/- each; 1,000 ohm, semi-variable, carry 150 ma., 2/-.

A LARGE Selection of Pedestal, table and radiogram cabinets, by best manufacturers at a fraction of original cost. Send for list.

THE following Lines 6d. each, or 5/- per dozen.—Chassis valve holders 5-, 6-, or 7-pin, screened screen-grid leads, any value 1-watt wire resistances, wire end condensers 0.0001 to 0.1, 3 amp. mainswitches, Cyldon capacitors; double trimmers.

SUPER-MOVING Coil Speakers, handle 10 watts, energised directly from A.C. mains, manufactured by world-famous radio and gramophone company, 40/-.

T.C.C. Electrolytic condensers, 8 mf. 440v. working, 3/-; 4 mf. 440v. working, 3/-; 15 mf. 50v. working, 1/-; 50 mf. 12v. working, 1/-; 15 mf. 100v. working, 1/3; 6 mf. 50v. working, 6d.; 2 mf. 100v. working, 6d.

DUBILIER Dry Electrolytic Condensers, 12 mf. 20v. working, 6d.; 50 mf. 50v. working, 1/9.

CONDENSER Blocks, H.M.V. 400v. working, 4+2+1+1+1+.5, 3/9; 2+2+1+1+1+.5, 3/-; Dubilier 300v. working, 4+4+2+.1, 3/-; Phillips 6+4+2+1+1, 4/6.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World Famous Continental valve manufacturer, all the following standard main types, fully guaranteed, 4/6 each; H.F. Pentodes, Variable-Mu H.F. Pentodes, H.L., L. power, medium, high, low mag. and variable-mu screen-grids, one, three and four watt A.C. output, directly heated pentodes, 250v. 60 ma., full wave rectifiers D.C. types, 20v. 18 amp., filaments, screen grid V.M., H., H.L. Power, Pentodes, H.F. Pentodes, Variable-Mu H.F. Pentodes.

THE Following Types, 5/6 each: 350v. 120 ma., full wave rectifier, 500v. 120 m.a., full wave rectifier, 2½ watt indirectly heated pentode.

THE Following American Types, 4/6: 250, 112, 171, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 83, 27.

THE Following Types, 6/6 each: 42, 77, 78, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A5, 2A6, 267, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59. Send for Complete Valve list.

GRAMPIAN Permanent Magnet 9 inch Moving Coil Speakers, handles 4 watts, Universal transformers, 18/6. Ditto Energised handles 5 watts. 2,500 ohms, 21/-.

WILKINS AND WRIGHT. Full-vision dials with Escutcheon, 2/11.

SCOTT Aerial and Anode Coils. Dual Range with Circuit, 2/6 per pair.

ELLIOTT Moving-Coil Milliameters projecting type, 2½in. diameter, 0-10, 0-30, 0-50, 0-150, 15/-.

MARIO directly-heated 1 watt, 200v. Mains Power Valves, 2/6.

BLUE SPOT 45 P.M. Speaker, multi-ratio transformer, handles 4 watts, listed 45/-, at 25/-, or in handsome walnut cabinet, 35/-. Blue Spot 99 P.M. Speaker, multi-ratio transformer, handles 5 watts, listed 59/6, at 31/-.

BLUE-SPOT Energised Speakers, 2,500 ohms type 29D.C., Power and Pentode Transformer, 9/11.

BLUE-SPOT P.M. Speaker with Multi-Ratio Transformers, special offer, 16/-.

LISSEN 3-gang Super-het coils with switching and circuit, 6/-.

LOTUS 3-gang Bandpass coils with Switching, 12/6.

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ADVERTISEMENT INDEX

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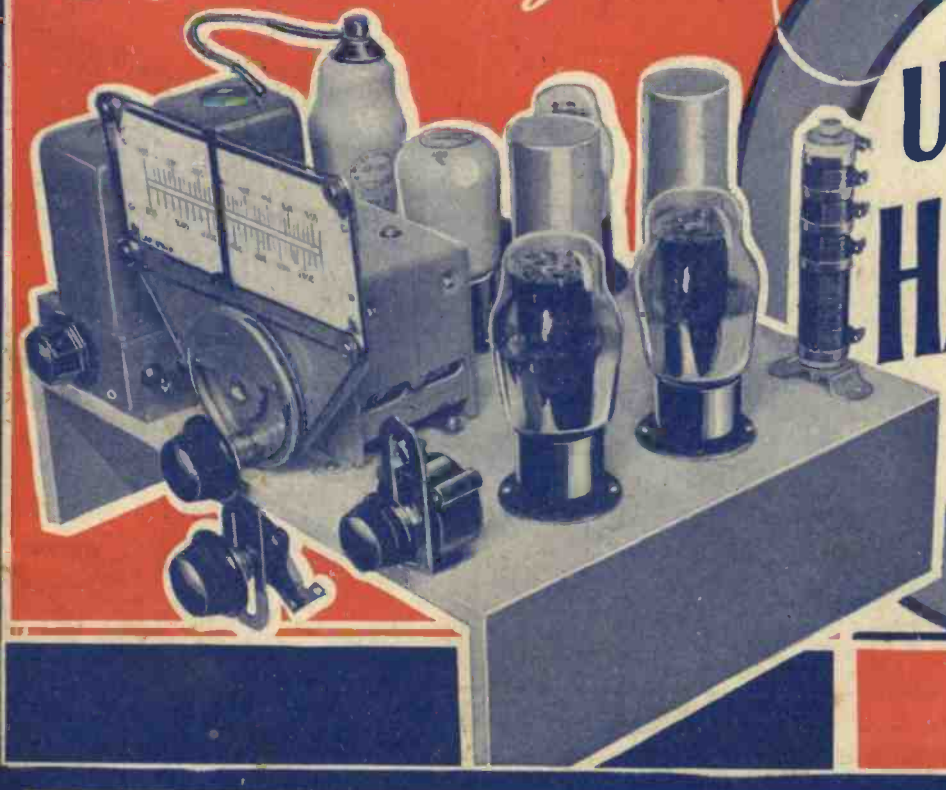
The New Two-in-One Wireless Weekly

Practical and Amateur Wireless

3D. EVERY WEDNESDAY
Vol. 5. Feb. 9th. 1935. No. 125

A GEORGE NEWNES Publication

Building the UNIVERSAL HALL-MARK FOUR



SINGLE SIDE-BAND BROADCASTING—See Page 753

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. V. No. 125. FEB. 9th, 1935.

ROUND *the* WORLD *of* WIRELESS

Suggestions Received

SINCERE thanks to the hundreds of readers who have written letters of congratulation on the amalgamation of "Practical Wireless" and "Amateur Wireless." Most readers have sent valuable suggestions as to the features they like best, the type of receiver they require, the sets they are operating at present, the particular subjects in which they are interested, and aspects of radio which they would like described in future issues. As a result of those suggestions we shall be able to publish articles, designs, and features to satisfy general requirements.

Readers of both papers have especially appreciated the fact that the fusion of two famous journals has enabled them to have the benefit of the experience of popular contributors to both journals. They have also appreciated the generously interpreted free advice bureau.

If you have not yet sent in your suggestion, we should be glad if you would do so now. A postcard will do. We have in hand plans and developments of great importance to every constructor. Watch "PRACTICAL AND AMATEUR WIRELESS."

That Fading Problem

FOR five days—from January 21st to 26th—the Langenberg transmitter was closed down between G.M.T. 08.00 and midday in order to permit engineers to tackle new anti-fading devices. In this instance, the work consisted of inserting special coils so as to allow the use of the entire length of the aerial. Results have proved satisfactory, and although the transmission still suffers in some degree from fading, reception conditions over a wider area than hitherto have been improved. Have you noticed the greater steadiness of signals?

The Radio Fan's Dream Aerial

THE French Commission responsible for the organisation of the Paris 1937 Universal Exhibition has put forward a proposal to erect in the immediate neighbourhood a giant tower which, according to plans, should attain six times the height of the present Eiffel Tower built in 1887. The design will be that of an Arab minaret with a rectangular base, and will consist of sixty-six storeys, of which three, at respectively 2,013ft., 4,223ft., and 6,035ft., will consist of large platforms capable of housing hotels and restaurants. The tower, reaching a total height of 6,100ft., should make the present Eiffel Tower and the New York skyscrapers look like dwarfs. At the summit, it is the Commission's intention to install a laboratory for astronomical and meteorological observations, and on one of the platforms it is also conceivable that room will be found for a radio-telephony station, the studio of which would be built within easy access of the street. The plans have been put forward in all seriousness.

New Brazilian High-power Station

IT is reported from Holland that a 50-kilowatt station is being constructed in that country on behalf of a broadcasting organisation in Brazil. The complete plant will be despatched to Rio de Janeiro towards the end of February, when the installation on a suitable site will be hurried forward. The wavelength allotted to this transmitter is in the region of 270 metres, and, if nothing unforeseen happens, it should be testing during the summer months.

ON OTHER PAGES

Not a Mystery Broadcast

THE transmission which is now being heard on 834.5 metres, just below the Heston Airport weather reports, emanates from Budapest (2), a 20-kilowatter which is providing Europe with alternative Hungarian programmes. The station is on the air daily, but has not yet taken over its full schedule of broadcasts.

Another Morse Interval Signal

TIRED of an endless search for a signature tune which would identify the Brno (Czecho-Slovakia) studio to its listeners, the engineers have decided that the best method is the transmission of the morse letters BRNO (– . . . . – . – – – –), and from the start of the year this system has been adopted. It is, however, only used when the Brno studio is broadcasting its own programmes.

Bulgaria's Ambitious Plan

SO far, the capital Sofia has only operated a small station, Radio Rodno, of which the broadcasts on 352.9 metres (850 kc/s) are seldom heard in Western Europe. It is hoped, however, to install in the capital during 1935 a 50-kilowatter which would serve the greater part of the country. The 300-watt Radio Rodno station would then be transferred to Varna.

A Seldom-recognised Broadcast

THROUGHOUT the day at specified times on 1,205 metres (240 kc/s) the commercial transmitter PCF at Scheveningen-Haven (Holland) transmits, for the benefit of subscribers to this special service, news bulletins, commercial reports, and stock exchange quotations. These are only transmitted in Dutch by a man and woman announcer. The station usually comes on the air with a deep note siren.

Following the Aircraft

WHEN tuning in on the lower end of the upper waveband, no doubt at times you have heard GED, Croydon Airport, in communication with cross-Channel 'planes. On the same wavelength (862 metres, 348 kc/s) you may pick up similar communications with aircraft from GET, Newtownards Aerodrome, Belfast; GEB2, Hedon, Hull; GEM, Manchester; GEN, Portsmouth, and GER, Abbotsinch; ONB, Brussels (Belgium); PHA, Amsterdam, and PHR, Rotterdam (Holland), with which Croydon is always in touch, usually transmit on 883 metres (340 kc/s).

ROUND the WORLD of WIRELESS (Continued)

Hallé Concert from Manchester

THE second half of the Hallé Society's Concert will be broadcast to Northern listeners from the Free Trade Hall, Manchester, on February 7th. Sir Thomas Beecham is to conduct the orchestra in the Overture and "Venusberg" from "Tannhäuser"; in "Three Legends," by Dvořák, and the final scene from Delius's opera, "Koanga."

"Promotion"

THE play, "Promotion," which concerns departmental rivalry in a big store, will be repeated on the Midland wavelength on February 12th. It was broadcast first in October, 1934. The author, Francis Durbridge, is only twenty-one, and has had half a dozen plays and revues produced by Martyn Webster. A sequel to "Promotion" is to be given about a fortnight later.

B.B.C. Midland Orchestra

MIRANDA SUGDEN (soprano) is the vocalist with the B.B.C. Midland Orchestra in a concert on February 13th, which will be heard in the Regional programme. Leslie Heward is the conductor. Landon Ronald's "Adonais" is one of the works to be given. On the same evening, Laurence Meynell, the well-known novelist, who belongs to Wolverhampton, will tell an original story entitled "Below the Surface."

Sophisticated Revues

THE second production by Denis Freeman, in the series of sophisticated revues which was launched successfully last week, will be broadcast on February 26th, late in the evening.

"Life in the Town"

RICHARD ROWLEY concludes the series of Northern Ireland talks "As You Were" with one on "Life in the Town" on February 12th. This talk is based on some as yet unpublished diaries kept in Downpatrick and district a hundred years ago. According to them life in Ulster was very entertaining indeed in the last century.

"The Homes of Wales"

IN the fourth of the Welsh series entitled "The Homes of Wales," on February 9th, a visit will be paid to St. David's, the home of Wales' Patron Saint. Besides visiting the Cathedral, listeners will hear several examples of ecclesiastical music representative of various periods.

Concert from Belfast

ELSIE SUDDABY (soprano), Jan Van der Gucht (tenor), and Hooton Mitchell (baritone) are to be the soloists in the third subscription concert of the Belfast Philharmonic Society, which will be relayed from the Ulster Hall, Belfast, on February 15th. The first part of the programme, which is to be broadcast, will be devoted to the first performance in Belfast of Handel's L'Allegro, Il Penseroso, and Il Moderato.

City of Birmingham Orchestra

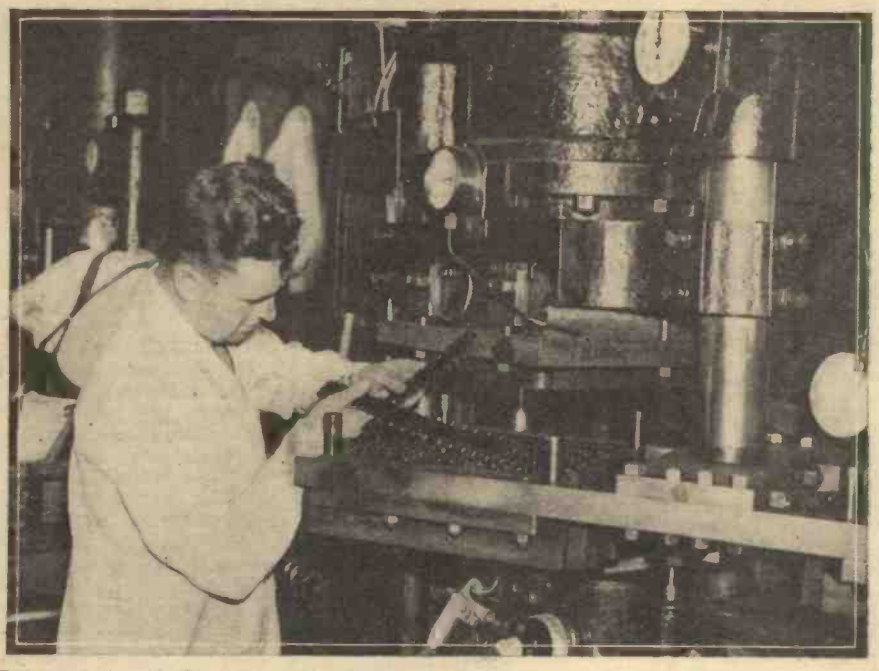
ON February 14th, Tchaikovsky's Fifth Symphony and the Delius Double Concerto are to be given by the City of Birmingham Orchestra in the Birmingham Town Hall, and will be relayed. The soloists for the concerto are Paul Beard (violin) and Antony Pini ('cello). Leslie Heward will conduct.

INTERESTING and TOPICAL PARAGRAPHS

"Trailers"

GEORGE GORDON'S high-speed revue, "Trailers," is to be produced for Northern Ireland listeners on February 11th, and for Regional listeners on February 14th. The technique of this revue is founded on the arrangements of the short films which advertise "Next Week's Attraction" in cinemas all over the country. A cast of twenty-one, the Belfast Wireless Orchestra, and a two-piano act will be heard in the show, which is mainly satirical in intention. One of the scenes depicts the arrangement of the massacre of Glencoe as it might have been dealt with by an American film producer imbued with the gangster tradition.

MASS PRODUCTION METHODS



The cases for 90 fixed condensers are made simultaneously by this 80-ton press at the "His Master's Voice" factories at Hayes, Middlesex.

SOLVE THIS!

Problem No. 125.

Matthews had a three-valve A.C. receiver employing the popular S.G., detector, and power circuit. After reading of the advantages of push-pull amplification he decided to try and improve his receiver by the addition of push-pull valves. He purchased an input and output push-pull transformer and re-wired the receiver. When tested, no greater amplification or improvement in quality was obtained, and on pulling out one of the push-pull valves the output remained unaltered. Why was this? 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. 125, and must be posted to reach here not later than the first post, Monday, February 11th.

Solution to Problem No. 124.

In connecting the three-point wave-change switch, Wilkinson had employed one point for a common earth connection, and had connected the other two points to the junction of medium- and long-wave windings on the two coils. Thus, the wave-change switch short-circuited the variable G.B. supply to the first valve.

The following three readers sent the first correct solutions opened in connection with Problem No. 123, and books are being sent to them: W. Harvey, Ward 4, City General Hospital, Gwendolen Road, Leicester; T. F. H. Bigg, 54, Ferndale Road, Gravesend, Kent; G. Lindley, 43, Leeds Road, Outwood, near Wakefield, Yorks.

New B.B.C. Studios

A START is now being made with preliminary work in connection with the construction of four additional studios at Maida Vale, where the B.B.C's largest studio is already in regular use for orchestral programmes. The reconstructed studios and offices at Newcastle are now in service, and work is nearing completion on the remaining studios in the Northern headquarters at Manchester; while at Bristol the decoration of the second half of the premises in Whiteladies Road will soon be complete.

Concert by Rushden Temperance Band

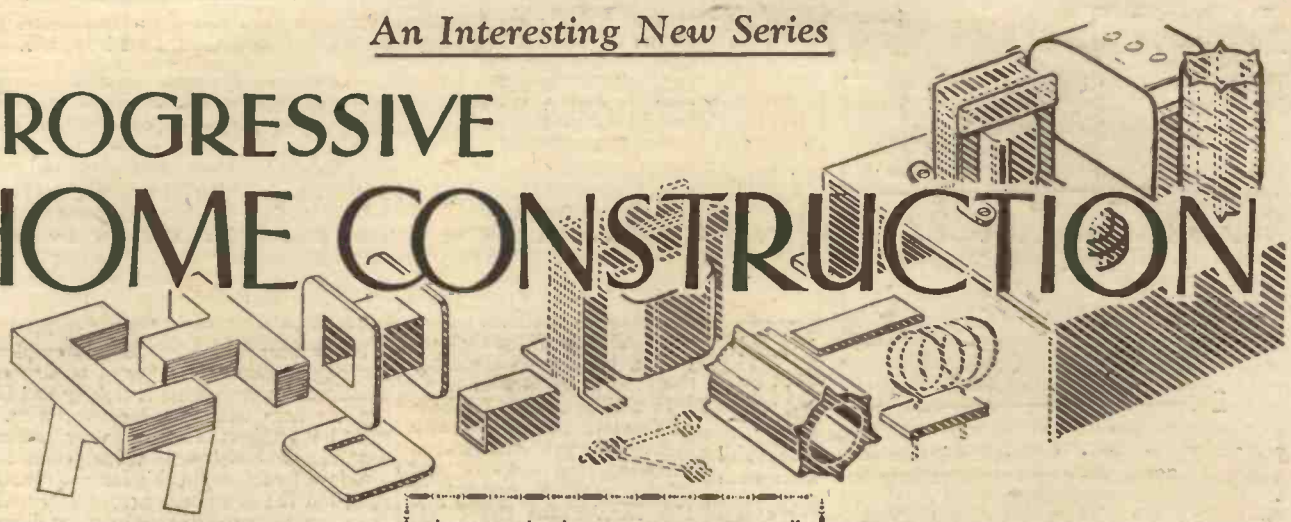
ON Monday evening, February 11th, a popular concert by the Rushden Temperance Band, from Northamptonshire, will be conducted by Thomas Young, and Raymond Green will entertain at the piano. Midland listeners will hear this programme.

Scottish Orchestral Concert

THE last concert of the season by the Scottish Orchestra, conducted by John Barbirolli, will be relayed from St. Andrew's Hall, Glasgow, on February 9th. The programme on this occasion will be a plebiscite one, including some of the items which have proved most popular during the season.

An Interesting New Series

PROGRESSIVE HOME CONSTRUCTION



This Week The Experimenters Tell You How to Obtain the Best Results from the Home-made Single-valver, and Proceed to Describe the Construction of an L.F. Amplifier

by The Experimenters

YOU should have completed the construction of all the parts for the single-valver by now, and you will probably have mounted them on the chassis or baseboard as well. In that case everything will be ready for wiring up, and this can be done in very little time, since so few connections are required. No doubt the majority of readers will be able to follow the connections by referring to the theoretical circuit given in PRACTICAL AND AMATEUR WIRELESS a fortnight ago (January 26th issue), but as it is evident from the correspondence which we have received that a large number of beginners are making the set, a practical wiring plan is given in Fig. 1 on this page. We had considered giving two wiring plans—one for a baseboard lay-out and another on the assumption that a chassis had been used—but it was decided that it would be more satisfactory to give a general plan which would apply to any particular component arrangement.

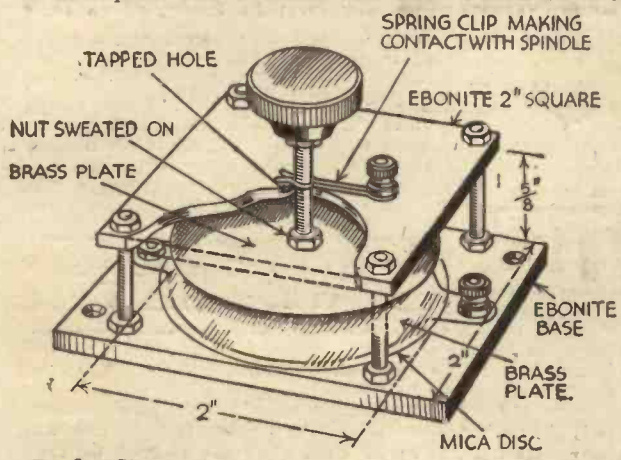


Fig. 2.—Showing how the pre-set aerial condenser may be constructed.

Coil Connections

Despite this, the components shown in Fig. 1 are shown in the approximate respective positions which they should occupy, and it will be seen that all connecting leads may be kept very short. In connection with the terminal arrangement on the coil base it should be explained that, due to a slight draughtsman's error, two terminals were numbered 4 in the sketch showing the coil base reproduced in the first article of this new series; actually, the terminal next to number 6 should have been marked 7, as shown in Fig. 1.

It will be seen that the four battery leads are shown as being joined directly to the various components, but those readers who prefer might bring out the leads to terminals mounted on an ebonite strip fixed to the rear edge of the chassis. Alternatively, a stranded battery-cable assembly could be used, but most constructors will no doubt prefer to make their own.

After everything has been connected, a valve can be inserted in the holder and the set put into use. With regard to the valve, this should for preference be of the special detector kind (Cossor 210D, for example) or of the 210 HL type. In either case a high-tension voltage of about 60 will be adequate.

The set will, of course, be switched on by rotating the knob of the right-hand switch, after which the wave-change switch on the left can be set for medium- or long-wave reception. This is done by turning the knob until the contacts are "closed" or "open" respectively. Set the reaction condenser to zero, and rotate the knob of the tuning condenser until the local station is heard, and then slowly increase the capacity of the reaction condenser to a point just below that at which oscillation is indicated by signals becoming slightly distorted. There is no need to allow the valve to oscillate, and oscillation should be avoided, since that would cause interference with other near-by receivers.

"Smoothing" Reaction

If it is found that signal strength increases as the reaction setting is advanced, and that after a certain setting has been reached the set bursts into oscillation, the H.T. voltage should be reduced until a position of the H.T. positive plug is found which enables smooth reaction control to be obtained. Another method of "smoothing out" reaction control is to vary the value of the grid leak, and this can easily be done by increasing or decreasing the width of the pencil line on the ebonite base. For this reason it might sometimes be found more convenient to make a second grid leak, and not to varnish it until the most suitable value of resistance has been found. In the majority of instances, however, it will be found that a leak made according to the instructions given previously will be most satisfactory.

(*Continued overleaf.*)

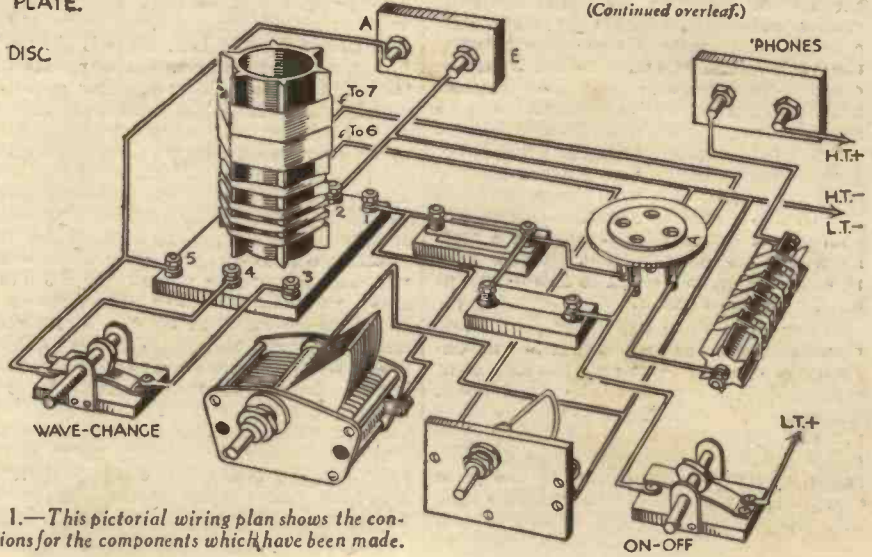


Fig. 1.—This pictorial wiring plan shows the connections for the components which have been made.

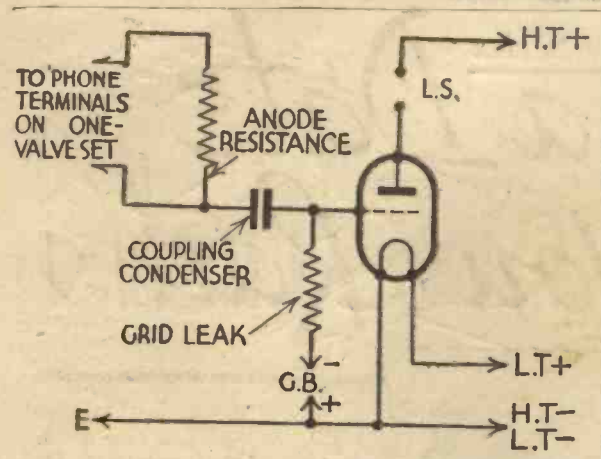


Fig. 3.—The circuit of the simple resistance-capacity-coupled amplifier which can be constructed entirely from home-made parts.

(Continued from previous page)

An Anode By-pass Condenser

Yet another method of improving reaction control, and one that is frequently recommended, is to connect a small capacity fixed condenser between the anode terminal of the detector valve and earth. This condenser should have a capacity of about .0002 mfd., and can be made in exactly the same manner as the grid condenser, by using only four sheets of foil (when waxed paper forms the dielectric), or by slightly reducing the size of the two foils when mica is employed.

After this condenser has been fitted, and the small adjustments previously described have been carried out, the little set should easily be capable of giving good 'phone reception of dozens of stations. The 'phones, incidentally, should be good ones, having a total resistance of not less than 2,000 ohms. When the set is used with a good outside aerial situated within a few miles of a broadcasting station, moderate loudspeaker results should be possible, provided that the speaker is a sensitive one of the moving-iron or balanced-armature type, but one must not be too optimistic in this respect, since, after all, a single-valve set is scarcely intended for loud-speaker output.

Making a Pre-set Condenser

When the set is used very near to a transmitter it is possible that the degree of selectivity — although fairly high — will scarcely be sufficient, especially when the aerial is on the long side. In that case, tuning may be sharpened by connecting a variable condenser of some type between the aerial terminal and terminal 5 on the coil. This condenser may be identical with that used for reaction and can be mounted on a small bracket attached to the rear of the chassis. On the other hand, a condenser of the pre-set pattern may be employed, and this can be made as shown in Fig. 2. It will be seen that a sheet of thin copper or brass is attached to a rectangular ebonite base, and that a very thin sheet of mica is stuck to this by means of thin shellac varnish.

A second piece of ebonite is drilled and mounted above the first on four pillars consisting of screwed brass rod (the shanks of some old terminals may be used here). The moving plate consists of a fairly stout piece of brass, and this is attached to the end of another length of brass rod by soldering a nut to the centre of the plate and forming the end of the rod into this. The rod passes through a suitably-tapped hole in the upper piece of ebonite, and contact with it is secured by means of a short length of springy wire held under the nut of a terminal and pressing against the spindle. It will be evident from the sketch that contact with the fixed plate is secured by attaching a terminal directly to a projecting lug.

The hole in the upper ebonite strip may be tapped by following the method described last week when dealing with the H.F. choke, after drilling a hole about 1/32in. smaller in diameter than the screwed rod.

It will be evident to those readers who are mechanically inclined that this method of mounting the spindle (and relying on the tapped hole in the ebonite for the drive) is by no means ideal, but it is described for the benefit of those whose stock of tools is very limited. A much better system would be to employ a brass bush, tapped to receive the spindle, and fitted to the upper ebonite strip. In that case connection to the terminal would be obtained by means of a strip of foil fitting underneath the nut of the bush and beneath the terminal nut.

Adding L.F.

Once the constructor has found that the single-valver gives such excellent results, he will certainly wish to make the set more powerful by adding a stage of L.F. amplification. This can be done in several ways, but in the first place it is recommended that a stage of resistance-capacity-coupled amplification is employed. This is simple to arrange, whilst the very few parts required can be made very easily and at a cost of a couple of shillings or so—we are, of course, assuming that the necessary valve is already to hand.

Fig. 4.—The easily-made anode resistance. Details are given in the text.

A circuit for the L.F. stage is shown in Fig. 3, and the first component required is the fixed anode resistance. This could be bought ready-made for a shilling, but, as we are making practically everything else, there is no reason why we should not make the resistance; the materials will only cost a few pence. The value of the resistance should be governed by the detector valve employed, being equal to about twice the impedance of the valve. For all practical purposes, however, a value of 30,000 ohms may be decided upon. In some respects it might be desirable to have a wire-wound resistance, but the construction of this would be very tedious, due to the fact that it would have to consist of about 500 yards of very fine resistance wire. In addition, the wire would have to be wound into slots and the direction of winding reversed for every slot to make the component non-inductive. A simpler method, however, which will prove perfectly reliable, is to employ a strip of writing paper, soaked in Indian ink, rolled up and fitted with connecting leads, as shown in Fig. 4. The value of the resistance varies slightly according to the exact paper employed and the ink used, but if the paper is about the thickness of this page and of fairly porous texture, a sheet measuring 9in. by 1½in. will be just about right. One simple method of soaking the paper is to roll it loosely, place it into a small test tube and then pour in just sufficient Indian ink (obtainable from any stationer's) to cover the paper. Another method is simply to apply the ink liberally to both sides of the paper with a small brush.

No matter which method is employed, the paper should be allowed to dry completely before wrapping it tightly and binding the ends with bared copper wire. It will be evident that a very accurate control of resistance value cannot be obtained by following this form of construction, but the constructor can easily make a few alternative resistances by using different lengths of paper, and also by using blotting paper (for lower values) instead of writing paper.

The Coupling Condenser

The next requirement is the coupling condenser, which should have a capacity of about .005 mfd. It is very desirable that this should have mica for the dielectric, because the voltage applied to it is comparatively high, and is alternating (this is in addition to the steady H.T. voltage). The condenser can be built up in exactly the same manner as was described in connection with the grid condenser, using mica .002 in. thick.

Instead of using only two plates, however, there should be about sixteen, of which eight will be connected to each terminal. The grid leak can be made exactly as before, but making the pencil line about ½in. wide to obtain a resistance of approximately .5 megohm.

Next week we will continue with the construction of the L.F. amplifier, dealing with the decoupling components and the construction of an L.F. transformer.

AN EXTENDED BAND-PASS FOR VISION RECEIVERS

IF a pair of high-frequency amplifying valves are oppositely detuned simultaneously by a small differential condenser, then the single-peaked, normal response curve of such a circuit is split up into a double-humped curve, representing lower over-all amplification, but a wider frequency band-pass coupled with a steep cut off on each side. The extent to which the band-pass is widened is controllable by means of the differential condenser, while permitting the anode condensers to be ganged as usual.

Another form of distortion, often neglected in television radio receivers, is amplitude distortion, and this applies particularly to the detector-valve stage. Of the two common methods of rectification, a grid leak and condenser is more efficient at low-input amplitudes and anode bend at high amplitudes, the efficiencies being about equal in the neighbourhood of half a volt input. Ordinary grid rectification is notoriously non-linear, but it should be clearly realized that for low-voltage inputs, anode-bend rectification also introduces acute amplitude distortion.

Make a Date with Your Radio

An Article Describing the Construction of a Novel Time-switch.

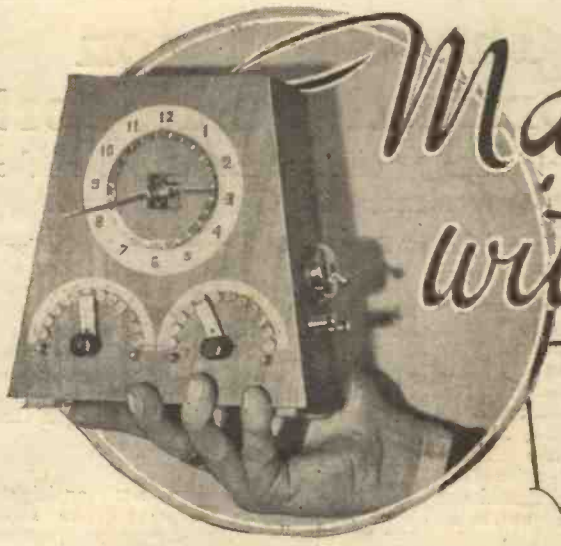


Fig. 1.—Showing the neat appearance of the finished time-switch.

IT often happens that the listener misses a certain programme he intended listening to through being otherwise engaged, and not observing the time. To remedy this state of affairs the writer constructed the time-switch shown in the accompanying illustrations, which automatically switches on the radio at any pre-selected time, and breaks the L.T. circuit of the set at the finish of the programme. The instrument can stand anywhere in the room remote from the set to which it is connected by two wires forming part of the L.T. circuit.

Constructional Details

It will be seen from the photograph, Fig. 1, that the instrument is housed in a neat cabinet, made of three-ply walnut, in the top part of which a clock is mounted, the lower part of the cabinet containing two pre-set switches each consisting of twelve contact studs. The cabinet of the model illustrated is 7in. high, 7in. wide at the bottom, tapering to 4¾in. at the top, and 3in. deep. The clock, which is of the cheap alarm type, is screwed to the inside of the cabinet in the position indicated in Fig. 3.

After cutting the front panel of the cabinet to shape, twenty-four ⅛in. holes were drilled through at equidistant spaces round a circle corresponding to the clock face. Pressed tightly in each hole is a strip of springy sheet brass, ⅛in. wide, which projects about ¼in. at the back, and about ¾in. at the front of the cabinet. After these strips are firmly inserted they are bent over at a slight angle, as shown in Fig. 2.

The Contact Mechanism

In place of the ordinary hour hand a piece of springy brass strip is substituted, and this is bent to the required shape to press firmly on the contact strips round the dial. Each of these small contact pieces represents half an hour, and each one is connected by a piece of No. 22 D.C.C. wire to the corresponding studs of the two switches. The switch arms are made of thin sheet brass, and are cut down the centre, which allows them to rest on either one or two studs at a time, according to whether a half-hour or an hour's programme is required.

By means of the two switches choice of two programmes can be had without resetting. The hour hand makes a sliding contact on the contact strips, and as it reaches the end of one piece it sharply breaks contact, and makes contact with the next strip. At the side of the cabinet are two terminals for connecting to the set, and a small switch for completely disconnecting from the set. The complete wiring connections are indicated in Fig. 3, and in Fig. 4 details of the switch construction are given.

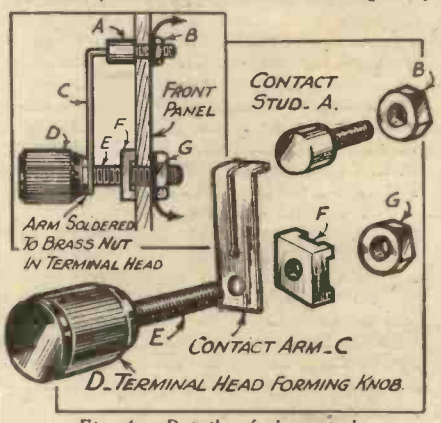


Fig. 4.—Details of the switch.

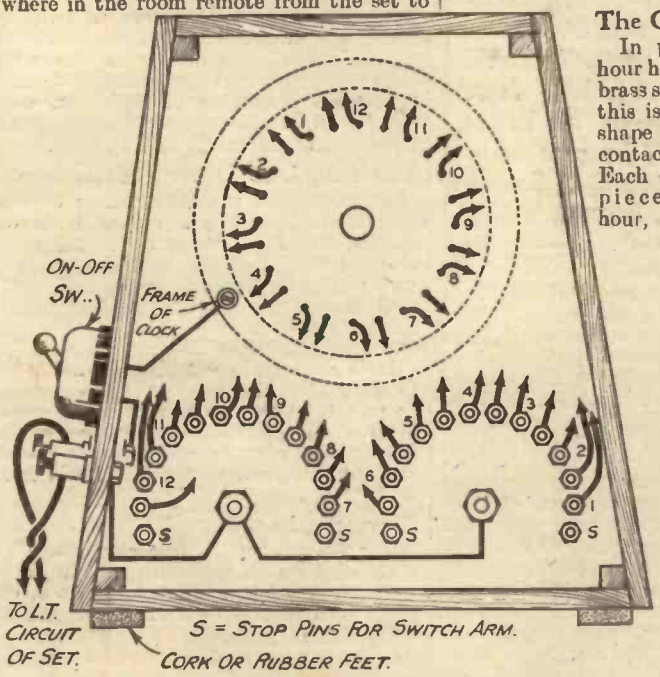


Fig. 3.—Rear view of the time-switch, with cover removed, showing the wiring connections.

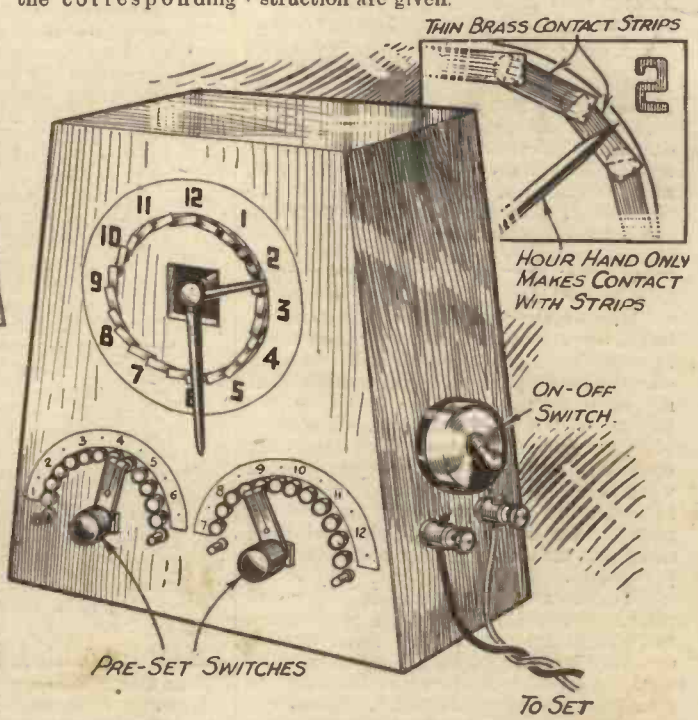


Fig. 2.—Three-quarter front view of the completed time switch.

The Television Committee, whose findings are issued in the report and summarised on this page. Left to right: Sir John Cadman, The Rt. Hon. Lord Selsdon (chairman), F. W. Phillips, J. Varley Roberts (secretary), O. F. Brown, Vice-Admiral Sir Charles Carpendale, Noel Ashbridge, and Col. A. S. Angwin.

The Television Committee's Report

The Important Clauses Extracted for the Convenience of Our Readers

AT the moment of going to press the "Report of the Television Committee" comes to hand. This important and long-awaited Report makes most interesting reading, and confirms the views and forecasts made many weeks ago in this journal and our companion journal *Practical Television* (6d. monthly).

The Report opens by stating that the appointment of the Committee was announced in the House of Commons on May 14th, 1934, the object being:—

"To consider the development of Television and to advise the Postmaster-General on the relative merits of the several systems and on the conditions under which any public service of Television should be provided."

The Committee have examined thirty-eight witnesses who represent many various interests in Television. It has also "had the benefit of consultation with members of various Departments of the Government" who have afforded every facility and assistance. Readers are also aware that the Committee has examined and given consideration to the various methods of Television transmissions in use in the United States and in Germany.

Methods of low-definition and high-definition Television transmission and reception have been investigated very fully, and the claims of both systems have been considered. As a result of these researches the Committee state:—

Definition and Frequency of Transmissions

"The degree of definition it is essential to obtain is necessarily a matter of opinion, but the evidence received and our own observations lead us to the conclusion that it should be not less than 240 lines per picture, with a minimum picture frequency of 25 per second. The standard which has been used extensively for experimental work is 180 lines, but we should prefer the figure of 240 and we do not exclude the possible use of an even higher order of definition and a frequency of 50 pictures per second.

"To attain such degrees of definition and picture frequency very high modulation frequencies are required, which in practice can only be handled by radio transmitters working on ultra-short waves the effective range of which is much more restricted than the range of medium waves used for ordinary sound broadcasting."

The Important Question of Price

The Committee has also been considering the question of price in connection with Television receiving apparatus, and recommends that: "The price demanded should not . . . be unreasonable." The price question has been discussed with various manufacturers and it is found that the price of an instrument capable of reproducing a picture measuring 8in. by 6in., and of reproducing the accompanying sound would at first range from £50 to £80, "but it is reasonable to assume that, if and when receivers were made on a large scale under competitive conditions, this price would be substantially reduced."

Low-definition Systems

An interesting statement is also made with regard to low-definition transmissions, such as those now in use, and which have been employed for some years past. In this regard the Committee states "these no doubt possess . . . a certain value to those interested in Television as an art, and possibly, but to a very minor extent, to those interested in it only as an entertainment. We feel that it would be undesirable to deprive these 'pioneer lookers' of their present facilities until at least a proportion of them have the opportunity of receiving a high-definition service. On the other hand, the maintenance of these low-definition broadcasts involves not only some expense, but also possibly considerable practical difficulties. We can only, therefore, recommend:—

(1) That the existing low-definition broadcasts be maintained, if practicable, for the present; and

(2) that the selection of the moment for their discontinuance be left for consideration by the Advisory Committee with the observation that, if practicable so to maintain these broadcasts, they might reasonably be discontinued as soon as the first station of a high-definition service is working."

Combined Vision and Sound

The Committee agrees with our opinions frequently expressed in these pages, that the reception of vision, unaccompanied by sound, is of little value, and that "Television is, however, a natural adjunct to sound broadcasting and its use will make it possible for the eye as well as the ear of the listener to be reached. Associated with sound it will greatly enhance the interest of certain of the existing types of broadcast and will also render practicable the production of other types in which interest is more dependent upon sight than upon sound."

How Soon?

The Committee does not anticipate that a television service will be made use of to the same extent as present-day sound broadcasting for some time to come, for it points out that: "The difficulties of wireless communication on ultra-short wavelengths, particularly in hilly districts, may seriously limit the extent to which the country can be effectively covered," and also that "Some time is likely to elapse before the price of an efficient television receiver will be comparable with that of the average type of receiver now in use for sound broadcasting."

Even so, the Committee consider that "the time may come when a sound broadcasting service entirely unaccompanied by Television will be almost as rare as the silent cinema film is to-day," and that "in general sound will always be the more important factor in broadcasting"; also that "the promotion of Television must not be allowed to prevent the continued development of sound broadcasting."

The B.B.C. to Operate Television

In connection with the matter of who shall be the Television Operating Authority the Report states "we cannot do otherwise than conclude that the Authority which is responsible for the former (*sound broadcasting*)—at present the British Broadcasting Corporation—should also be entrusted with the latter (*television*)."

It is apparently not thought advisable to allow Television services to be organised by private enterprises because "This would involve the granting of licences for the transmission of sound and vision to several firms who are pioneering in this experimental field."

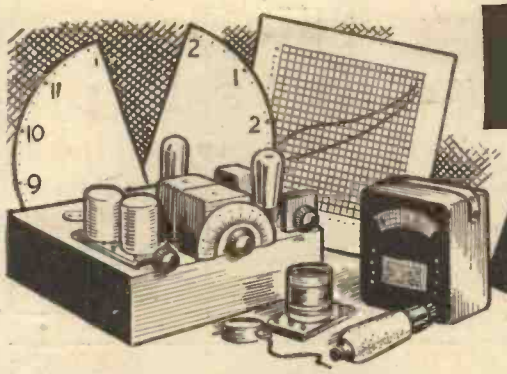
Wavelengths

The Committee is quite emphatic that high-definition Television is the only satisfactory system, and the Report states that "the transmission of high-definition Television is practicable only with ultra-short waves, and a wide band of frequencies is necessary. Fortunately there should be no difficulty, at present at all events, in assigning suitable wavelengths in the spectrum—between 3 and 10 metres—for public Television in this country, although in allocating such wavelengths regard must, of course, be paid to the claims of other services."

Relay Service

The difficulty in covering a wide area with ultra-short wave transmissions is fully realised, for it is stated that "Present experience both here and abroad seems to indicate that these ultra-short waves cannot be relied upon to be effective for a broadcast service much beyond what is

(*Continued on page 750*)



HALF-HOUR EXPERIMENTS

By FRANK PRESTON

A Simple Explanation of the Method of Plotting Valve Characteristic Curves is Given in This Article

FOR some reason or other most of the letters recently received in connection with this series of articles have asked for details concerning measuring instruments and the methods of taking various current and voltage readings. The last two instalments have been devoted to the subject of devising instruments suitable for fairly accurate measurement, and it is therefore proposed, this week, to show how the instruments can be employed for the interesting purpose of plotting valve characteristic curves.

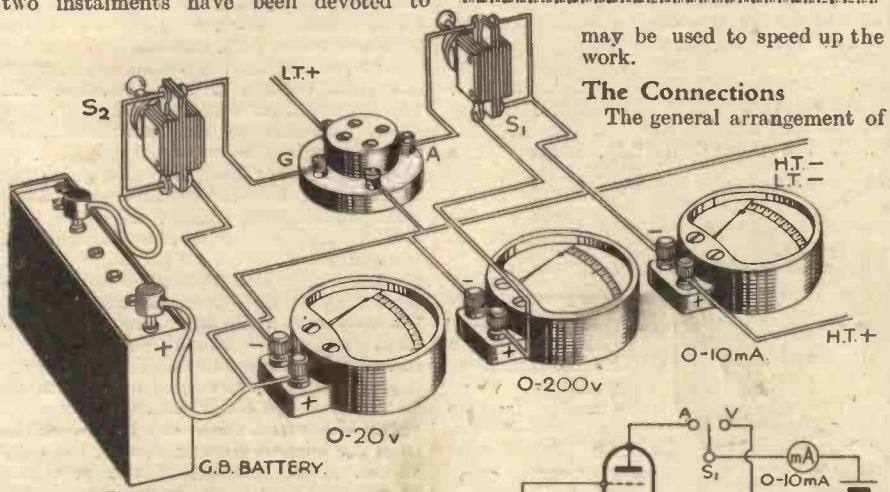


Fig. 1.—Showing the connections required for drawing the characteristic curves of three-electrode valves.

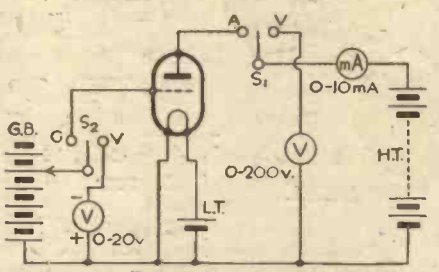
Perhaps there will be readers who consider it quite unnecessary to draw these curves, because they are always given (and nearly always with greater accuracy than the amateur can achieve) with the valves supplied by all British manufacturers. The fact remains, however, that the process of taking the various readings required, and of drawing out the curves, is in itself a wonderful education in all matters relating to valves. Once the curves have been drawn they are easily understood, and their true significance is fully appreciated. Besides this, the experimenter is able to test in a very thorough manner any older valves he may have, so as to determine whether or not they are in perfect condition.

Simple Apparatus

The apparatus and materials required for plotting the valve curves is simple enough, provided that great accuracy is not essential—and it is not in the majority of instances—and will cost very little. In fact, the principal item is a calibrated meter for reading volts and milliamps, and this can be made as described last week. The other parts are high-tension, low-tension, and grid-bias batteries, and a valve-holder, although if the reader has separate meters one or two switches may be used to speed up the work.

The Connections

The general arrangement of



the circuit required for checking the characteristics of a three-electrode valve is shown in Fig. 1, where it will be seen that the battery circuits are just the same as those employed in a receiver. The difference is that the usual anode-circuit and grid-circuit components are omitted, these being replaced by meters. In the particular circuit illustrated three separate meters are indicated, these being for measuring the anode voltage, grid voltage, and anode current respectively; two switches are also shown for bringing the meters into circuit as required. Most readers will have only a single multi-purpose meter, and so the connections will be rather different in practice, although identical in principle.

It will simplify the explanation if we first of all consider the procedure when using the arrangement shown in Fig. 1 and three separate meters. The characteristic curves most generally employed are those which show the variation in anode current for a corresponding variation in grid voltage—known as the grid volts-anode current curves. These are drawn for definite values of anode voltage, and so the first step is to adjust the anode voltage to, say, 100. This is done by setting the switch marked S.1 to the V position and varying the position of the positive H.T. battery tapping until a reading of exactly 100 volts is obtained. When this is done the current registered by the milliammeter should not be more than 10 milliamps so long as the resistance of the voltmeter is sufficiently high; in fact, if the resistance is so low that a current reading in excess of 5 milliamps. is obtained the results will not be very accurate.

Make a Note of Readings

Having thus adjusted the anode voltage, switch S.2 should be turned to the V position and the G.B. negative tapping moved until a reading of about 1½ volts is obtained. Whatever the reading is, an accurate note should be made of it in a table drawn up as shown overleaf. This done, turn S.2 to the G position, and S.1 to the A position, and then take a careful note of the anode current. Enter the figure in the table opposite the G.B. figure noted. Next disconnect the H.T. lead, alter the G.B. voltage to, say, 3 volts, and repeat the process described above.

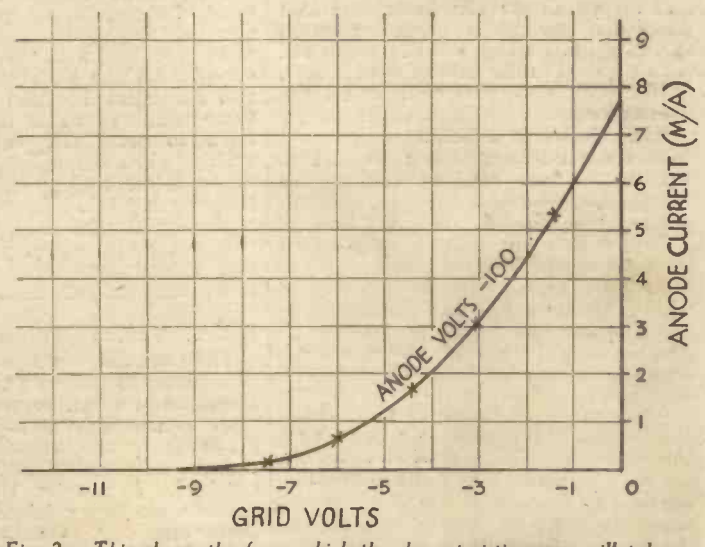


Fig. 2.—This shows the form which the characteristic curve will take, and shows how the various points are plotted.

Grid Voltage	Anode Current
0	7½ m.a.
1½ —	5½ m.a.
3 —	3 m.a.
4½ —	1½ m.a.
6 —	½ m.a.
7½ —	¼ m.a.
9 —	0

After these measurements have been repeated until the G.B. voltage has been made so high that the anode current has dropped almost to zero, a graph can be made from the figures noted. The method of preparing the graph is shown in Fig. 2, where the points plotted are those indicated in the table given above. The squared paper required for the graph can be obtained from any good stationer's, and is known as "One-tenth-inch graph paper"—the dimension refers, of course, to the size of the squares.

Drawing the Graph

After getting the paper, the first thing is to draw two lines at right angles in the approximate positions shown; that is, one near the lower edge of the paper, and a vertical one near the right-hand edge. Mark the point where the two lines intersect O, and then divide the lower line into voltage divisions, preferably going up to about 12 volts. So high a G.B. voltage will not be required in the case of most valves, but if the divisions are equal for all the valves to be treated it is an easier matter to make direct comparisons.

The vertical line can then be divided up into milliamp. divisions, taking the current at zero grid volts nearly at the top of the line. Next move along the horizontal line until the first voltage figure in the table is reached; at that point move upwards until a point is reached that is in line with the figure relating to the anode current for that particular grid voltage, and here make a neat, faint cross with a pencil. Repeat this for the various other readings, when a line can be drawn to pass through the centres of all the crosses drawn. This line should be an even curve, and should be drawn with a nice sweeping movement of the pencil point.

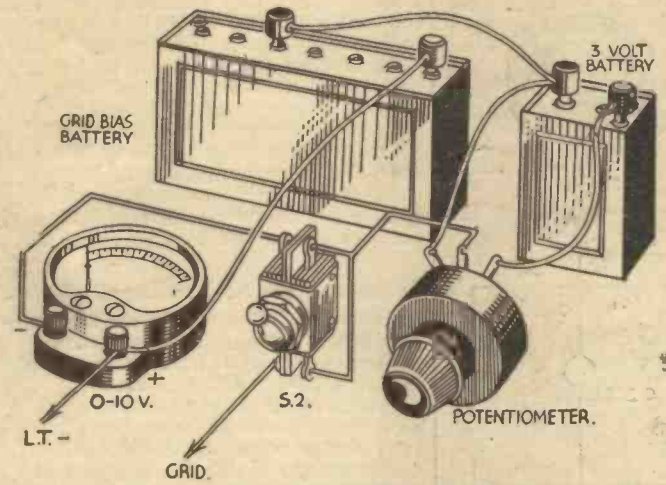


Fig. 3.—Greater accuracy of G.B. voltage adjustment can be obtained by using the connections shown here in place of those in Fig. 1.

A convenient type of instrument for the experimenter—the Pifco universal A.C./D.C. test-meter.

Greater Accuracy

It will sometimes be found that the curve appears to change its direction rapidly between any two points that have been plotted. When this is the case it would be impossible to produce an accurate curve without having more readings between the two points concerned. This will necessitate a rather more delicate adjustment of G.B. voltage, so that it might be necessary to connect a 3-volt G.B. battery in series with the normal battery, connecting a potentiometer (100 to 500 ohms) in parallel with it, as shown in Fig. 3.

By varying the setting of the potentiometer the G.B. voltage can be changed to within a very small fraction of a volt, and accuracy thereby ensured.

When using a single measuring instrument of the multiple type, similar to that described last week, the procedure will be almost identical with that described above, except that the meter will be connected and disconnected to and from each of the three points at which it is required. In order to avoid any variation in anode voltage when the meter is removed from the series (milliamp.) position, it might sometimes be desirable to connect a fixed resistance of equal value in its place. Generally, this will be necessary only when dealing with valves whose anode-current consumption is above, say, 20 milliamps.

Mains Valves

The method described above refers particularly to battery valves, but precisely the same idea can be used in connection with mains valves, it generally being preferable to use batteries for taking the various measurements. Thus, the heater can be fed from a 4-volt accumulator, the cathode pin being joined to one of the heater terminals. On the other hand, it is quite possible to use the mains-supply unit for H.T. and L.T., although it is preferable to keep the battery for G.B. The arrangement is as shown in Fig. 4, where it will be seen that a 10,000 ohm variable resistance is included in the H.T. positive lead. The reason for this is that, with any mains unit, the H.T. voltage rises as the current load is reduced. Thus, as the G.B. voltage is increased, the H.T. voltage would increase automatically.

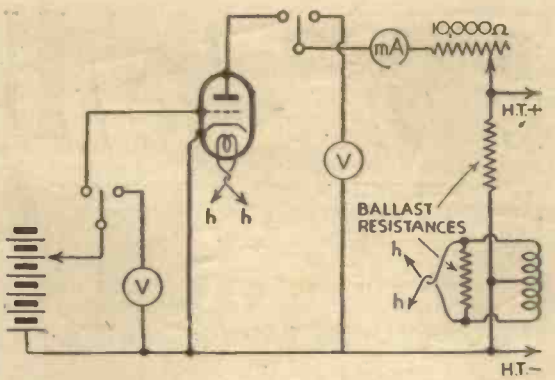


Fig. 4.—This circuit shows the connections to be employed in dealing with mains valves.

For the reasons just mentioned, the variable resistance must be adjusted for every setting of the G.B. voltage in order to maintain the anode voltage constant throughout any particular set of measurements. In using the mains unit for feeding the one valve, it will be necessary to compensate for the load normally applied by the other valves in the receiver, otherwise the voltages would increase enormously. A fixed resistance should, therefore, be connected between the H.T. positive and negative terminals, and also between the terminals of the 4-volt A.C. winding. The value of the resistance can be determined from the current consumption of the other valves. For example, if the remaining valves in the set normally consume 30 milliamps. between them, the resistance should be of such a value that it will just pass this current. The value of the resistance is found by dividing the voltage of the supply by the current in milliamps. and multiplying by 1,000. For example, if the voltage were 240, the value would be 8,000 ohms.

In the case of the L.T. circuit, the other valves in the set will probably take 1 amp. each, so that if there are three of them the current will be 3 amps. In this case, the value of parallel resistance required would be 4/3, or 1⅓ ohms, and this could be made by winding 2yds. of 20-gauge Eureka resistance wire on a strip of fibre. Incidentally, it might be mentioned that this simple calculation will often prove useful when using a mains transformer giving a higher output of L.T. current than that normally required by the valves in the receiver. When this is the case a parallel resistance will safeguard the valves.

An inexpensive test-meter—the Avominor.

On Your Wavelength

by Thermion

Interference From Droitwich

I DON'T know why it is, but I am constantly hearing from listeners who say that they cannot completely cut out Droitwich, and that the transmissions from this station spread all round the dial. This has never been my own experience, and I have always found that Droitwich was no more troublesome than Daventry used to be. Of course, I can understand the difficulty experienced by those whose aerials are now much nearer to the long-wave National transmitter, but the complaints of which I have referred are from people situated in or around London. My own aerial is just about the same distance from Droitwich as it was from Daventry and, quite frankly, the spread on the tuning dial is no greater than it was before. When using a simple three-valver with mains aerial the long-wave station comes in at just about the same strength as the two London stations—which means that the programmes can be received at comfortable loud-speaker strength.

Wave Traps—Or Not?

OF course I may be wrong, but I have come to the conclusion that those listeners who find Droitwich to be their *bête noire* are using out-of-date receivers, or else have not taken the trouble to devise means of increasing long-wave selectivity. I generally find it sufficient to provide a tapping on the long-wave winding of the aerial coil and to use this for the aerial connection for long-wave reception. Incidentally, I do not think that an aerial-series condenser is much use on long waves, and a loose-coupled or tapped winding always seems to be far more satisfactory.

On the other hand, if selectivity in general is quite good enough, the old wave trap nearly always provides a simple method of cutting out the interfering station. This seems to raise the old argument as to whether a wave trap should, or should not, be used. Some argue that if the receiver (and especially the aerial coil) is correctly designed a wave trap should not be necessary. Others say that a wave trap is the proper thing to use. Personally, I have no desire to argue either for or against the wave trap; all I say is that if it provides a simple way out of a difficulty it should be used. In any case, a good wave trap is extremely valuable, and I know that described in PRACTICAL AND AMATEUR WIRELESS last week to be very satisfactory.

The Television Scare

THE daily papers have lately been brimful of "information" (?) concerning the developments in television that will shortly take place, and I am afraid that many of the stories told have been greatly exaggerated. For instance, the tale that all our present receivers will be rendered obsolete when the new television programmes commence should be taken with a very large pinch of salt. At the time of penning these notes the Television Committee has not made its proposals public, but when details are released I am quite sure that they will not sound the death knell of our 1935 sets. Whether or not thirty-line transmissions will continue, and whether they will be made on the same wavelengths as at present I do not know, but I should certainly like to see a continuance. But if entirely different high-definition transmissions are made on the short and ultra-short waves it is hardly likely that our sets will have to be scrapped—even if we wish to make use of the vision programmes. But, whatever happens, readers may rest assured that the transmission of sound programmes will continue on the same wavebands as are now in use.

This new apparatus in the "His Master's Voice" factories is used for testing the low-frequency gain of radio receivers. The operator rotates the frequency selector switch and ensures that the needle of the output meter is indicating correctly for all the frequencies. This apparatus ensures that the H.M.V. receiver or radio-gramophone will cover a wide range of frequencies without distortion.

Frame Aerials

WHILST talking "wireless" with some non-technical friends the other day I was asked by one if it was worth while making a frame aerial as a means of solving the selectivity problem. My reply was to the effect that the frame aerial was dead, and that such an aid to selectivity was no longer required. A member of the company quickly "picked me up," however, by pointing out that he had used a frame for six years past, and had no intention of giving it up. He went so far as to say that he could not separate the local stations by any other means. Further inquiry elicited the fact that he was also using the same *set* that he had had for six years—so there is no wonder he found the frame practically essential. I tried to persuade him that he should build a modern receiver, but he insisted that he had not yet seen one that could beat his own. So I took him round to twiddle the knobs of my £5 Superhet (A.C. model). He is going to scrap the frame now!

Short-Wave Reception

I JOINED in an argument concerning the best type of short-wave receiver the other day, but I had no idea how fierce it was going to become. One contestant was an old wireless "fan," and he would have it that the *only* real short-waver is that consisting of a detector-L.F. combination. Another said that he would never dream of building a short-waver without having an untuned H.F. stage for smoothing out reaction and eliminating "dead-spots." Personally, I go for a superhet every time—so who is right?

I think it depends upon whether the set is wanted as a means of entertainment or merely for "globe-trotting" and for "logging hams." If the set is to be used for *listening* the superhet is hard to beat. It has as good a range as any other type, is definitely easier to tune, and is not so prone to vary according to reception conditions. At any rate, that is my view, but I may be wrong.

I.E.E. Informal Meetings

I LEARN that the Wireless Section Committee of the I.E.E. have decided to include in the programme of activities of the section informal discussions of a popular character on subjects of wide interest, such as broadcasting transmitters, and receivers.

Apart from members of the section, it is thought that these informal discussions will be of considerable interest to many non-members who are interested in the practical side of wireless, and they are cordially invited to attend. Tickets of admission will not be required. The following is the programme of these informal meetings for the remainder of the present session:—

(*Tuesdays at* 6 *p.m.; Light Refreshments at* 5.30 *p.m.*)

February 26*th*, 1935.

Discussion on "Production Testing of Broadcast Receivers," to be opened by Mr. F. Murphy, B.Sc. (Eng.).

March 26*th*, 1935.

Discussion on "The Servicing of Broadcast Receivers," to be opened by Mr. A. Hall.

(*Continued overleaf*)

(Continued from previous page)

Cheaper Batteries

ONLY six bob for a high-class 120-volt battery. Just think of it! It seems only yesterday that I had to pay 22s. 6d. for batteries which gave a reasonable discharge and a fairly low voltage-drop curve for three months before renewal became necessary. Like most other people in those early days I was tempted to buy cheap batteries at a third of the price of the high-class article. The stated voltage was there, of course, but after three or four hours use the voltage dropped as much as 30 per cent., and after about a week's use the internal resistance was so high that the battery was incapable of yielding useful current. Lots of readers, in those days, I remember, seemed to presume that the mere presence of voltage indicated that the battery was O.K. Many were the sets I examined which had gone phut, and I was told that I need not examine the battery as it was showing 90 volts. A current test, however, on each valve failed to deflect the needle of the milliammeter. But these modern cheap batteries are cheap in price only. They are not cheap and nasty, but high-class pieces of work capable of standing a fairly high current drain even up to 25 to 30 milliamperes for considerable periods.

Home Construction Even Cheaper

TWO of the most expensive items in connection with home construction have been considerably reduced in price during the past year, namely, valves and batteries. From correspondence, I gathered that many readers apprehended that it would soon be cheaper to buy a set than to make one. Their fears are now set at rest, for you may now make a highly satisfactory receiver equal from every point of view to the twenty-guinea commercial receiver for less than half that sum, which is all to the good. The prices of components has fallen considerably. Six years ago I paid twenty-five shillings for transformers which I can now purchase for one-third of that sum. Home constructors are now reaping the benefit of the fact that manufacturers' tool costs have long since been covered.

What Is Service?

SERVICE difficulty would probably be considerably alleviated if makers of complete receivers were to allow their products to be sold only by people who were competent enough to render reasonable service in the case of trouble. As it is, many manufacturers simply ask dealers to return all sets to them for attention, since they realize that the average dealer is incapable of safeguarding their interests. Car manufacturers only allow capable people to sell their productions, and require the seller to carry out all the routine service requirements. It should not be too much to ask wireless manufacturers to adopt a similar scheme. One well-known firm has already made an important move in this direction by stipulating that any dealer who returns a set to them for service must deposit a certain sum, which will be retained if it is found that the fault was due to improper use, or if the adjustment was one that a competent dealer should be able to carry out himself. When the fault is found to be due to a faulty part, or to faulty construction, the money is refunded.

Notes from the Test Bench

Adding Q.P.P. to the £5 Superhet

A READER who had built the £5 Superhet desired to increase the output so that the receiver could be used for gramophone reproduction in a small hall. He consulted the local radio expert and was persuaded to add a Q.P.P. stage, using economy pentodes and a 9-1 Q.P.P. input transformer. After effecting this addition he found that although the volume obtained was ample for his requirements, the quality of reproduction was poor. As he had spent approximately 50s. on the additional parts, he was naturally very disappointed, and brought the receiver to our laboratory for test, thinking that one of the components was defective. We found, however, that the wiring and the components were in order, and that the distortion was due to overloading of the pentodes. The transformer following the Westector was therefore replaced by a resistance of 500,000 ohms, and an L.F. valve was substituted for the PT220. This procedure sufficiently reduced the overall L.F. amplification, and quality of reproduction, especially on gramophone, was exceptionally good. It was also found that the average H.T. consumption was decidedly lower than with the three original valves in use. Our further experiments with this receiver indicated that if any form of output stage other than ClassB (*e.g.*, Q.P.P., straight power, or pentode) is added to this three-valve superhet the procedure outlined above should be followed.

Using a Signal Generator

OWING to the prevalence of ultra-selective receivers, the signal generator has become a necessary addition to the radio repairer's testing equipment, as its use greatly facilitates the process of trimming the various tuned circuits. There is one point which is often overlooked when this instrument is used, however. Most multi-valve sets have A.V.C. incorporated, and therefore a slight adjustment of the trimmers does not have any appreciable effect on the output signal. When making preliminary tuning adjustments with this type of set it is therefore necessary to break the A.V.C. circuit at the anode of the double diode valve.

Thick Plate Accumulators

THE introduction of output economisers for reducing the H.T. consumption of battery receivers has popularised multi-valve battery sets this season. There is one point which should be emphasised in connection with sets of this type, however. Although their H.T. consumption is low their L.T. consumption is high, and therefore the commonly used thick plate accumulator is unsuitable for supplying the filament current; the thin plate accumulator designed for a heavy discharge rate should be employed. We often find that the use of a mass—type cell accounts for distortion experienced when using a large Class B output valve.

DON'T FORGET THE COUPON WHEN SENDING A QUERY!

TELEVISION COMMITTEE'S REPORT

(Continued from page 746)

commonly called 'optical range.' . . . . We nevertheless envisage the ultimate establishment of a general television service in this country, and . . . . contemplate the possibility of television broadcasts being relayed by line or by wireless from one or more main transmitting stations to sub-stations in different parts of the country."

Start to be Made in London

With regard to the commencement of a service, the Report reads "We have come to the conclusion that a start could be made with a service of high-definition Television by the establishment of such a service in London. It seems probable that the London area can be covered by one transmitting station, and that two systems of Television can be operated from that station. On this assumption we suggest that a start be made in such a manner as to provide an extended trial of two systems, under strictly comparable conditions, by installing them side by side at a station in London where they should be used alternately . . . . for a public service."

Systems to be Adopted

As to the two systems to be employed, the Report reads—"There are two systems of high-definition transmission . . . . which are in a relatively advanced stage of development and have indeed been operated over wireless channels for some time past with satisfactory results. We recommend that the Baird Company be given an opportunity to supply the necessary apparatus for the operation of its system at the London station, and that the Marconi-E. M. I. Company be given a similar opportunity in respect of apparatus for the operation of its system also at that station."

Important clauses in the Committee's recommendations are as follow:—

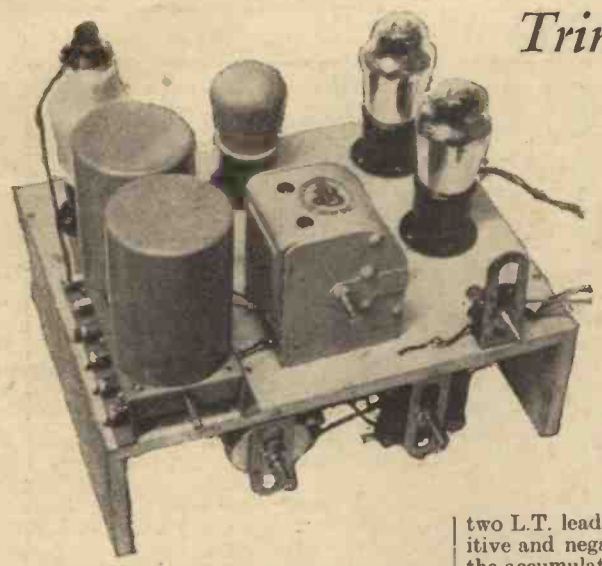
"The British Broadcasting Corporation to be indemnified against any claim for infringement of patents.

"The Company to undertake to grant a licence to any responsible manufacturer to use its existing patents or any patents, hereafter held by it, for the manufacture of television receiving sets in this country on payment of royalty."

The Programmes

As to the types of programmes which may be transmitted by Television, the Report states: "It is scarcely within our province to make detailed recommendations on the subject of television programmes. To what extent those programmes should consist of, direct transmissions of studio or outdoor scenes, or televised reproduction of films, must be determined largely by experience, technical progress, and public support, as well as by financial considerations. No doubt the televising of sporting and other public events will have a wide appeal, and will add considerably to the attractiveness of the service. We regard such transmissions as a desirable part of a public television service, and it is essential that the British Broadcasting Corporation should have complete freedom for the televising of such scenes, with appropriate sound accompaniment, at any time of the day."

In the first place it is considered that it should not be necessary at first to provide television programmes for many hours a day, and an hour's transmission in the morning and afternoon, with two hours in the evening, should suffice. In any case, transmitting times must be governed by experience and financial considerations.



Trimming, Adjusting and Operating THE BATTERY HALL-MARK FOUR

The Preliminary Adjustments are Few in Number and May Easily be Carried Out. They Should, Nevertheless, Be Performed with Care to Ensure that the Full Efficiency of the Receiver is Obtained

AS was previously explained, the construction of the battery model Hall-Mark Four is extremely simple, and it is most unlikely that any readers who followed the instructions given last week have experienced any difficulty. The few trimming adjustments and the general operation of the receiver are equally simple and straightforward. Despite this, however, the general performance of the receiver can be considerably enhanced if a little care is taken to ensure that the preliminary adjustments are carefully made. Once they have been made, the set can be used successfully for a considerable length of time, and the operation will be simple enough for any member of the family.

Battery Connections

Having completed the construction of the receiver, the valves may be inserted into their respective holders and the aerial, earth, batteries, and loud-speaker connected. The correct order for the valves is: V.1, 210 VPT; V.2, 210 Det.; V.3 and V.4, 220 HPT., the "V" references being those given on the wiring plan reproduced last week. It will be clear that the flexible lead from terminal 6 on the second coil should be joined to the anode terminal on top of the variable-mu valve.

Of the battery leads, that marked H.T.— should be joined to the negative socket on the H.T. battery, that marked H.T.+1 should be taken to a tapping giving about 60 volts, and H.T.+2 should be given the full voltage of the battery. The two L.T. leads should be joined to the positive and negative terminals respectively of the accumulator. There are three grid-bias leads, of which the positive one should be connected to the positive terminal of the G.B. battery, G.B.—1 should be given the full voltage of the battery, and G.B.—2 should receive about 4½ volts.

The general operation of the set calls for no explanation, it being understood that the central knob is for tuning, the right-hand one for reaction control, and that on the left for volume control. In practice it will be found that the two latter controls can be used together to obtain the degree of selectivity required.

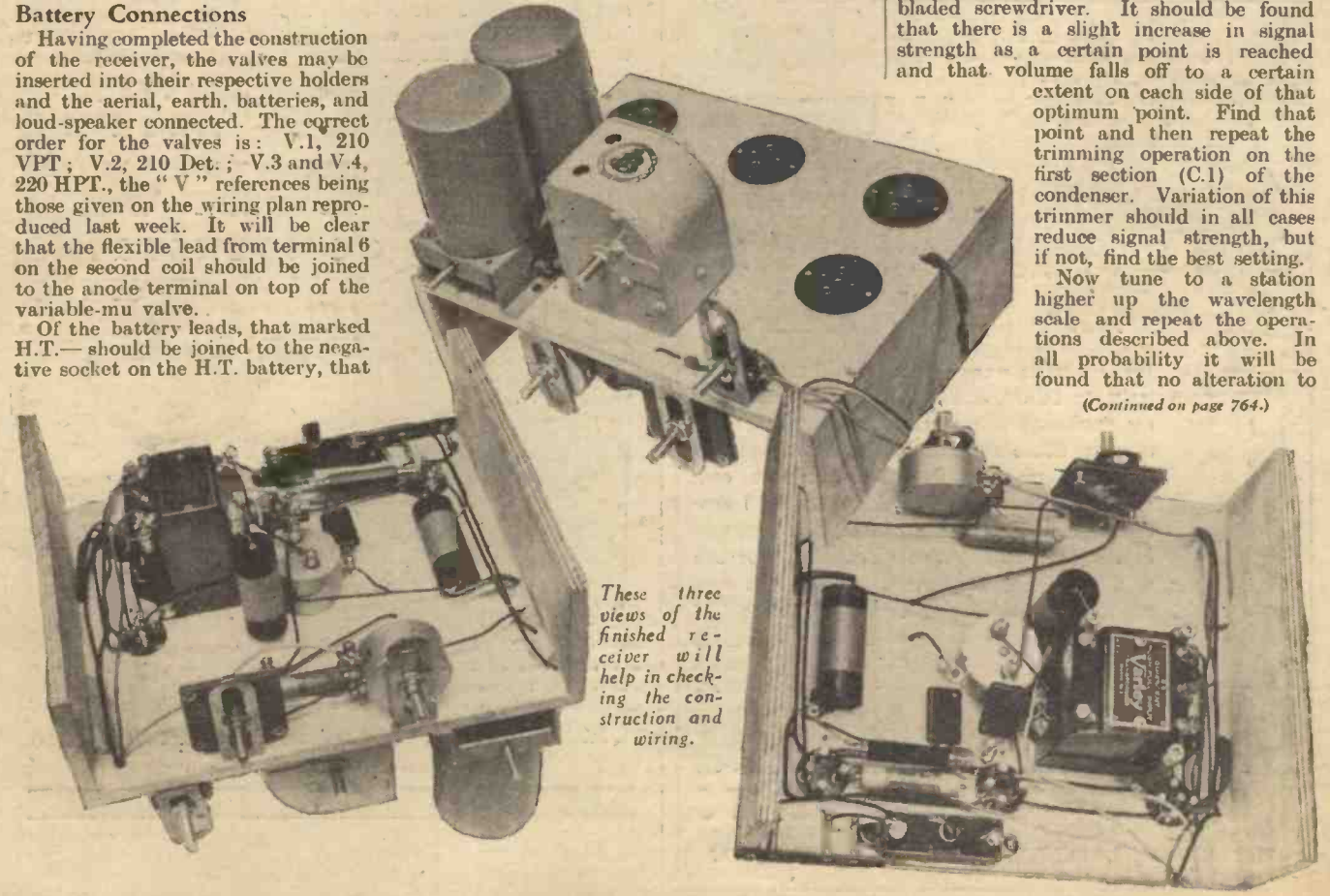
Trimming

The first trimming operation that should be carried out concerns the setting of the two trimmers on the two-gang condenser, for much depends upon their accurate adjustment. If they are ignored, or carelessly set, the overall selectivity, as well as the sensitivity, of the receiver will obviously be reduced.

Before dealing with the trimmer screws, however, the knob of the pre-set condenser, which is situated on the underside of the baseboard, should be turned to its midway position, the aerial being connected to the terminal socket marked A.2. This will give a good compromise between selectivity and sensitivity, and form a good basis for the more delicate settings. Now tune in a weak station on about 250 metres and turn the reaction condenser to its zero (anti-clockwise) position. After bringing in the transmission as loudly as possible by means of the main tuning knob, slowly turn the trimmer screw on the section of the gang condenser marked C.2 on the wiring plan by means of a long narrow-bladed screwdriver. It should be found that there is a slight increase in signal strength as a certain point is reached and that volume falls off to a certain extent on each side of that optimum point. Find that point and then repeat the trimming operation on the first section (C.1) of the condenser. Variation of this trimmer should in all cases reduce signal strength, but if not, find the best setting.

Now tune to a station higher up the wavelength scale and repeat the operations described above. In all probability it will be found that no alteration to

(Continued on page 764.)



These three views of the finished receiver will help in checking the construction and wiring.

SINGLE SIDE-BAND BROADCASTING

Describing How the Quality of Reception Could Be Improved and Interference Reduced by Using One Set of Side-bands Only in the Transmission of Broadcast Programmes. The Meaning of "Side-bands" also is Explained.

By W. B. RICHARDSON

SINCE no one has ever seen a wireless wave it is not unnatural that the average amateur should have rather a hazy conception of what it is like.

The usual vague analogies comparing radio emissions with marine disturbances do not help very much. For one thing, the waves of the sea, as we comprehend them, travel on the *surface* of the water, but there is obviously no surface to the ether, which is assumed to be all-pervading.

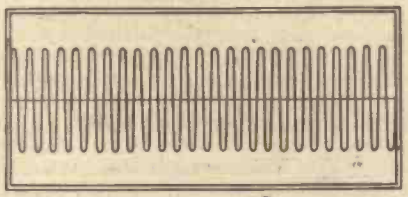


Fig. 1.—The carrier wave radiated by a broadcasting station before the microphone is switched on.

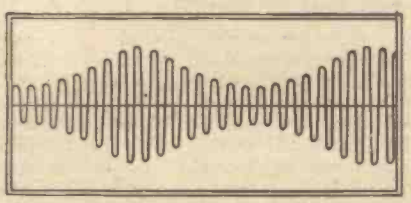


Fig. 2.—How the carrier is modulated by the transmitted sounds as soon as the "mike" is brought into use.

Again, to compare them with sound waves does little to assist in forming a mental picture of wireless radiations, since sound waves themselves are invisible and therefore difficult to comprehend.

Nature of the Transmitted Wave

One way of obtaining a visible representation of wireless waves, however, is to measure the electric currents which produce them, that is, the currents in the aerial circuit of the transmitter. These readings are plotted on paper in the form of a graph or curve, a good example of which is shown in Fig. 1.

A glance at the graph will show that the current is alternating. It flows first in one direction and then in the other, as indicated by the alternate rising and falling of the curve above and below the zero line. Thus when the curve crosses this line it indicates that no current is flowing, but as it rises above the line it means that the current is increasing in one direction, and, conversely, as it falls below the line it shows that it is increasing in the opposite direction.

Fig. 1 may very conveniently be used to represent the wave sent out by the transmitter when the station is "switched on," but before the announcer speaks into the microphone. This is a *continuous* wave; that is to say, a succession of ripples of the same size and, incidentally, following one another very rapidly owing to the high frequency of the current producing them. However, as soon as the microphone is brought into operation and sounds are conveyed into it, the transmitted wave takes on a different form. The individual ripples still follow one another at the same high speed or frequency, but they now vary in height due to the sounds being transmitted. They are said to be *modulated*. An example of this is shown in Fig. 2. The fact that the wave is "carrying" music or other sounds is indicated by the rise and fall in its amplitude. Of course, the wave will not necessarily rise and fall in the regular manner shown in Fig. 2. Thus, if the transmitted sounds are complicated the modulated wave will also take on a complicated form. The wave form shown in Fig. 2 would only be produced by the radiation of a simple musical note of constant intensity.

To cite a specific instance of simple modulation, suppose the frequency of the transmitted wave to be 1,000,000 cycles per second—in other words, that 1,000,000 ripples leave the aerial per second, and that this wave carries a single high-pitched musical note—one near the treble end of the pianoforte keyboard, say, a note of 5,000 vibrations per second. This musical note will be represented by a rise and fall in the height of the transmitted wave at the rate of 5,000 times per second. To use the correct technical expression the wave consists of a *carrier* of 1,000 kilocycles (1,000,000 cycles) modulated by a 5,000-cycle note.

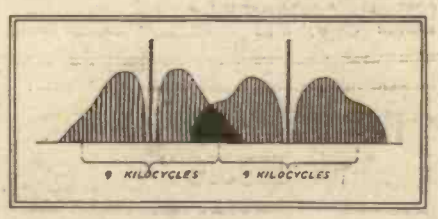


Fig. 7.—Showing how with the present system of only 9 kilocycles separation between stations it is possible for the side bands of adjacent stations to overlap and cause a form of interference called side-band splash.

The Side-band Theory

The method of representing a wireless wave which we have just described is known as the *Amplitude* theory. In the opinion of the writer this is the more tangible of the two accepted theories, but in order to explain certain phenomena, such as the effect of selectivity on the audio-frequency response of a receiver, it is simpler to employ the *Side-Band* theory. It can be stated right away that these two theories amount to precisely the same thing, and can be proved to be mathematically equivalent, so that the choice of one or the other is a matter of convenience. However, to explain the matters in hand we shall confine ourselves to the side-band theory.

Applying this to the example just given, the transmitted wave is no longer represented as a single wave varying in amplitude at the modulation frequency, but is shown

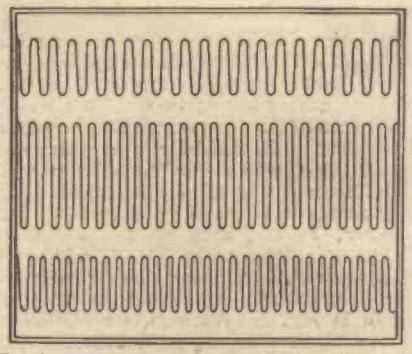


Fig. 3.—With the side-band theory of modulation, the transmission of a single musical note is represented by three pure continuous waves.

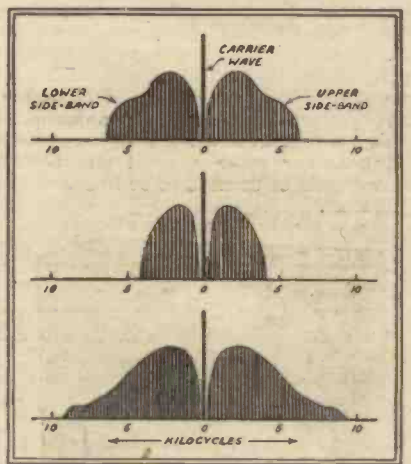
as consisting of three *waves* each of a different frequency. Firstly, there is the carrier wave consisting of a pure continuous wave of 1,000 kilocycles. And then on either side of it another pure continuous wave, one equal to the *sum* of the carrier frequency and the modulation frequency, and the other equal to the *difference*. The frequencies being radiated are thus 1,000 kilocycles, 1,005 kilocycles and 995 kilocycles, or to put them in their correct order in the frequency spectrum, 995, 1,000, and 1,005 kilocycles. A similar series of frequencies is shown graphically in Fig. 3. The centre wave represents the carrier, and the other two the accompanying "side-bands."

Quality *versus* Selectivity

From what we have just seen it will be clear that although the carrier wave from a broadcasting station is confined to just one frequency, yet when speech or music is being radiated it becomes split up with a number of secondary waves extending around it. This means that in order to get faithful reception our receiver must not be too sharply tuned or we shall cut out some of these secondary waves and thus lose some of the sounds which are being radiated. It is the higher notes which produce the waves most distant from the carrier, and it is these which are lacking in the reproduction from a sharply-tuned receiver.

This idea of side-bands can be, perhaps, more clearly represented by the diagram in Fig. 4, which shows the carrier wave and its accompanying side-bands in their relative positions in the frequency spectrum.

(*Continued overleaf*)



Figs. 4, 5, and 6.—Three examples showing the symmetrical grouping of side-bands with the present system of transmission. The broadcasting of high-pitched sounds causes a widening of these secondary waves as in Fig. 6.

(Continued from previous page)

The carrier is represented as a thin vertical line (indicating that it is confined to just one frequency) with a spread of accompanying waves of various intensities on either side of it. The actual outline which these form will naturally vary from one instant to the next, in accordance with each fluctuation in the pitch and intensity of the sounds which they represent. For instance, at one moment the collective outline might be as in Fig. 4, while the next moment, during, say, the transmission of a bass passage, it might take the form shown in Fig. 5. Again, the radiation of a very shrill note amongst others might extend its width as in Fig. 6.

From an examination of these three graphs two important points emerge. One is that during the transmission of a very high-pitched note the total width of the waveband may be something like 20 kilocycles or more, as in Fig. 6; while the other point is that whatever the complexity of the transmitted sounds, the side-bands are always grouped symmetrically about the carrier. That is to say, that the one side-band is a mirrored image of the other.

The first of these two points emphasises the fact that for perfect reproduction of all the transmitted sounds, including the higher musical notes, it is necessary for the receiver to be fairly unselective. In other words, with the pointer on the tuning scale set to the required frequency or wavelength, the set must be responsive to frequencies at least some 10 kilocycles on either side. However, for reproduction which is not quite perfect, but which is not very noticeably deficient in the higher notes, the tuning may be sharpened up so that the useful response is reduced to 4½ or 5 kilocycles on either side of the carrier.

Station Separation

Incidentally this total width of 9 or 10 kilocycles is also the standard spacing between broadcasting stations. Under the Lucerne plan no station which is likely, by reason of its geographical position or its power, to cause interference with another is allowed to broadcast on a carrier whose frequency is less than 9 kilocycles from the others. It will be realised that this spacing is not as generous as it should be, and some slight interference is inevitable between two adjacent stations if both are radiating a full range of frequencies. Such a case is illustrated in Fig. 7. Of course, if the frequency range of both stations be restricted to 9 kilocycles jamming can be avoided, but this obviously means that quality will suffer. This, in the opinion of the writer, is tackling the problem from the wrong end. If the transmissions themselves are not above reproach the listener stands a poor chance of attaining perfect reproduction. The sensible way out of the difficulty is clearly to reduce the number of stations at present transmitting, and to space them wider apart in the frequency spectrum.

However, even if we accept the present situation and take it for granted that a reduction of stations is impossible there is still a possible solution in the adoption of *single side-band transmission*. The underlying principle which this involves is that of dispensing with one set of side-bands altogether!

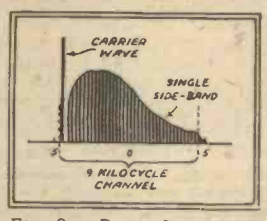


Fig. 8.—By radiating one side-band only, it would be possible to accommodate a much wider band of frequencies within the allotted channel width without risk of interference between stations.

Transmitting One Side-band Only

We have already observed that the two sets of side-bands accompanying a carrier wave are distributed in a perfectly symmetrical manner on either side. It might be inferred from this that the character of the transmitted sounds is completely represented by *one* set of side-bands only, and that for transmission purposes the other set might well be dispensed with. This is found to be correct, and by the use of suitable filters it is possible to broadcast the carrier and one set of side-bands only. This idea obviously opens up attractive possibilities. It immediately suggests two things. Firstly, that without lowering the present standard of quality, it would be possible to squeeze twice as many stations into the existing broadcast wavebands. Secondly, the new system might be used to provide better quality and to reduce interference.

If the new scheme should be adopted with the idea of giving a little more breathing space it would certainly be a good thing. It would then be possible with a 9-kilocycle separation between stations to allow sufficient spread to give full unattenuated reproduction of the highest audible frequencies. This is clearly shown in Fig. 8. This shows how the carrier and one of the sidebands of Fig. 6 could be just accommodated within the allotted 9 kilocycle channel.

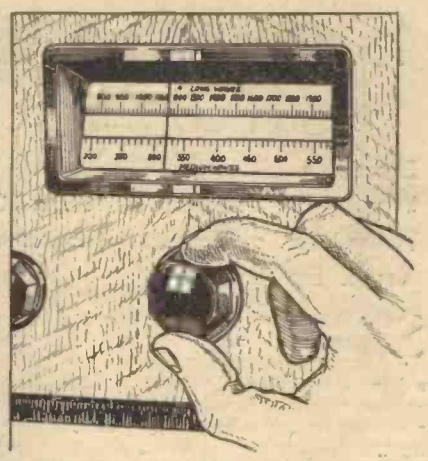


Fig. 9.—With the present system of broadcasting a serious loss of the high notes occurs if the receiver is made too selective.

HOUSES "WIRED FOR MUSIC"

THAT extension loud-speakers are not more widely used at the present time is rather surprising. In their absence all kinds of makeshift arrangements are resorted to, resulting in considerable inconvenience. In many homes, for instance, doors have to be left open in order that a meal may be accompanied by music. Yet if a little trouble were taken a wire could be run from the extension sockets of the set permanently installed in another room to connect with an extension loud-speaker in the dining-room, and a "background" of appropriate music could then be switched on to enliven a dull meal, or make a good one better. There should be no need to be frozen at the same time.

The attractive Blue Spot extension loud-speaker

Many householders go in for loud-speakers thoroughly, and have them installed in dining-room, kitchen, and bedrooms, with perhaps a wiring point run out to the garden for comfortable reception in the summer. The outcome of this arrangement is that entertainment is provided in any part of the house, as required, when once the receiver itself is tuned in. Often, in fact, two, and even three, speakers may be going simultaneously from the same set with no loss in the quality of reception.

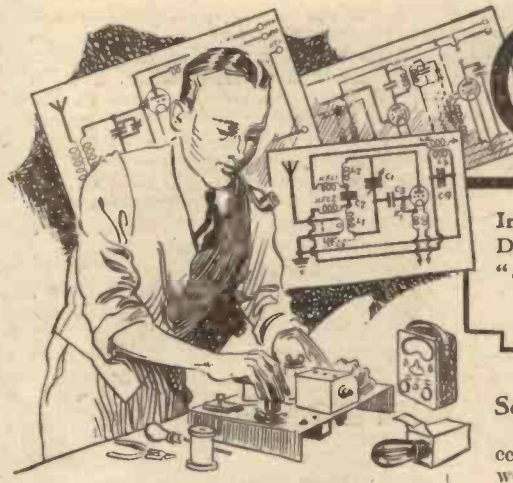
A Boon to Convalescents

The case, too, may well be considered of a person convalescing after, say, an attack of 'flu who finds himself (or herself) in an extremely boring predicament, which the various wireless programmes throughout the day could do much to alleviate. In these circumstances how convenient it is merely to have to place one of the extension speakers in the bedroom, and connect it to the socket, as fitted for the purpose, on the wall. Many otherwise wearisome hours can thus be made to pass pleasantly.

The work of wiring up for extension speakers is too simple to require explanation, but the choice of an extension speaker requires care. The new "Star" models in the Blue-Spot speaker range, one of which is illustrated here, have much to recommend them as regards high performance, good appearance, and low cost. These are fitted with an on-off switch in the speaker, and for a little extra cost this may be replaced by a combined volume-control and switch which enables the speaker to be controlled from a distance.

The same firm also makes the new "Blue-Spot" pick-up for enabling perfect gramophone music to be produced in conjunction with a radio set. An illustration of this pick-up also appears on this page. Catalogues and any specific information required will be gladly supplied by the makers: British Blue-Spot Co., Ltd., Blue-Spot House, 94-96, Rosoman Street, London, E.C.1.

This illustration shows the Blue Spot pick-up, which is fitted with a self-contained volume control.



CIRCUITS AND SETS FOR ALL

In Response to Many Requests the Circuit Described this Week is for a Four-valve "Straight" Set with Delayed A.V.C.

By Bernard Dunn

I SHOULD like to thank all those readers who have sent in postcards describing circuits of the types of which they would like to have more complete details, and would say that these have very carefully been analysed, and that every effort will be made to deal with those circuits that are most generally in demand.

Readers will have observed, from a very few of the letters that have been published in recent issues, that there is an insistent demand for a powerful receiver having two H.F. stages, A.V.C., and a good and powerful output stage. A circuit of this nature therefore forms the subject of this present article. After some deliberation it was decided that the majority of readers would prefer to have a set of the simplest possible kind consistent with its embodying the features above mentioned, and it is for this reason that normal single-purpose valves are specified. Whilst it is admitted that a more complete A.V.C. action is to be obtained by using a double-diode triode or similar valve, the "Westector" arrangement shown has been proved to be highly satisfactory on both long and medium waves, especially when the WX6 "Westector"—which functions very well indeed down to 200 metres—is employed.

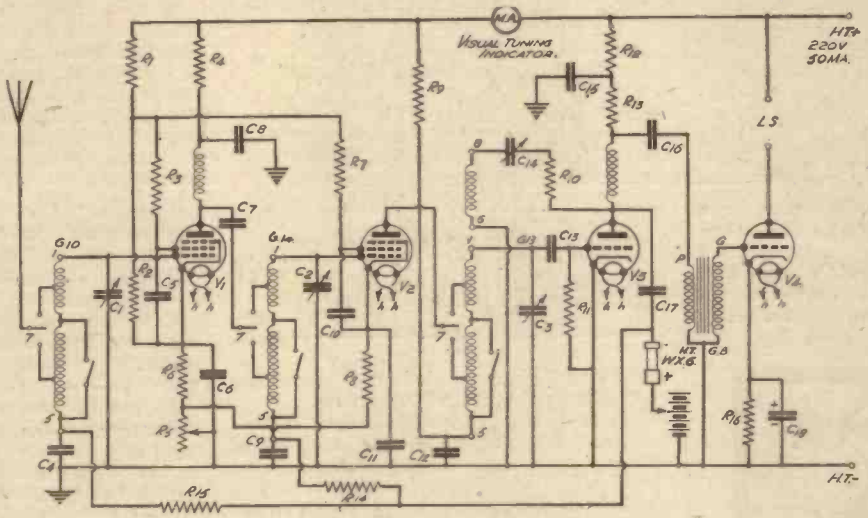
Delayed A.V.C.

A common failing of certain A.V.C. arrangements is that they render the set less sensitive on the weaker stations due to the fact that the automatic volume control reduces H.F. sensitivity on all signals. It is for this reason that delayed A.V.C. is used in this instance. The delay voltage is obtained from a dry battery, but there is no theoretical reason why the required voltage should not be obtained "automatically" by making use of the voltage-drop across a resistance connected in the H.T. negative lead. In practice, however, there is one objection, this being in connection with the extra expense and slight additional complication that are involved. In any case the G.B. battery used will last for several months, whilst there is no loss in volume or quality as the battery runs down.

Separate Power Pack

Apart from this one battery the receiver is designed for complete A.C. mains working, although the power-supply portion is not shown. The latter is omitted partly at the request of several readers who already have suitable mains units, and partly because it is felt that many constructors will prefer to fit a power output stage containing its own mains unit, which can also be employed to supply the receiver. Incidentally, it might be added that details of two such units were given in an article published last week.

It is well known that tuning by ear is difficult when an effective measure of A.V.C. is provided, and for this reason a visual-tuning indicator is included in the circuit. This indicator takes the form of a 0—10 milliammeter connected in series with the H.T. positive lead to the first two valves. If desired, this meter can, of course, be replaced by a meter intended purely for use as a tuning indicator, and two or three suitable instruments of this type are available from Messrs. Bulgin.



The circuit for the four-valve set described in this article.

LIST OF COMPONENTS REQUIRED.

One Metaplex Chassis, 14in. by 10in., with 3in. runners—Peto-Scott.
One Set Ferrocart Coils, types G.10, G.13 and G.14—Colvern.
One .0005-mfd. 3-Gang Condenser (C.1, C.2 and C.3)—Polar "Midget."
One Calibrated Condenser Drive—Polar V.P., with Horizontal Wavelength Scale.
Fifteen 1-watt Fixed Resistances: two 10,000 ohms (R.1 and R.2), two 1,000 ohms (R.3 and R.7), two 5,000 ohms (R.4 and R.9), two 200 ohms (R.6 and R.8), one 500 ohms (R.10), one 1 megohm (R.11), one 10,000 ohms (R.12), one 30,000 ohms (R.13), two 150,000 ohms (R.14 and R.15), one 350 ohms (R.16)—Dubilier.
Nine Tubular Condensers: six .1-mfd. (C.4, C.5, C.6, C.9, C.10 and C.11), two .0002-mfd. (C.7 and C.13), one .001-mfd. (C.17)—T.M.C.
Four Fixed Condensers: two 1-mfd. (C.8 and C.12), one 2-mfd. (C.15), and one .01-mfd. (C.16)—T.M.C., type 40.
One 25-mfd. Electrolytic Condenser (C.18)—Dubilier type 0280.
One .0003-mfd. Reaction Condenser (C.14)—Graham Farish.
One Screened H.F. Choke—Wearite type H.F.P.
One Detector H.F. Choke—Graham Farish "Snap."
One 2,500-ohm Potentiometer (R.5)—Varley.
One 5:1 L.F. Transformer (British Radiogram).
One H.F. Metal Rectifier—Westinghouse type W.X.6.
Four Five-pin Chassis-Mounting Valve Holders—Clix.
Connecting Wire, Terminals, 9-volt G.B. Battery, Screws, etc.
Four Valves: two 3-pin M.S.V. Pen. (V.1 and V.2), 41 M.H.L. (V.3), and 41 MP. (V.4)—Cossor.

Simple Circuit

It will be perfectly obvious from a study of the circuit diagram given that the general circuit arrangement is by no means complicated, and that it consists of two variable-mu pentodes, followed by a leaky-grid detector, with reaction and A.V.C. and, finally, by a small mains power valve. The latter has a rated undistorted output of 1½ watts, this being sufficient for many requirements. As mentioned above, however, it is a simple matter to add a more powerful amplifier when outputs up to, say, 5 watts are desired.

In order to keep down the cost of the receiver, as well as to make it as simple as possible, consistent with really good results, comparatively simple tuning circuits are used, these consisting of a standard three-coil assembly, consisting of Ferrocart iron-core coils, and a standard three-gang variable condenser. Moreover, by using the condenser and drive specified reasonably-accurate wavelength calibration is assured without the need for complicated preliminary adjustments. The tuning circuits employed will give an adequate degree of selectivity on both wavebands for almost every purpose; in fact, it can be stated that more selective tuning could not well be obtained without the use of a super-heterodyne circuit. And as the present circuit is intended very largely for those who prefer a "straight" to a super-heterodyne arrangement, that is saying a good deal.

Manual Volume Control

In addition to the automatic volume control provided, there is also a manual control which is connected to act on the

first two valves. This is a useful addition when the set is generally intended to be operated so as to give a modest output, although full output may often be required. The reaction control, also, although seldom required, serves as a further device for controlling the volume manually. The reaction condenser is also useful when a slightly higher degree of selectivity is wanted for some particular "difficult" station.

As shown, the receiver can be operated from a mains unit giving a maximum H.T. output of 220 volts at 50 milliamps, and an L.T. (A.C.) output of 4 volts at 4 amps. In the case of those who wish to make use of an H.T. eliminator not provided with an L.T. (A.C.) output it is a simple matter to derive the necessary low-tension current for the heaters from a separate transformer, of which there are many available makes and types. Despite what has been said above, satisfactory results can be obtained when the H.T. unit has an output of no more than 200 volts at about 40 milliamps, but the maximum undistorted output of 1¼ watts will not then be realised, although well over 1 watt can still be expected.

Component Arrangement

As all the principal H.F. components specified are adequately screened the lay-out is not unduly critical, although reasonable care must be exercised in so placing the parts that the wiring in the high-frequency circuits is as short and direct as possible. Bearing this idea in mind, and at the same time making the frontal appearance symmetrical, it will be found best to mount the three-gang tuning condenser in the centre of the chassis, with the coil assembly on the left. The holders for the two variable-mu pentodes can then be placed in line at the extreme left of the chassis, one behind the other when looking from the front of the set. The reaction condenser may be placed on a bracket mounted on top of the chassis and as far to the right of the tuning scale as the wave-change switch of the coil assembly is to the left. The variable-mu volume-control potentiometer should be placed on a bracket attached to the underside of the chassis and in line with the H.F. valve-holders. Complete symmetry can then be secured by mounting the rotary Q.M.B. on-off switch (not shown in the circuit) on another bracket towards the right of the chassis, and on the underside.

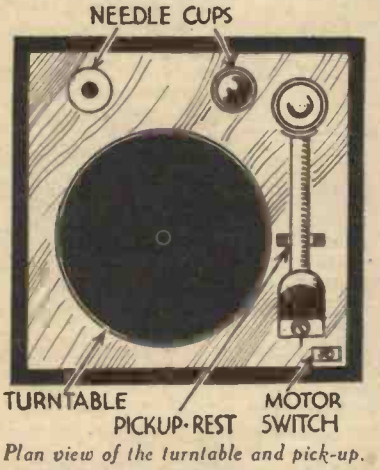
Insulate the Reaction Condenser

It will be seen from the diagram that the reaction condenser is on the "anode" side of the reaction winding, and for this reason it should be insulated from the metallised chassis. To ensure this it is advisable to scrape away a little of the metallised surface at the point where the corresponding bracket is fitted. Another method would be to insulate the condenser from the bracket by means of fibre bushes, but this is not quite such a simple method. The bracket for the potentiometer will be insulated from the metal surface of the chassis, unless one of the mounting screws passes right through the wood. In order entirely to avoid any possible trouble in this respect, however, it will be desirable to make the earth connection to this component to the centre terminal, which is in contact with the mounting bush.

Little explanation is called for in respect of the detector and L.F. portions of the set, but it might be mentioned that the detector valve-holder should be placed close to its corresponding coil, the L.F. valve-holder being situated near the right-hand side of the chassis. It is best, although not essential, to place the L.F. transformer on the under-side of the chassis well away from the H.F. components. Other points to be observed in the construction are those which are standard in connection with all mains receivers, so it is scarcely necessary to detail them. With regard to the method of bringing out the power-supply connections, it will be found most convenient to use terminal-socket strips fixed to the rear (three-ply) side of the chassis. By following this idea there will be little danger of "live" terminals being exposed, and thus freedom from electric shocks in connecting up or carrying out any adjustments.

CONVERTING YOUR SET INTO A RADIO-GRAM.

MANY radio enthusiasts yearn for a radio-gramophone, and yet they are unable to find accommodation for the necessary additional equipment; neither do they feel justified in scrapping their present cabinet—often a really good and handsome piece of furniture. Here is an attempt to overcome the difficulty.



Plan view of the turntable and pick-up.

The accompanying sketch shows the gramophone equipment housed in a box "disguised" as a coal-box with a padded seat—hence its usefulness is two-fold. If desired, accommodation for records is available in two compartments under the motor with a door on the front. A volume control is placed on one side of the equipment, together with two plugs—one for the mains, where an electric motor is used, and one for the pick-up connections to the radio set. The pick-up cable should preferably be lead-cased, the case being earthed so as to avoid any undue interference from the mains, etc., although in actual practice ordinary twin-flex is quite satisfactory. The dimensions of the box will be obvious to the reader, and can, of course, be varied to suit individual requirements. For instance, some may desire to increase the height a little in order that the records may be stored vertically. The upholstered lid is, of course, hinged at the back, and when raised is held in position by the usual metal side supports. A thin layer of felt is glued round the top edges of the box so that when the pick-up is in action neither surface scratch from the record nor "chatter" from the pick-up will be heard.

Scratch Filter and Volume Control

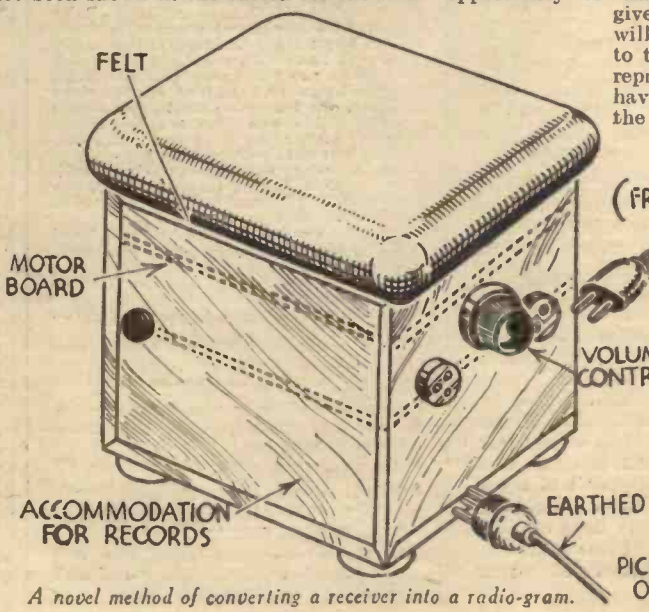
There is also plenty of room for a scratch filter to be incorporated, although this has not been shown in the sketch for the sake of clearness. A suitable filter was described in PRACTICAL WIRELESS Data Sheet No. 18.

It certainly is convenient to have the volume control on the conversion equipment, as the operator can then raise or lower the volume without getting up from his seat.

To reduce modifications of the wiring of the radio set to a minimum the grid-bias battery for the detector valve can be housed satisfactorily in the equipment, so that the two connections to the radio set, when used as an amplifier, are made to the grid of the detector valve and the earth line. If, however, there are already pick-up terminals or sockets on the radio set, these modifications are not necessary.

Although an electric motor is more convenient to use, a clockwork motor is equally satisfactory, and for those who already possess a good motor here is an opportunity to employ it usefully, for given a good radio set you will never wish to go back to the acoustic method of reproducing records after having successfully used the "electric" method.

J. S. R.



A novel method of converting a receiver into a radio-gram.

If You Require a Blueprint, Consult Our Blueprint Service on page 776.

FROM MICROPHONE TO LOUD-SPEAKER

An Article Describing the Apparatus Used in the Production, Transmission, and Reproduction of Wireless Programmes

THERE are probably many readers of PRACTICAL AND AMATEUR WIRELESS who are but newly interested in radio, and many others whose knowledge of broadcasting begins and ends with the ability to operate their receivers efficiently, and whose only interest in wireless is the musical entertainment it provides. There is, however, a considerable amount of pleasure and interest in the chain of processes and the sequence of ingenious apparatus employed in the production, transmission, and reproduction of the programme, and this short series of articles is intended to reveal, without going too deeply into highly technical matters, some of the mysteries of broadcasting

At the outset it should be recognised that, although to the uninitiated they may appear intricate, the broad lines of broadcasting are in principle an extremely simple matter. It is merely a method of transferring sound energy from the place at which it is produced, and re-creating it at other places—of bringing the events which take place at the studio into your home. Because, therefore, sound is both the raw material of a broadcast programme, and also the finished product given out by your loud-speaker, it is necessary to set down simply what sound actually is.

A lady artiste preparing for the transmission of her voice over the microphone seen on the right.

We can all recognise sound when we hear it—but few could define it in everyday language. Perhaps the best practical definition is this: sound is the effect of air vibrations upon our ears, produced by the vibration of the instrument emitting the "sound." Most people are aware that sound is produced by vibrations such as those of a violin string when bowed or plucked, but it is not always realized that vibration is not a "sound" until it reaches the ear.

Sound Mechanism

The actual mechanism of sound propagation is as follows. An instrument—a violin string, a drum head or something similar—is forced to vibrate. As it does so, it alternately pushes and releases a small quantity of air in its immediate neighbourhood, causing it to be alternately compressed and decompressed in absolute sympathy with the instrument vibrations. The displacement of the air particles gives corresponding "nudges" to adjacent particles and these in turn pass on the impulse to the next layer of air.

The compression and release thus travels outwards in all directions, *not* as a stream of moving air, but as a vibration or pressure wave.

When the pressure wave reaches the ear its energy is communicated to a delicate mechanism and sets up corresponding vibrations which ultimately affect certain nerves, giving rise to the sensation we call sound. It is principally by means of sound that we communicate with each other, but ordinary speech has a range of only a few yards and even a loud shout can only be heard a few hundred yards away. Many have been the efforts made from the earliest days of history, to increase the distance across which people can communicate by means of sound.

Drums and horns of various kinds represent some of the first attempts at long-distance sound signalling, and in Africa to this day news is conveyed over enormous stretches of country and at incredible speed by code signals tapped out on drums and passed from native village to village by relays of these instruments.

But drum throbs, however suitable for jungle communication, are quite unsuited to the conditions of modern civilization. Were the air in very truth "filled with music" the din would be appalling, it would be impossible to distinguish one message from another, and there would be no secrecy. The first satisfactory solution to the problem was the telephone invented by Bell.

A special violin transmission in the studio, with an engineer checking the sound by means of headphones.

Many improvements have been made upon the original electric telephone instrument, but the principle remains. In ordinary telephony the original sound—say, the human voice—is allowed to fall upon a diaphragm in a device known as the microphone. The diaphragm vibrates in sympathy and, by means which will be described later, causes the strength of an electric current to vary.

The Microphone

The microphone is connected by wires to the receiving instrument. Through these wires the varying current flows, and at the receiving end produces corresponding variations in the strength of a magnetic system. The exact explanation of how this is brought about must be deferred for the moment. The varying magnetism exerts a varying pull upon a second thin plate or diaphragm, which therefore vibrates itself in sympathy with the magnetic impulses, and its vibrations set up new air vibrations which the ear of the person at the receiving end interprets as sound.

For personal conversations telephony is perfectly satisfactory, and communication can be carried on over hundreds of miles by overhead, underground, and even submarine wires. It is, however, quite unsuitable for the form of universal communication represented by present-day broadcasting requirements. In the first place, it is necessary to instal wires between the transmitting station and every listener—a most costly undertaking. Then it would not be possible to link every listener to every broadcasting station, so that choice of programmes would be very restricted.

What was wanted was some medium other than an electric current flowing along metallic wires for the transmission of sound impulses, and that medium was discovered in the form of the radio "wave." In this preliminary survey it must suffice to say that the radio wave is very similar to light in its nature. It travels at enormous speed—186,000 miles per second—but, unlike light, it does not affect, so far as we know, any of the human senses.

(*Continued overleaf*)

A small early studio, adequately draped, with a microphone on the stand at the right of the picture.

(*Continued from previous page*)

But just as we can vary the strength of an electric current in sympathy with the vibrations of a human voice or an instrumental performance, so we can "modulate" or vary certain properties of a radio wave, and this is what is done at a broadcasting station.

The practical effect is that the aerial of a transmitting station emits an invisible radiation the instantaneous values of which correspond with the instantaneous values of the electric current flowing in the microphone circuit.

The "Modulated" Wave

The "modulated" radio wave, pervading all space and moving forward at its terrific speed, reaches in a small fraction of a second every receiving aerial in the world. And it possesses the power of setting up in each receiving aerial, a tiny electric current corresponding in every fluctuation with the original wave. To the aerial is connected the receiving "set," the construction of which is such that, providing the original signal current set up in the aerial is sufficiently strong, the weak impulses can be amplified and transformed again into a reproduction of the original microphone current, and further amplified until they are powerful enough to operate a loud-speaker which, as most listeners know, is only a magnified and improved version of a telephone receiver. The programme, be it music or speech, is produced under conditions as near ideal as possible before a microphone upon which the air vibrations forming the programme impinge, one or two examples of this instrument being shown in the accompanying photographic illustrations. The energy of these air vibrations is converted by the microphone into a vibrating electric current. To this is added what is known as a "radio-frequency current" and the combined current, now termed a "modulated radio-frequency current," is led to the transmitting aerial. Its energy is now radiated from the aerial as a "modulated" radio wave which travels outwards at the speed of light. When the wave is intercepted by a receiving aerial, the radiated energy is converted back into a corresponding modulated radio frequency current which is led to the receiving set. Within the set is apparatus capable of selecting the wave of the particular station to which it is required to listen—a process known as "tuning." There may also be valves for magnifying the weak incoming signals. Another valve and associated apparatus transforms the energy into a "telephone" current, and yet others amplify its strength until it is sufficiently powerful to operate a loud-speaker. In this loud-speaker the varying telephonic current causes movement of a diaphragm which, in turn, sets up vibrations of air, thus re-creating the original sound waves.

It must be remembered that, all the way through this seemingly complicated series of processes, the vibrations, whether of air, of microphone diaphragms, of electric currents, or radio waves of magnetic strength, are in perfect sympathy with each other; each is a true "reflection" in another medium of the original programme, and providing the receiving apparatus is correctly designed and operated, the final reproduction is a remarkably faithful re-creation of the sounds produced in the studio.

The Nature of Sound Waves

It is now necessary to amplify the foregoing, but before this can be done we must examine the nature of the waves—of sound, electricity, and of radio energy.

As previously mentioned, the waves possess motion; that is to say, they reach out from the point at which they are produced and arrive at other points. For instance, the air waves produced by a singer or instrumentalist pass from him to the microphone; similarly, the radio waves produced from the transmitting aerial pass outwards until they reach the aerials of all listeners. Since they possess the property of motion, they must also possess a certain speed, and the speed of sound waves is 1,100 feet per second, and that of radio waves 186,000 miles a second.

Wave Frequency

By frequency is meant the number of complete waves occurring in one second. Now sound waves have frequencies lying between some few dozen to several thousand complete waves or vibrations or "cycles" per second. A wave having a frequency towards the bottom end of this scale would give rise to a deep or bass note, while a wave of high frequency, say 2,000 or 3,000 per second, would give a high-pitched or treble note.

Actually the middle C of a piano vibrates at a frequency of 256, and for all practical purposes a good loud-speaker should be able to reproduce all notes between 100 or somewhat less and 6,000 cycles per second. Another point which must be remembered about sound waves is that few, if any, instruments give out a pure wave of one frequency. If, for example, you played middle C upon a violin, the string would send out vibrations of 256 cycles—the "fundamental," as it is called—and also much weaker vibrations of twice, three times, and other multiples of the main frequency. These subsidiary waves are called "harmonics," and their number and relative strength give the music of each instrument its characteristic tone.

An example of a modern studio used for musical purposes with two different types of microphone.

Avoiding Distortion

It was mentioned above that a good loud-speaker should be able to respond to vibrations between, say, 100 and 6,000. The ear can detect sounds both lower and higher in pitch, but their loss is not of very great importance. The range of frequencies to which the ear can respond is called the "audio-frequency" range, and it will be clear that as the air waves produced in the studio are of audio frequency, so the currents produced in the microphone must also be of audio frequency. It is important, too, that the audio-frequency microphone currents should be an exact copy, so far as frequency and harmonics are concerned, of the original sound waves. Were there any serious difference between the two, it would be impossible to produce, at the listener's end, the exact sound which was made before the microphone, and we should say that distortion has been introduced.

This remark applies, of course, to every other stage through which the programme passes. The various amplifiers at the studio and transmitting station must be able to pass on the signal strengthened, but not changed as to quality. When the signal is combined with the radio frequency element, the audio-frequency characteristics must still be preserved unchanged; and in your own set the signal has to pass through several processes—a simple three-valve set will change the nature of the signal perhaps a dozen times—but little or no change in quality is permissible if enjoyable reproduction is to be obtained. It is interesting to note the number of times the signal can be transformed—sound, electric currents, magnetic variations, ether waves, electric currents again, more magnetic effects, more currents, mechanical motion and, finally, air waves once more—and yet be not merely a recognisable reproduction of the original, but a remarkably faithful reproduction.

Radio Waves

It has been seen that when the programme leaves the broadcasting station it does so as a radio wave. Now the frequency of the radio wave is not an audio frequency. The radio waves, it must be understood, are not air vibrations, but are variations in electric magnetic stress in what scientists call the "ether of space"—a somewhat vague medium which is considered to pervade all the universe. If these variations occur at a very high frequency, they affect our eyes and are called light. Ether vibrations of a lower frequency are heat rays, and still lower frequencies, but still far too high to be within the audio-frequency range, exhibit the special properties which can be made use of for wireless.

The complete range of frequencies of use for wireless is very wide, commencing at a few dozen kilocycles (a kilocycle is 1,000 cycles per second) and extending to many million cycles per second. From the broadcasting point of view, however, the important limits are between about 150,000 and 2,000,000 cycles.

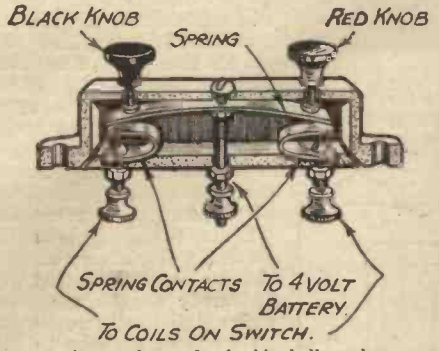
(*To be continued*)

READERS' WRINKLES

THE HALF-GUINEA PAGE

A Double Bell-push

FOR remote control purposes a pre-set condenser can easily be converted to replace two bell pushes, used in connection with a coil-operated switch. The



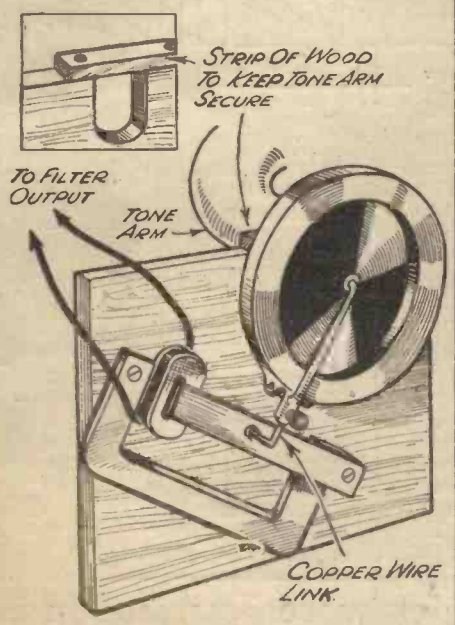
An easily-made double bell-push.

black and red knobs are fitted to screws about ½in. long, and are kept in position by a spring fixed firmly to the centre of the condenser case. The screw that originally held the plates in position will do for this purpose. Both the spring and contact pieces are made from the condenser plates.

The contacts are bent over, as illustrated, so to be ½in. away from the spring. Be sure that the stems of the knobs work freely in the holes in the casing. The bottom of the condenser is held in position by the centre screw.—H. W. OWEN (Forest Hill).

An Efficient Improvised Loud-speaker

A VERY good improvised loud-speaker can be made by attaching a moving-iron loud-speaker unit to the soundbox of a gramophone, as shown in sketch. The tone-arm and unit are attached to a piece of board ⅜in. to ½in. thick, so that the maximum vibration of the moving iron is transmitted to the soundbox diaphragm. The connecting link is a right-angled piece of 18 S.W.G. copper wire. A cabinet gramophone produces the best tone with this simple loud-speaker.—R. M. Ross (Alness).



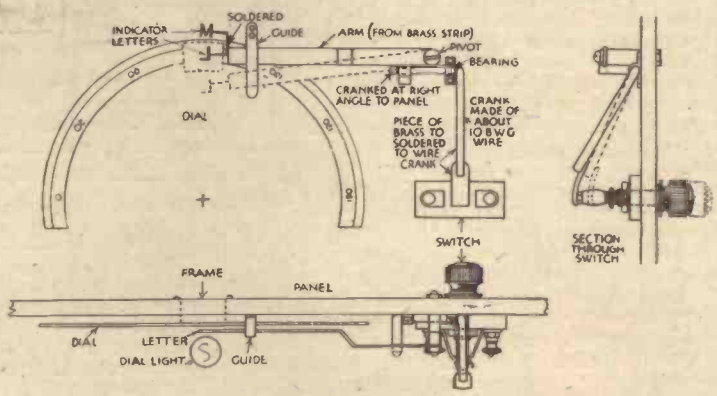
Method of making an improvised loud-speaker with a moving-iron unit and gramophone soundbox.

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 Novel Wave-band Indicator

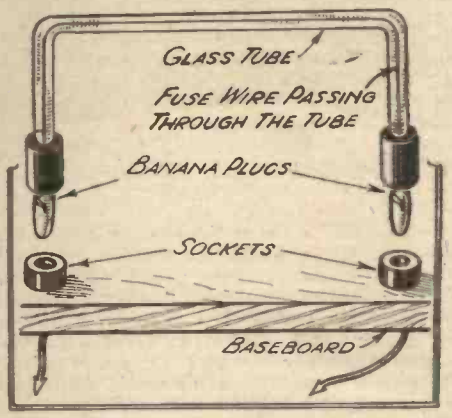
A GOOD many sets in these days of simplified controls have no means of indicating which waveband is switched on, except the position of the wave-change switch. The accompanying sketch shows an idea which indicates at a glance which waveband is in circuit. It consists of the letters "M" and "L" or the words "Medium" and "Long" neatly cut out of thin sheet metal, suspended between the dial light and the dial of the tuning condenser so that only one at a time is shown in the escutcheon frame in the panel. The letters are soldered to an arm which is raised or lowered, similar to the action of a Norfolk latch, by the action of the wave-change switch, which is transmitted to the arm by means of a crank which bears on the end of the switch plunger by reason of its own weight and that of the arm. When the wave-change switch is pushed in it raises the arm sufficient to show either the "M" or the "L" in the frame. It is not possible to give any dimensions as the position of the wave-change switch and the size of frame of the dial, etc., govern the amount of leverage required, which has to be found by experiment. Where the wave-change mechanism is operated by means of a rod, as in the case of ganged coils, a collar should be fixed to the rod in a convenient position to engage with the crank. Should the wave-change switch be of a semi-rotary type, an arm should be fixed to the switch spindle, and by means of a crank the motion can be transmitted to the indicator arm as before.—A. E. H. SCUDAMORE (Nottingham).



Details of a novel wave-band indicator.

A Handy Fuse

HERE is a novel fuse which will prove useful to the experimenter. To make the fuse, take two banana plugs with sockets, and a piece of glass tubing of a diameter which will fit snugly into the tops of the plugs. Make two right-angled bends in the tube, as shown. (The glass will be found to bend quite easily if heated in a gas flame). The fuse wire is twisted round the metallic portion of one plug, passed through the tube and fixed on to the second plug. By looking at the glass tube one can see at once if the fuse has been "blown," or is intact.—J. A. GUY (Poplar).



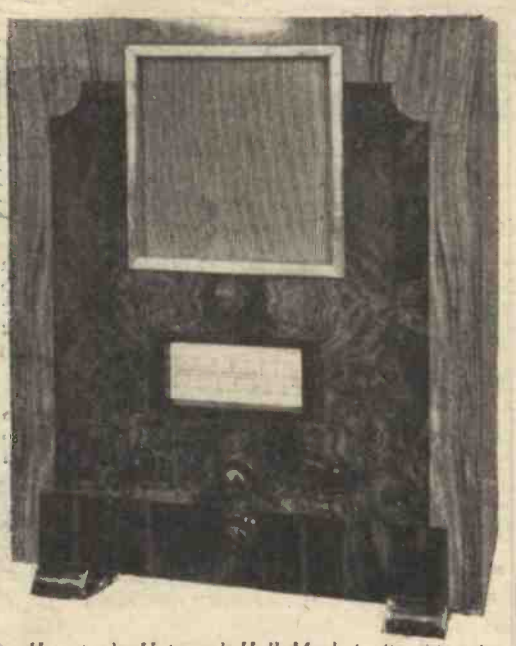
A useful fuse for the experimenter.

Condenser Calculations: A Correction

IN a wrinkle under this heading, published in our issue for January 19th, it was stated that "the resultant capacity of two condensers of equal rating in parallel is exactly the half of either of them." This, of course, is incorrect, as the capacity in that case would be double that of one condenser.

BUILDING THE U HALL-MARK

This Article Gives Full Constructional Details of O

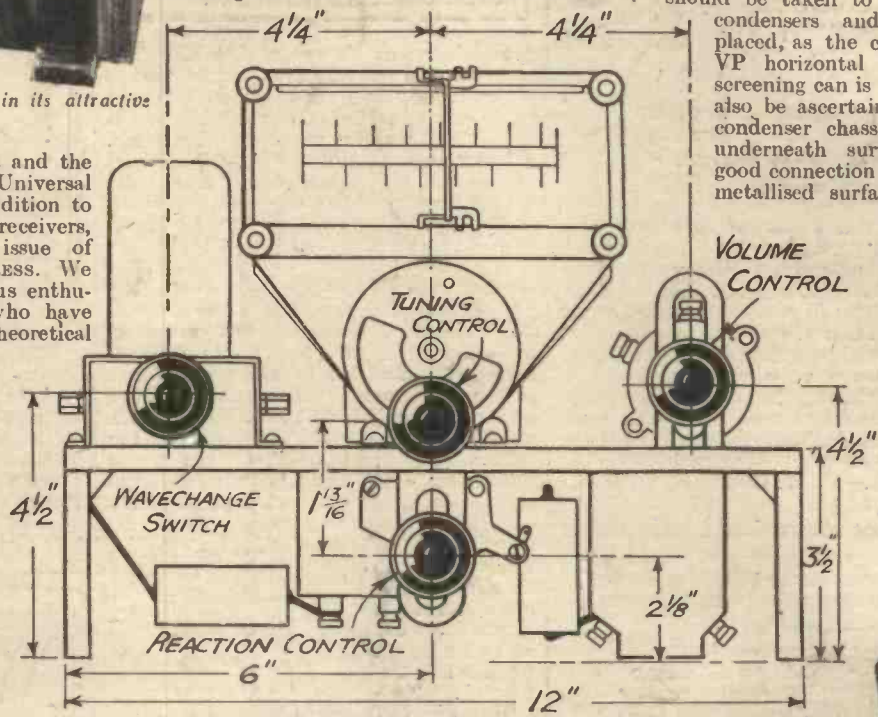


Here is the Universal Hall-Mark in its attractive cabinet.

BRIEF constructional details and the theoretical diagram of the Universal Hall-Mark, the latest addition to our series of push-pull quality receivers, were given in last week's issue of PRACTICAL AND AMATEUR WIRELESS. We have already received numerous enthusiastic reports from readers who have constructed this set from the theoretical diagram, and it is evident that the Universal Hall-Mark is going to prove immensely popular, especially amongst the D.C. mains users. In the past very few D.C. receivers having an output of over 1½ watts have been available. The usual D.C. mains voltage is approximately 220, and therefore a push-pull output stage is essential if a large undistorted output is to be obtained. By using two Tungsram power pentodes in the output stage in conjunction with a specially selected speaker, the unusually high output of 6 watts has been made possible. This is, of course, in excess of that required for a small room, but volume may be limited by means of the potentiometer control. It is a well-known fact, however, that a reserve of power output is very desirable in order to prevent transient distortion. No doubt many readers have experienced this form of distortion when using a valve having a low undistorted output; this type of valve deals with most of the musical items without distortion, but an occasional sudden rise of volume on certain notes causes overloading and consequent distortion. Universal Hall-Mark constructors need have no fear of such overloading occurring, however—the valves and speaker of this receiver can adequately deal with transients.

Pick-up Connections

As mentioned in last week's PRACTICAL AND AMATEUR WIRELESS, the efficient L.F. stage of this set makes it very suitable for gramophone reproduction. The detector stage has been designed with a view to making the detector valve suitable as the first gramophone amplifier; it is correctly biased by means of the cathode resistance R7, and when a pick-up is used or if the receiver is to be converted into a radiogram, it will only be necessary to fit a pick-up strip, connecting one socket of this *via* a .5 mfd. condenser to G terminal of V2, and the other socket *via* another .5 mfd. condenser to the metallised surface of the baseboard.



Front of chassis lay-out of the Universal Hall-Mark.

Component Assembly

The construction should present no difficulty, as the components are well spaced and the wiring is clearly shown in the wiring diagram. All components, except the L.F. choke, fixed resistances, and tubular condensers may be mounted before commencing with the wiring. The choke partly covers one of the output valve-holders, however, and therefore the latter should be wired before the choke is screwed down. It will be noted that the tubular condensers and fixed resistances are held in position by their connecting wires, and therefore thick wire should be used for this purpose as it is necessary that these components be quite rigid.

The front view of the chassis shown below clearly indicates the position of the various controlled components. Great care should be taken to see that the tuning condensers and coils are correctly placed, as the clearance between the VP horizontal scale and the coil screening can is very small. It should also be ascertained that the coil and condenser chassis are clean on the underneath surface, in order that good connection may be made to the metallised surface of the baseboard. It is unnecessary to insulate the volume control bracket from the baseboard, but the reaction condenser bracket must not be in contact with MB, otherwise the reaction winding will be short-circuited. Care should therefore be taken to use fixing screws that do not pass through the baseboard. It will be noted that the coils are reversible. They should be so placed that the terminal markings are in the exact position shown on the wiring diagram. If the spindle has to be removed, in order that one or other of the coils may be reversed, care should be taken when replacing this as it is essential that the individual switches of the two coils

The Chassis of the Hall-Mark.

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Absolute Safety in Use.

A.C. and Battery Models were described in issues o January 26th and February 2nd

NIVERSAL FOUR

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are in the same position—that is, on long or on short waves.

Fixing Electrolytic Condensers

Before fixing the electrolytic condensers C18 and C19 it will be necessary to recess the underneath surface of the baseboard by means of a 1½-in. drill, as the threaded portion of the condenser is not long enough to allow for the fastening of the nut; ½in. holes should then be drilled through the baseboard and the large fixing nuts should be screwed tightly from underneath—the condensers should not be revolved, as the metallised surface of the baseboard might become damaged if this were done, thereby preventing a good contact being effected between the casings of the condensers and MB. The casing of this type of condenser is the negative terminal and therefore effective contact at this point is essential.

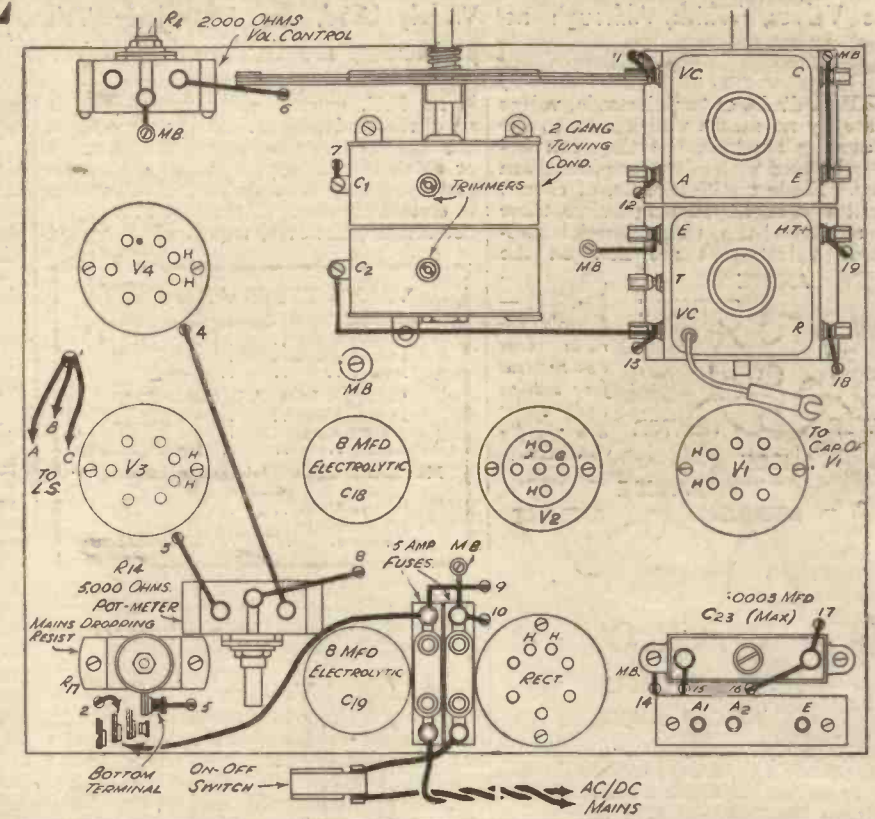
The potentiometer R4 has been included in order that perfect matching of the

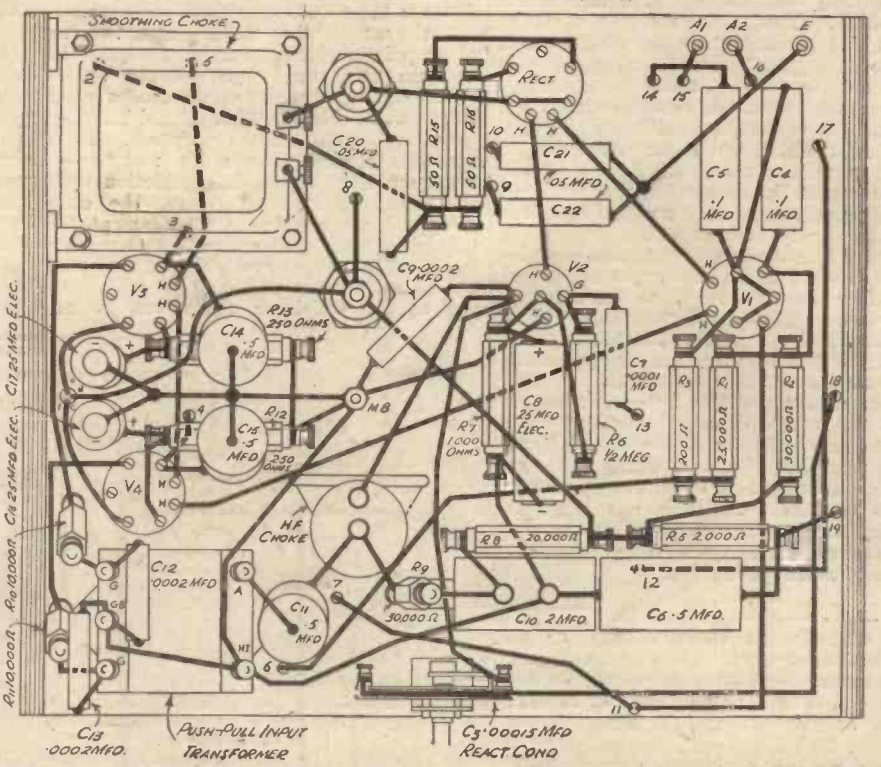
(Continued on page 764)

LIST OF COMPONENTS.

One 2-gang set coils, types Q and T.—Wearite.
One 2-gang .0005 mfd. midget condenser with type V.P. drive with wavelength scale (C1, C2)—Polar.
One .00015 mfd. reaction condenser (C3)—Graham Farish.
Four .5 mfd. fixed tubular condensers (C6, C11, C14, C15)—T.M.C.
Two .1 mfd. fixed tubular condensers (C4, C5)—T.M.C.
Three .05 mfd. fixed tubular condensers (C20, C21, C22)—T.M.C.
One .0001 mfd. fixed tubular condenser (C7)—T.M.C.
Three .0002 mfd. fixed tubular condensers (C9, C12, C13)—T.M.C.
One 2 mfd. fixed condenser (C10)—T.M.C.
Three 25 mfd. electrolytic condensers (C8, C16, C17)—Dubilier.
Two 8 mfd. electrolytic condensers (C18, C19)—Dubilier.
One .0003 mfd. pre-set condenser (C23)—Formo.
Fourteen fixed resistances, 30,000Ω (R2), 25,000 (R1), 2,000 (R5), 500,000 (R6), 20,000 (R8), 30,000 (R9), 1,000 (R7), 250 (R12), 250 (R13), 50 (R15), 50 (R16), 10,000 (R10), 10,000 (R11), 200 (R3)—Graham Farish.
Two potentiometers 2,000 ohms, type V.C.26 (R4) and 5,000 ohms, type V.C.29 (R14)—Bulgin.
One mains dropping resistance (R17)—B.T.S.
One Snap H.F. choke—Graham Farish.
One L.F. choke H.T.11—Wright and Weaire.
One input push-pull transformer, type D.P.36—Varley.
Three potentiometer brackets—Peto Scott.
One Mains on/off switch, type S. 80—Bulgin.
Five valve-holders, 4, 7-pin, 1, 5-pin—Clix.
Two .5 amp. mains fuses—Microfuse.
One mains lead and plug—Belling and Lee.
Five valves, types H.P.2118, R.2018, P.P.4118, P.P.4118, P.V.3018.—Tungsram.
One loud-speaker, type P.R.7. P.M.24—Rola.
One Metaplex chassis—Peto Scott (12 x 10 x 3½in.).
A.E. strip and plugs—Belling Lee.
One Hall-Mark Four cabinet.

Top and Sub-chassis Wiring Diagrams of F. J. Camm's Universal Hall-Mark Four





VALVE TYPES AND USES—7

Diode Valves, Which, Although not Widely Used, are Particularly Valuable to the Home Constructor and Experimenter, are Dealt with This Week

SPECIAL diode, or two-electrode, valves are by no means well known to the average amateur, but they can frequently be used with advantage in modern circuits. Diode rectification is, of course, old and was employed long before there were available the many special two-electrode valves that are now on the market. In the past, however, ordinary three-electrode valves were used as diodes, either by leaving the anode disconnected or by joining together the grid and anode terminals. There are many schools of thought regarding the most efficient and distortionless method of detection, but it is recognised by all that, so far as "quality" is concerned, the diode cannot be improved upon. One reason is that the diode is a "pure" rectifier, and cannot be employed as an amplifier; unlike the three-electrode valve (especially when reaction is applied), the diode performs only a single function.

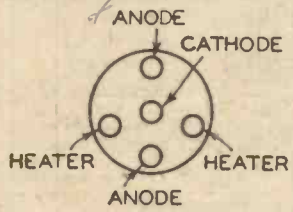


Fig. 1.—Showing the valve base connections for battery and mains double diodes.

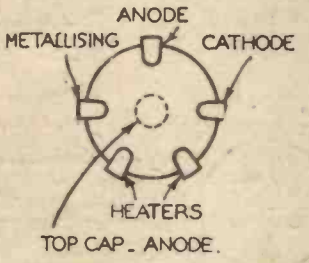


Fig. 2.—This drawing shows the connections for the universal dual diode which has a side contact base.

It is largely because of the recognised value of the diode detector that double-diode triodes, double-diode pentodes, and the like have come into such great prominence. There are, however, objections to these multiple valves, not the least of which is that they are rather expensive. A more important point is that if one section of the multiple valve develops a fault the complete unit is useless. On the other hand, if a diode is employed in conjunction with a separate triode or pentode failure of the latter valve does not affect the former. This advantage is emphasised by the fact that the life of a diode is very long, generally exceeding that of the normal type of valve.

No H.T. Required

A diode valve consists only of an indirectly-heated cathode and an anode, but most of the diodes are of the double type, and thus have two anodes, both of which work in conjunction with the one cathode. The double diodes can be used in a large variety of circuit arrangements, for both anodes can, if desired, be joined together and used as one, the anodes can be used separately in a full-wave circuit, or one anode can be used for rectification and the other for providing A.V.C. in the same manner as when double-diode triodes are employed.

The diode does not require an applied H.T. voltage, and this means that there is no H.T. current consumption—this is an obvious advantage. At the same time, the fact that reaction cannot satisfactorily or efficiently be applied when a diode is employed may be a definite disadvantage in certain circuits. In the case of a super-heterodyne, however, reaction is not used with the second detector, so that the diode is just as satisfactory as a normal type of three-electrode detector.

VALVE TYPES AND USES

COSSOR 220DD (Battery double-diode)	
Heater Volts	2
Heater Amps... ..	.2
Base	5-pin
COSSOR DD4 (A.C. double-diode)	
Heater Volts	4
Heater Amps... ..	.5
Base	5-pin
MULLARD 2D13 (Universal mains double-diode)	
Heater Volts	13
Heater Amps... ..	.2
Base	Side-contact

Input Signal Voltage

Due to the fact that the diode functions without an applied voltage between the electrodes, there are no characteristic curves of the normal kind to consider, and the only points that call for consideration are the maximum signal input voltage and the maximum rectified current. Even these points seldom need to be considered because they rarely govern the choice or use of the valve, for all the diodes made have a sufficiently high signal-handling capacity for all normal purposes. It is for this reason that some makers do not even issue figures in connection with the factors mentioned above, the only information given being the filament (or heater) voltage and current. Generally speaking, the diodes available can deal with a rectified current up to at least ¾ m.a. per anode, which is equivalent to an extremely high signal output—sufficient fully to load the following L.F. valve.

Diode valves are available for use in all types of receiver—battery, A.C. mains, and universal, and the details given in the accompanying panel show the filament characteristics of valves of all three types. The battery and A.C. types are fitted with 5-pin bases, the connections for which are shown in Fig. 1, whilst the Mullard 2D13 (for universal mains sets) has a side-contact base, the connections for which are given in Fig. 2.

"Cold" Diodes

An entirely different type of diode is the high-frequency metal rectifier (sometimes referred to as the "cold" valve), and this is available in half-wave or full-wave types, these corresponding with the single-diode and double-diode valves. The connections for these Westinghouse "Westectors" have previously been given in these pages, and the £5 *Superhet* is a typical example of a modern receiver in which a "Westector" is used as a diode for second detection. In the receiver referred to, the "Westector" is used as a single diode, but a circuit for the double-diode (full-wave) type is given in Fig. 3. In this circuit the double H.F. rectifier is used for second detection and delayed A.V.C. in a superheterodyne circuit. One half of the double rectifier provides delayed A.V.C., and the other performs the function of detector, and follows the I.F. transformer in the conventional manner. It is not necessary in this article to point out that the metal rectifier (or "cold" diode) can be employed for a variety of other purposes than those mentioned, since that matter has adequately been covered in a number of previous articles. It is also unnecessary to stress the fact that the metal rectifier is even more economical than the normal diode, due to the fact that it operates "cold," and has no filament or heater.

(To be continued)

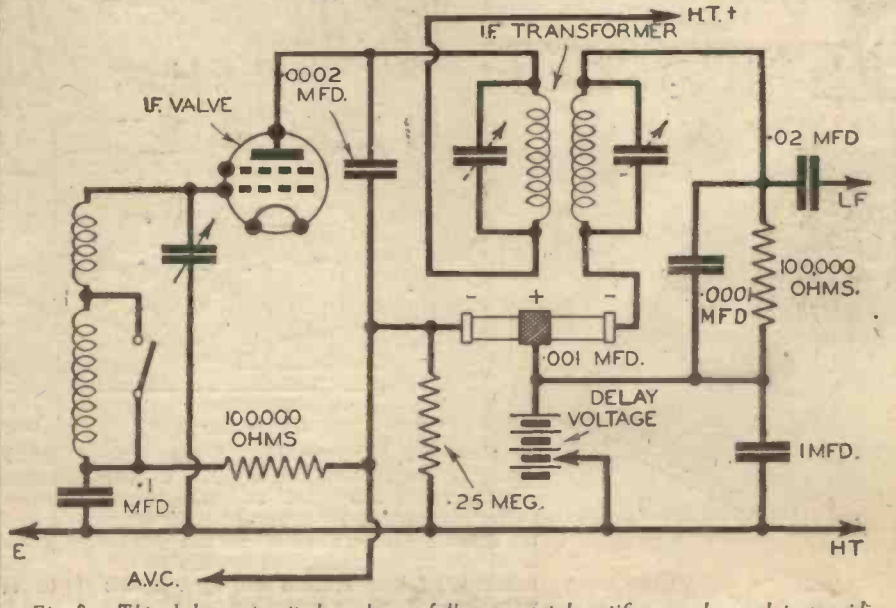


Fig. 3.—This skeleton circuit shows how a full-wave metal rectifier can be used to provide second detection and delayed A.V.C.

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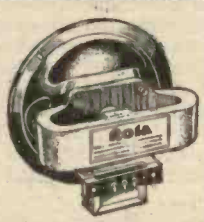

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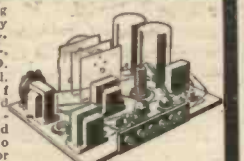

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1 Varley Input Push-Pull transformer, type DP36 ..		15	0
1 Set of 4 specified valves	2	6	0
Peto-Scott De Luxe Walnut Battery Hall-Mark 4 Consolette Cabinet		19	6
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W.B. Speaker, Cash or C.O.D. Carriage Paid, or 2/6 Deposit and 11 monthly payments of 4/- ..	2	2	0

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THE BATTERY HALL-MARK FOUR

(Continued from page 752)

either trimmer is required; if it is, however, it will be best to again check the adjustments by tuning to a third station somewhere about the centre of the scale. These adjustments should have been made with the wave-change switch set to the medium-wave position (clockwise rotation of the knob), and it might be found worth while to make a second check on the long-wave band.

It might appear, from reading the above instructions, that trimming is somewhat complicated and will occupy rather a long time; actually, this is not the case, and the whole process can be carried out quite easily in half an hour or less.

The next step is to vary the pre-set aerial condenser until the capacity most suitable for the aerial in use is found. Where the aerial is long, and especially if it is rather close to buildings or trees, the condenser knob will require to be screwed out for six turns or so, but if a short aerial, or an indoor one, is employed it will be better to increase the capacity by screwing the knob right down. It hardly need be explained that an increase in capacity of the pre-set condenser will cause a reduction in selectivity and a certain increase in signal strength. For this reason, some compromise might have to be made.

It will be seen that the aerial terminal socket marked A.1 is connected directly to the aerial coil, and this will only be used when selectivity is not an important requirement, or where the receiver is used at a fair distance from the nearest transmitter. This connection will also prove useful when long-distance reception is wanted at times of the day when there are not many stations in operation.

BUYING ELECTRICITY

An Article Explaining the Different Charges for Electricity

THERE is often some misunderstanding to the householder consumer of electricity concerning its cost, or different costs, for what he might call the same commodity.

The charge for lighting may be anything between 4d. and 8d. per unit, whilst for heating, cooking, and other domestic uses, the charge may only be 1d. or ½d., and in some districts only ¼d. per unit. On the other hand there may be a fixed low charge per unit for whatever purpose the electricity is required, whether it be for lighting or power purposes, together with a fixed annual or quarterly payment.

To help towards an understanding of these different prices charged per unit, it must be realised that the costs of electricity are not measured solely by the amount used, but are largely influenced by the rate and time of use as well as the purpose for which the consumer requires the electricity. The reason why these latter points influence the cost of electricity will be understood if we consider the Electric Supply Authorities' point of view regarding the generation and distribution of electrical energy. Lack of proper information concerning tariffs and flat rates may cause the consumer to restrict the use of electricity in the home on the grounds of mistaken ideas about costs, or no idea at all in some cases.

Expenses in Generation

To enable us clearly to understand the cost of electricity, let the buying of electricity be viewed more in the light of paying for a service than that of buying a commodity.

Since electricity in the form we require it cannot be economically stored on a commercial basis, it follows that the whole power consumption required by the multitude of consumers at any instant from any supply station must be generated and transmitted direct to the consumer. This means that the station equipment, cables, etc., for transmission, must be large enough to meet the biggest load that may be required from it, irrespective of this big load being only required at certain times, say in the evening when every consumer wants power for light.

The greatest expenses in the generation of electricity are the initial costs of machinery, buildings, cables, meters, etc., interest on money invested on same, labour, rates, and insurance. These items are little affected, whether the consumers' loads are light or heavy. The remaining expenses, covering the cost of fuel used for the operation of the machinery, do, of course, vary with the amount of energy produced, which the consumer pays for.

It is obvious, therefore, that with these essential conditions, the supply authorities must have some income from the vast body of consumers, something by way of a rental for the equipment necessary to meet these conditions, ready to supply energy. When sufficient energy is consumed to meet this initial rental, it follows that all energy required over this amount can be supplied at comparatively lower rates.

Consumers Requiring Light Only

It will be seen from this that consumers who require energy only for lighting purposes must pay the highest rate for it. They use a comparatively small amount individually, and require it at that time when the load from the supply station is at its heaviest—during the lighting period of the evening, when everyone wants energy for light. For the remainder of the twenty-four hours of the day the generating equipment, etc., need not be there for what use the "lighting only" consumers have for it. They take no load from the station, and consequently there is no revenue for the supply authorities.

Now the consumer who, besides taking energy for lighting, takes it for heating, cooking, and some of the many other electrical domestic requirements, helps to build up a load from the supply during the day when the load is only light compared with the evening load.

The supply authorities therefore, in the hope of levelling out the demand for electricity, offer this type of consumer a reduced rate, which consideration introduces tariffs. This encourages the progressive use of electricity in household power appliances, helps to get away from restricted lighting to ample illumination, and aims at the completely electrified house. At the same time it is an inducement to users of electric light only to expand the use of electricity to some of the many other household uses and so benefit by the reduced rates.

Having seen why the prices for power units are cheaper than those for light, it is advantageous now to consider the general methods of charging for electrical energy.

There are two standard methods offered to household consumers, one is the flat rate per unit, that is, one rate per unit for lighting and another rate for heating, cooking, vacuum cleaners, wireless, etc., and other uses coming under the heading of power. This method complicates the house wiring and circuits in that two meters have to be supplied, one fairly small for measuring lighting units at a relatively high price and a larger meter for the power units at a lower price. Furthermore, the wiring and plug points for power must be kept distinct from the lighting wiring, thus involving two separate main circuits. Under this flat rate system an average price for lighting units might be 4d. and for power purposes about 1d.

Domestic Tariff

The other method of charging offered to consumers, and it is becoming increasingly popular in medium-sized houses, is referred to as the "domestic tariff," "two part," or "all in" tariff. It consists of a fixed annual charge, related to the size of the house or the amount of electrical apparatus installed, plus a small charge per unit used, usually between ½d. and 1½d., for whatever use the electricity is needed.

With this method only one meter is required, and consequently only one system of wiring, as all the units are at the same price. This is a great convenience, especially in the smaller houses, where a light duty plug can be connected to the lighting circuit at any convenient outlet and used for any of the small appliances without the need to consider whether the supply is charged for at a higher lighting rate, or a lower power rate.

The annual charge alluded to above is usually calculated so that, together with the revenue from normal lighting at the unit rate, they produce the yearly amount which would be expected from a consumer who uses light only at the standard flat rate.

BUILDING THE UNIVERSAL HALL-MARK FOUR

(Continued from page 761)

pentode valves may be effected. This component should be treated as a pre-set control, however, and once it is adjusted for a pair of output pentodes its setting need not be altered until a new valve has to be fitted. The control has therefore been attached to the back of the baseboard. When making preliminary adjustments this control may be set at approximately mid-way position.

The leads marked A, B, C should be connected to the transformer attached to the speaker, A and C being joined to the end tags and B to the centre tag. We would emphasise that the speaker has been specially selected for this receiver, and the push-pull transformer is of the exact type required for matching the valves and speaker speech coil. Readers are therefore strongly advised to use the specified component if best results are desired.

The same warning applies to the main dropping resistance, as the value of this has been carefully calculated to suit the valves in use. Using the wrong value resistance in this position may cause serious damage to the valves, as the necessary .18 amp. required by the valve heaters is regulated by means of this component. If the mains voltage is 200 to 205 the lead passed through chassis hole No. 2 and the flexible lead from the fuse-holder should be connected to the second terminal of the resistance (viewed from the bottom), to the third terminal for a 220-to 230-volt supply, and to the fourth terminal if the voltage is 240 to 250.

THE EASY ROAD TO RADIO.

THE BEGINNER'S SUPPLEMENT

ELECTRIC CURRENTS IN WIRELESS

(PART II)

An Explanation of the Various Currents Met With in a Modern Radio Receiver.

WE now come to a study of the currents in the first valve of our receiver. We have already described how the steady direct current which passes through the filament causes the emission of electrons. These electrons fly off the filament like spray from a glass of effervescing mineral water. However, unless there is some outside attraction they shoot out, only to return again, as in Fig. 7. To prevent them falling back again, the filament is surrounded by a metal sheath called the *anode*. This is connected to the positive pole of another battery—the high-tension battery. This means that the anode becomes positively charged, or, in other words, that it has a deficiency of electrons. To make up this deficiency it attracts the electrons which are being emitted by the filament. These electrons, therefore, instead of returning to the filament, fly across to the anode, as in Fig. 8. Of course, in practice the anode completely surrounds the filament, but for clarity it is here shown above it.

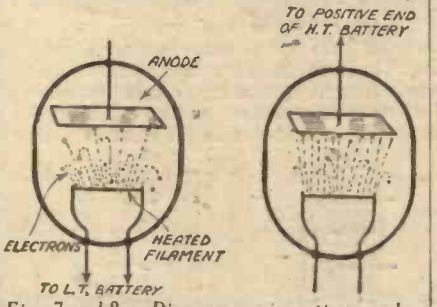
We have already come across two different kinds of current in our receiver, namely the steady direct current which heats the valve filaments and the high-frequency current in the aerial circuit. We now have this third current in the form of a stream of electrons which actually jumps across the space between the filament and the anode of the valve. It is called the *anode current*.

We are now in a position to link up the H.F. current in the aerial circuit with the anode current in the first valve. The connecting element here is the wire *grid* which is placed between the filament and the anode. This is connected directly to the aerial circuit at the point A as shown in Fig. 3 (reproduced in last week's issue), and can therefore be considered as electrically identical with A. Incidentally, there are two grids shown in Fig. 3, but the outer one is really a screen, the function of which is outside the scope of this article.

Nature of the Anode Current

It has already been pointed out that there is an alternate piling up and emptying of electrons at A, and since the grid is connected to this point it is therefore subject to the same electrical changes. When the grid contains an excess of electrons the effect of its presence between the filament and the anode is to *reduce* the anode current. The electrons on the grid repel those which are shooting off from the filament and send many of them back again, thus reducing the total number which get across to the anode. When, in the next instant, the electrons leave the grid it no longer repels the electron stream which is issuing from the filament, and so the anode current increases. It will be seen, therefore, that the circulating current in the aerial circuit has, through the agency of the grid, a profound influence on the anode current, causing it to rise and fall in harmony with its own fluctuations. In other words, the anode current is no longer a steady direct current, but a fluctuating direct current. Moreover, it is one which fluctuates at a high frequency.

Of course, it only fluctuates in this way



Figs. 7 and 8.—Diagrams representing a valve without a grid, showing the electrons issuing from the filament, and the electrons attracted to the positive anode.

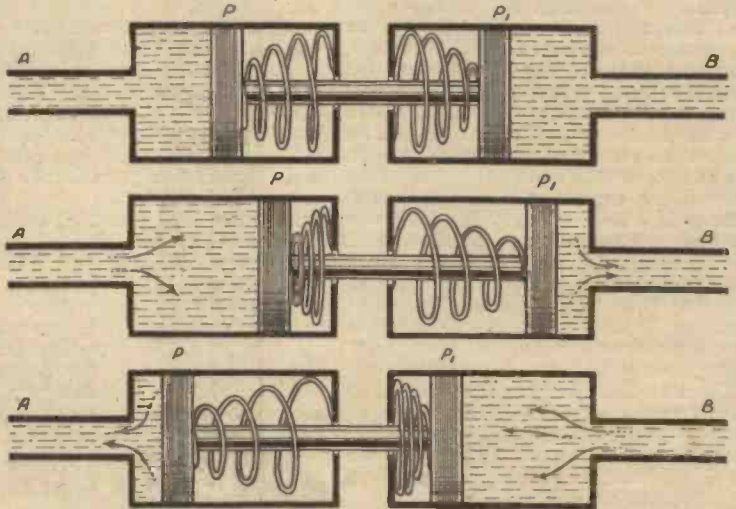
while a station is being received. If the broadcasting station ceased to transmit or the aerial circuit is detuned, so that the oscillations in the aerial circuit die down, then the grid has no further influence on the electron stream within the valve. The latter then immediately settles down to a steady flow, that is to say, it once more becomes a pure direct current. To summarise, the anode current may take either of two forms. Thus, when no station is being received it is a *steady* direct current, but when the set is tuned to a station it becomes a *fluctuating* direct current.

Another way of regarding the anode current in its fluctuating form is to consider it as being a mixture of *two* currents—one a steady direct current and the other a high-frequency alternating current. Imagine, for example, that the steady anode current passing through the valve when no station is being received is, say, 10 milliamps (actually it would be very much less than this), and that on the set being tuned to a particular wave that this current immediately commences to fluctuate between 6 milliamps and 14 milliamps. It will be realised that it is still a direct current, although it is now rising and falling in strength at a high speed or frequency. It is also still one current, in that it is composed of the same stream of electrons from filament to anode. However, it is just as correct to think of it as a steady direct current of 10 milliamps mixed with a high-frequency alternating current which reaches a maximum figure of 4 milliamps in each direction. Thus, at the moment the alternating current is flowing in the same direction as the steady direct current the total current will amount to 10 milliamps +4 milliamps=14 milliamps. When in the next instant the alternating current is flowing in the opposite direction it will partially neutralise the direct current and reduce it to 6 milliamps (10 milliamps—4 milliamps=6 milliamps).

Considered as two separate entities in this manner, it will be clear that it is the alternating current which we wish to preserve and to pass on to the next valve, because it is this which is a replica of the aerial current. The steady direct current is not wanted. Actually, the high-frequency component is more than a replica of the aerial current. It is an *enlarged* replica of it. This is due to the fact that a *small* variation in the electric charge on the grid of the valve induces a *large* variation in the anode current. In other words, a small current fluctuation in the input circuit of the valve is reproduced as a large current fluctuation in the output circuit. To produce this amplifying effect is, of course, the chief function of the valve.

Separating the Currents

We have now to see how the high-frequency current in the output of V_1 is isolated from the direct current component and fed to the next valve. If reference is made to Fig. 3, it will be noticed that the anode circuit divides after it leaves the valve, one branch passing through the high-frequency choke



Figs. 9, 10, and 11.—Showing how the action of a condenser is comparable with that of a hydraulic piston.

(marked H.F.C.) to the positive pole of the high-tension battery, while the other branch leads to the small fixed condenser C_2, and thence to the tuned-grid circuit of the next valve V_2.

The D.C. component takes the first path, the electrons travelling through the H.F. choke to H.T.+. From there they pass through the battery and return to the filament of the valve *via* the common H.T.—, L.T.— lead. Their progress is impeded very little by the H.F. choke, since this only consists of a coil of wire of comparatively low resistance. The resistance of the H.T. battery is also low. The direct current cannot follow the second path, which is reserved for the high-frequency alternations, because when it reaches the condenser C_2 it comes up against a complete barrier in the form of the insulation between the plates.

Now let us see what happens to the alternating current comprising the useful part of the output current of the valve. First of all, it is prevented from taking the first course by the H.F. choke. Now, although this choke offers very little opposition to direct current, yet it provides an almost impassable barrier to high-frequency alternating current. This is due to its *inductance*, a property which coils exhibit when subjected to rapid alternations of electric current. It is something like inertia, since it has the effect of opposing any rapid changes in the flow of current through the coil. It does not oppose a steady flow but only an increase or decrease in the flow. In the case of the high-frequency current under discussion the changes are very rapid, and therefore the opposition or *impedance* of the choke becomes correspondingly large.

Since the current cannot pass through the H.F. choke it takes the second path leading to the condenser C_2. Now, curiously enough, although this condenser forms a complete barrier against direct current, it offers a ready path to H.F. currents.

Condenser Action

Strictly speaking, the current does not pass through the condenser, although the effect is similar. To use an analogy, the action of the condenser is comparable with that of the hydraulic device shown in Figs. 9-11. Water entering at A pushes the double piston to the right, as in Fig. 10. It is obvious that this will cause the ejection of an equal amount of water from B, although, of course, it is not the *same* water. On the other hand a reversal of the water pressure will cause an influx of water into the right-hand cylinder at B and an outflow of an equal amount at A. In the case of a condenser subjected to an alternating current the flow of the current in one direction "fills" up one plate of the condenser with electrons, and the presence of these electrons has the effect of repelling an equal number of electrons from the opposite plate as in Fig. 12. When the current changes its direction of flow, a reversal of this process takes place as in Fig. 13. From this it will be seen that electrons flow in and out of the condenser with each change of direction of the current, and although the same electrons do not emerge from the one side as enter the other, yet the effect is that of an unbroken circuit.

To return to the circuit under discussion, the H.F. current from the anode of the screen-grid valve travels along to the condenser C_2. This condenser then passes on similar alternations to the second tuned circuit in our receiver. The action of this is exactly similar to that of the aerial circuit already dealt with. It has to be tuned in just the same way, and when the variable condenser C_3 is adjusted to the correct capacity it will oscillate in a similar manner. These oscillations are imposed on the grid of the detector valve V_2 in the same way that the oscillations in the first tuned circuit are imposed on the grid of V_1. However, in this case a condenser C_5 is included in the lead to the grid. This has a similar action to that of C_2 in that it offers a ready passage to the H.F. impulses. Its presence in the lead to the grid of the valve is justified, however, by the necessity of isolating the grid from the rest of the circuit, an essential condition of the valve's function as a detector. This little point cannot be dealt with more fully here, but readers are referred to previous articles which have appeared in these pages for a complete explanation of the function of the detector valve.

To analyse our findings up to the moment, we have come across steady direct current, high-frequency alternating current, and pulsating direct current. And now, in passing from the grid circuit of the detector valve to its anode circuit we meet with low-frequency alternating current.

Figs. 12 and 13.—Diagrams illustrating the action of a condenser when subjected to an alternating current.

Speech Currents

It must be understood that when music or speech is being received the H.F. current which the radiated waves induce in our receiver circuits is not of constant strength. It varies according to each little inflection of the transmitted sounds. The variations occur at a much slower rate than the individual H.F. pulsations of the current. For instance, the transmission of a pure musical note such as middle C would cause a rise and fall in the strength of the H.F. pulsations at a rate or frequency of 256 times per second. The action of the detector valve is to isolate these low-frequency fluctuations, which represent the actual sounds being transmitted, and they are then passed on to the output valve V_3.

An analysis of the anode current of the detector valve will show it to be more complex even than that of the first valve, for the low-frequency pulsations are now present as a separate component. The anode current as it leaves the valve, therefore, can be considered as being composed of three distinct elements. Firstly, a steady direct current; secondly, a high-frequency alternating current; and thirdly a low-frequency alternating current. It is the last named which has to be passed on to the final valve for amplification. The other two components we do not want, although the H.F. current can be used for reaction purposes by feeding it back through the variable condenser C_4 and the reaction coil. This latter is placed near the grid coil and the passage of the H.F. current tends to boost up the strength of the oscillations in the latter.

The direct current component passes through the H.F. choke and the primary winding of the low-frequency transformer to the H.T. battery. Its path can easily be traced out by reference to Fig. 3.

The low-frequency current passes quite easily through the H.F.C., since the inductance of this is not sufficient to impede this comparatively slowly fluctuating current. However, the inductance of the transformer primary offers a very appreciable impedance, and this causes a difference of electrical pressure between one end of the winding and the other. This pressure or electro-motive force (E.M.F.), as it is called, fluctuates with every variation in the current and these fluctuations induce similar but amplified fluctuations in the secondary winding of the transformer. This secondary winding, it will be observed, is connected to the grid of the output valve V_3 and therefore these fluctuations are imposed on the grid. The object of this valve is, of course, to amplify these.

The current flowing in the grid circuit (comprising the secondary winding of the transformer and the grid-bias battery) is purely low-frequency current. The H.F. current has been stopped by the H.F. choke and the direct current component has passed through the primary of the transformer to the H.T. battery, and thus it is only the low-frequency or speech current which arrives at the grid of V_3. This is amplified by the valve and passed through the loud-speaker.

TRIMMING SUPERHETS

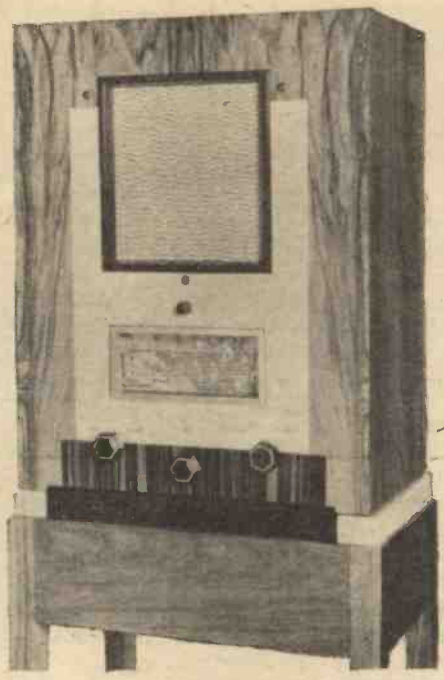
ACCURATELY to trim a superhet a signal generator is sometimes essential, but there is one point that is often overlooked when this instrument is used. Most multi-valve superhets have A.V.C. incorporated, and therefore a slight adjustment of the trimmers does not have any appreciable effect on the output signal. When making preliminary tuning adjustments with this type of set it is therefore necessary to break the A.V.C. circuit at the anode of the double-diode valve.

THE OCTODE VALVE

THE octode frequency-changer valve is exactly similar to the heptode, except that the first detector or mixer section is a pentode instead of a tetrode, and, of course, it has the advantages which distinguish the H.F. pentode from the S.G. type of valve. No injector coil or other form of external coupling is required between the oscillator and mixer sections of either the heptode or the octode, the necessary coupling being provided by the electron stream itself. This is known as electronic coupling, and is thus distinguished from other forms of coupling.

THE FERRANTI A.C./D.C. CONSOLETTE

A New Four-valve All-electric Superhet.



A three-quarter front view of the Ferranti receiver on its table, showing its attractive appearance and neat layout of the control knobs.

THIS receiver, which was first shown at Olympia last year, has several interesting features, including a visible tone control dial. This shows at a glance the station names and wavelength, whether the set is tuned correctly, the position of the tone and volume controls, and whether the set is on or off. Another special feature is a floating chassis to reduce resonance.

The receiver is suitable for use on 200 to 250 volts D.C. or A.C. of any frequency, and a leaflet sent out with each receiver gives clear instructions for connecting up to the mains supply. The wave-change switch knob is on the left-hand side of the receiver, and the combined on-off switch-knob and volume control is on the right-hand side. The centre knob is the tuning control, and the receiver is tuned by rotating this knob until the tuning bar coincides with the dot on the dial indicating the position station. A scale giving medium wavelengths (200 to 550 metres) is included at the top of the dial, and long wavelengths (900 to 2,000 metres) at the bottom of the dial.

Operation

After connecting the set to the mains, and switching on, the volume control pointer is set about quarter way along its travel. The dial will be illuminated, and in less than a minute the valves will be heated up, and the set will be ready for reception. As the tuning knob is rotated the pointer of the electric tuner will move downwards as each powerful transmission is received, and will rise as the station is passed. The correct tuning position for any station is the point at which the electric tuner pointer moves to its lowest position. The amount of the movement varies according to the strength of the station received, and in the case of very weak signals, especially when using a mains aerial, no movement will be apparent. Such weak signals can be tuned in in the usual way, and for this purpose the volume control should be advanced.

Delayed automatic volume control is provided, and the manual control enables the volume to be set at any desired level, the pointer at the bottom right-hand corner of the dial giving an indication of the degree of volume. The small knob seen above the centre of the dial is for tone control. This will reduce extraneous noises, particularly when listening to very distant stations with the volume control turned to its maximum position.

SPECIFICATION IN BRIEF

RECEIVER: Ferranti Universal A.C./D.C. 4-valve superhet. Consolette model.

MAKERS: Ferranti Ltd.

SPECIFICATION: Four valves. Oscillator and first detector, H.F. pentode and first L.F. amplifier, second detector and A.V.C. power valve, half-wave rectifier, and barretter. Moving-coil speaker. Electric tuning. Continuously variable tone control. Delayed automatic volume control. Steel chassis. Walnut cabinet inlaid with maple and measuring 19½in. x 14½in. x 9½in.

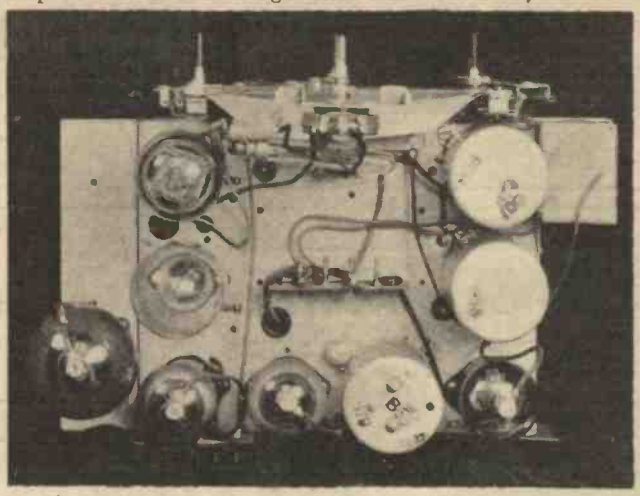
PRICE: 13 guineas. A.C. or D.C. mains 200/250 volts, any supply frequency.

Constructional Details

The set is housed in a beautifully finished walnut cabinet with a front inlaid in quilted maple. A suitable table is provided to match. The chassis is an all-steel one, and a feature of the component assembly is that the tuning condenser unit is mounted below the chassis. A Ferranti moving-coil speaker is mounted above the set, and inside the cabinet at the top of the receiver two terminals are fitted to which connection may be made for operating one or two external speakers. Great care has been taken with the design to render it as fool-proof as possible, insulated spindles being provided for the controls, to prevent the possibility of shock when used on a D.C. supply having the positive main earthed, or if wrongly connected.

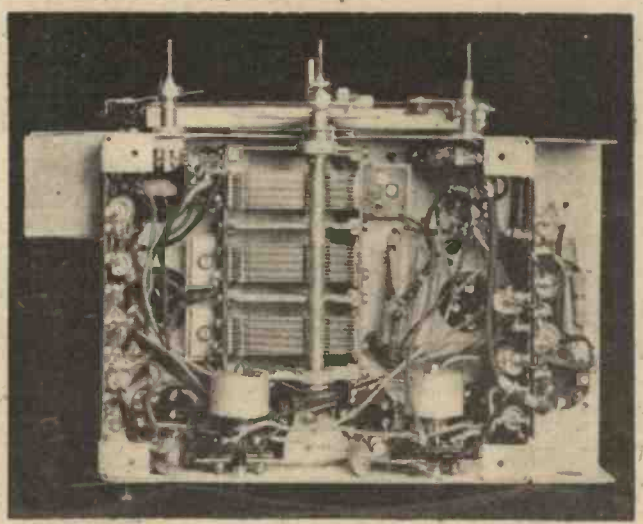
Fitting an External Speaker

An external speaker may be fitted to this receiver, the necessary terminals for which are situated at the rear of the chassis. Ferranti, Ltd., make a variety of such speakers, which are specially suitable for this purpose, requiring no special adaptors or fitments of any kind. If any other make of speaker is used, a Ferranti transformer, type OPM6 (price 22s. 6d.) must be employed. The terminals on the transformer marked "Speaker Ratio 22.5/1" should be connected to the extra-speaker terminals on the set, and the terminals marked "Receiver" should be connected to the extension speaker.

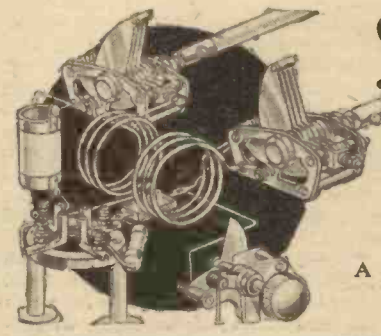


Above, chassis view showing the neat layout of the components.

The receiver is economical to run, as its current consumption is only 90 watts. From this it will be seen that the receiver consumes less current than that required to light an average size room. A point worth mentioning is that all Ferranti receivers are covered by a twelve months' guarantee, with the exception of the valves, which are sold under the same conditions as electric lamps, and are not, therefore, guaranteed.



Sub-chassis view showing the ganged tuning condensers.



Short Wave Section

ABOUT TUNING COILS

A Practical Article Dealing with Tuning Coils, Variable Condensers, and Dials.

AT the present time it is certainly true that a short-wave set is designed with a view to range and, in consequence, the high-frequency side of the circuit is the more important. Tuning arrangements, therefore, must conform to two rules—"reliability" and "low-loss." In the early days of short-waves, as experienced "fans" will remember, the short-wave fraternity went "low-loss mad," and skeleton construction of coils and condensers, together with "de-based" valves, were all the rage. All this is not necessary now, for with better-quality insulating materials of almost infinite resistance, short-wave components are as being used nowadays, this is an extremely satisfactory combination. Three coils are generally required to cover the complete range from 10 to 80 metres. Naturally, different makers have their own ideas as to coil design and particularly as to various arrangements for spacing the coil-pins. Some makers of short-wave gear provide three other different plug-in fittings besides the valve-pin type already mentioned. This, the writer feels, is an unfortunate situation in that all makes of plug-in coils should be interchangeable, firstly for the convenience of the amateur who may possess more than one make, and secondly in the event of one manufacturer ceasing to make short-wave coils. Short waves are coming to the fore, more makes of coils will appear on the market, and it is strongly recommended that manufacturers should decide now on one or another form of pin arrangement as standard.

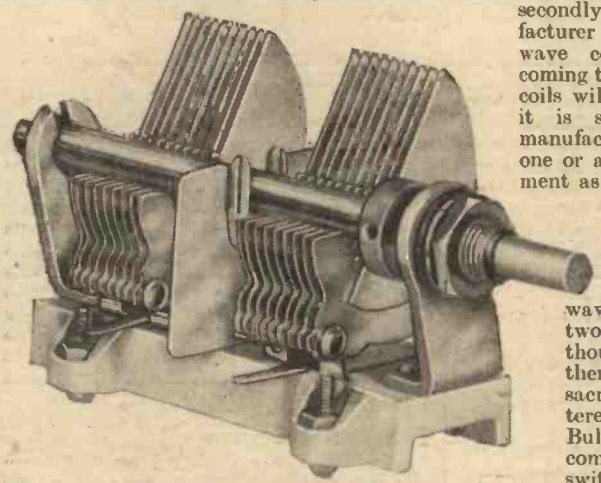


Fig. 2.—A Polar two-gang short-wave condenser on a special steatite base.

There may be many who feel that plug-in coils are a little obsolescent even for a more-or-less experimental receiver such as a short-waver—for these there are one or two wave-change designs. Although they are very well made, there is bound to be some slight sacrifice of efficiency in the interests of convenience. Messrs. Bulgin have a very interesting combination of plug-in coils and switching on the market. Seven coils are obtainable covering the entire range from 10 to 2,000 metres, and out of these any five coils may be plugged in. A multiple switch arranges for any one coil to be put into circuit.

much more efficient, and the design of short-wavers follows quite standard practice. Care still needs to be taken, however, for maximum results, and in this article some hints on tuning arrangements are given.

Coils

On the two broadcast wavebands, wave-change switching from one to the other is the order of the day, but owing to the number of different wavebands used on short waves, plug-in coils of some form still hold sway. The two-pin variety such as used to be popular some years ago are still used by many amateurs. They made probably the most useful and flexible tuning arrangements ever attempted, but have been superseded by more modern forms and are no longer on the market. They are, however, quite simple to make, and directions as to how to do this were given in PRACTICAL WIRELESS a few weeks ago. The important point to remember is that the bases and holders must be of the best quality obtainable, as otherwise losses would ruin all the good effects of the efficient coils. The modern form of short-wave coil is usually made with a four-pin base to plug into a valve-holder, and in view of the special low-loss materials already mentioned

Condensers

There are, it seems, more varieties of special short-wave condensers on the market than there are of coils. It is useless to employ an efficient coil with a poor condenser, and therefore it must be seen to that the losses in the condenser are small. This is done by means of keeping the dielectric material at a minimum, and condensers of reputable make can be relied upon in this respect. Another question to consider in regard to short-wave condensers is that of noise. They are usually made with double spacing between the vanes to minimise the risk of noise due to dirt between them; and as a rubbing contact is so often liable to cause noise, a pigtail connection between moving vanes and chassis is advisable. Contacts between two dissimilar materials set up a form of chemical action which, in a condenser, can cause a "crackling" noise. This was frequently found to be the case where steel ball-bearings were used with a brass condenser, and as a result short-wave condensers are specially fitted with phosphor-bronze ball-bearings. It is even more essential on short waves, than on medium or long, that the variable condenser should work smoothly and easily, for, as short-wave amateurs know, searching for and the final resolving of short-wave signals is so much more "tricky."

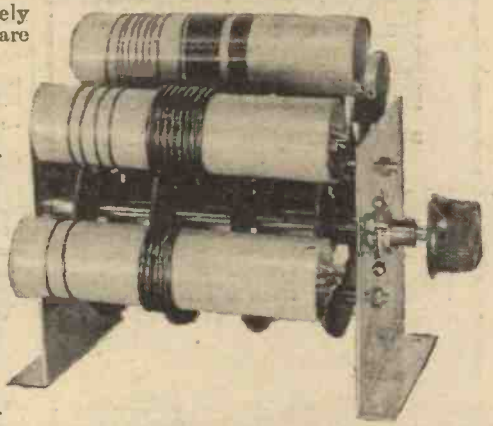


Fig. 1.—A Bulgin multiple short-wave coil chassis.

Dials

Besides smoothness of working in the condenser, then, it is obvious that the dial used with it must work smoothly and efficiently, and in this the modern amateur is fortunate. Old hands will recall many troubles and difficulties arising from the cheap and nasty slow-motion dials once so popular. Besides a "coarseness" of motion, "backlash" and "slip" were the curse of the early slow-motion dial, but all these are entirely absent from the modern condenser drive of any reputable manufacturer. The writer recommends the

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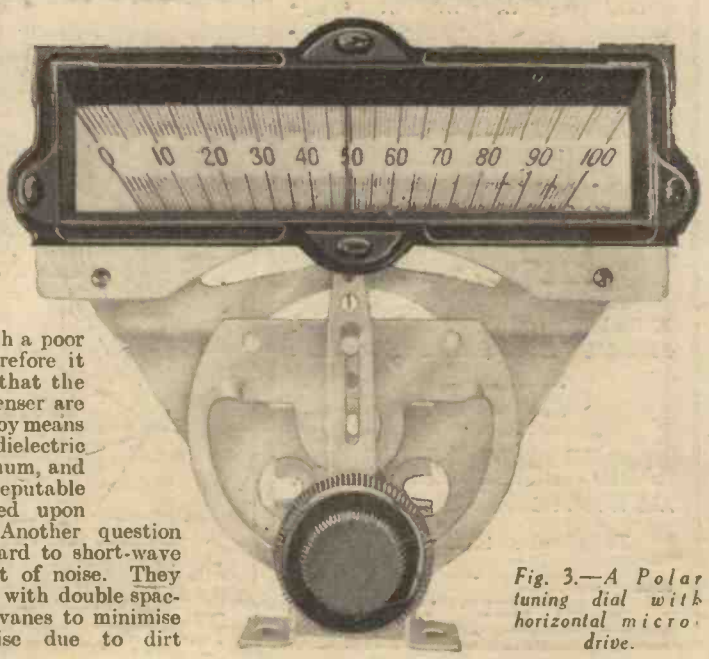


Fig. 3.—A Polar tuning dial with horizontal micro-drive.

SHORT-WAVE SECTION

(Continued from previous page)

"full-vision" type of scale and, naturally enough, this should be marked in degrees, not wavelengths (which would, of course, be for the medium and long waves). A particularly useful type for short waves is made by Polar. This has two concentric knobs, one giving a ratio of 7:1 and the other of 100:1. A useful tip where a condenser drive is concerned is to remove the small one-inch knob fitted to it and to fit a three-inch dial to the spindle. Besides affording a much better grip, the "dial-finger" ratio is much larger, and hence the knob, and so the whole drive, may be turned much more slowly. Great care must be taken to see that the drive it is contemplated using is entirely free from inherent noise, as some makes, being often very intricate pieces of mechanism, may be liable to creak.

The foregoing remarks apply to the tuning circuit more than to the reaction side, for here a little more laxity is allowable. Standard reaction components may be used, but for the sake of efficiency an air-spaced, rather than a solid-dielectric reaction condenser should be employed. This should be fitted with slow motion or a slow-motion drive, and the most important point to remember is that the space between the vanes should be kept scrupulously clean. It is obvious that as the reaction condenser is across H.T.+ and H.T.− any high-resistance leak due to dirt as the vanes are rotated means a high-resistance leak across the H.T. battery which results in a loud noise every time it occurs, or in the case of much dirt—a continuous crackle. It can be greatly obviated by putting a fixed condenser of .001 mfd. upwards in series with the reaction condenser, and so preventing any possibility of a battery short-circuit.

Coils and condensers for simple straight short-wave receivers only have been dealt with in this article, as it is believed that these are at present by far the most popular. The superheterodyne is thought by many to be the saviour of short-wave reception, particularly abroad, and this type of receiver will be dealt with in a later article.

LONG-DISTANCE WORK ON ULTRA-SHORT WAVES

A Description of the Special Aerial Systems Used for Transmissions Below 5 metres

UNTIL recently ultra-short waves have been regarded as suitable only for optical ranges, *i.e.*, up to 25 or 30 miles. On a few occasions these distances have been exceeded by taking transmitters up in aeroplanes or installing them in high towers or on mountain tops, and by this means a record range of 200 miles has been established, but such methods are not very useful for general purposes.

For some months now, however, American amateurs have been experimenting with directional aerials, and have obtained much greater ranges from stations located at ordinary levels. Consistent communication has, in fact, been established between Hartford and Boston, Massachusetts, over a distance of 100 miles, using aerials only 30 or 40 feet up in the air. Actually signals have been received over 290 miles by this method, but the Hartford-Boston experiments are of particular interest because communication has been maintained daily for a period of four months, with no more than one or two days missed. Such results would have been considered impossible a year ago.

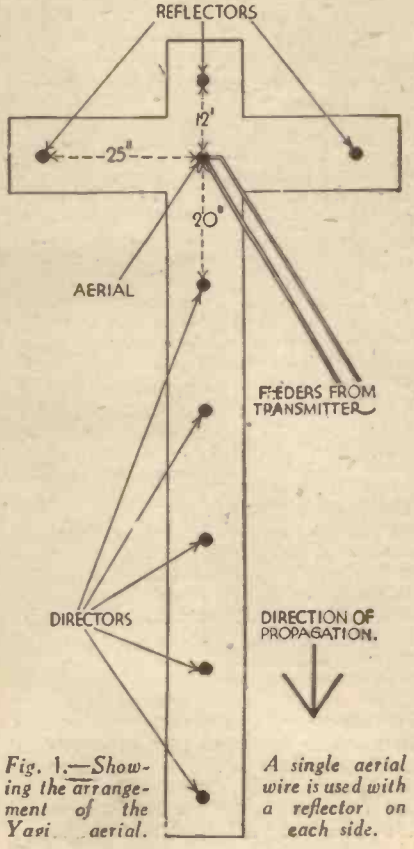


Fig. 1.—Showing the arrangement of the Yagi aerial.

A single aerial wire is used with a reflector on each side.

The Aerial System

The aerials are designed on the same principle as the directional aerials used by beam stations working on the longer short waves between 15 and 50 metres. These aerials consist of two parallel rows of vertical wires, one set of which are the aerials proper and the other set the reflectors. Figure 2 illustrates diagrammatically an aerial array as seen from the top. The heavy dots are the aerial and reflector wires. The aerial wires are fed with high-frequency current from the transmitter by means of twin feeders connected to the bottom of the wires. Since the action of the aerial depends on producing the proper phase relation between the currents in each wire the feeder is transposed between each wire and is cut very carefully to the proper length.

The aerial and reflector wires are approximately half the wavelength long, so that on 5 metres they are about 8 ft. long. The spacing (S) between wires in each group is also about half a wavelength, but the distance (D) between the groups is only a quarter of a wavelength, or about 4ft. Thus the whole array occupies a space of about 25ft. by 5ft., which is by no means too big for a private garden. Similar arrays on longer waves occupy so much space that they are beyond the reach of most amateurs.

In addition to increasing the range of a transmitter to an extraordinary extent, the directional aerial produces a correspond-

ing increase in the range of reception. At the beginning of the Hartford-Boston experiment the Hartford station was the only one using a directional array, and the operator could not only put his signals into Boston but was able to hear Boston stations which were using non-directional aerials with a normal range of only 25 miles or so.

The success of these tests on 5 metres led to tests on the much shorter wavelengths around 1¼ metres (125 centimetres). Preliminary difficulties arose in connection with the design of transmitters and receivers for this band, but with the arrival of the new American acorn valves, specially designed for ultra-short-wave work, satisfactory apparatus was obtained and almost at once a range of 35 miles was covered. This has since been increased to 75 miles, though it was necessary to take the receiver up a mountain to do it.

The Yagi Aerial

The 1¼-metre directional aerial is even simpler than the five-metre array. It consists of a row of vertical wires stuck through a wooden cross measuring about 10ft. long by 5ft. along the short arm. The

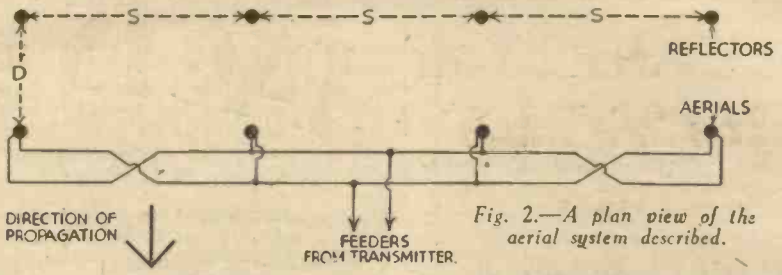


Fig. 2.—A plan view of the aerial system described.

arrangement, which is known as a Yagi aerial, is shown in Fig. 1. A single aerial wire is used with a reflector on each side of and behind it, and five director wires in front of it. All the wires are about 25ins. long.

The dimensions given for both arrays are only approximate. They are very critical for proper working, and depend on the exact wavelength used.

It seems that weather conditions affect transmission on the ultra-short wavelengths, since marked variations in signal strength from day to day, and during the day, have been recorded. It is improbable that the waves are reflected from the Heavyside layer and therefore it is supposed that changes in the atmospheric conditions are responsible.

British amateurs are also working on the same aspect of ultra-short-wave work, and we may expect some very interesting results over remarkable distances on 5 metres before long. The possibilities of point-to-point communication are enormous, especially in view of the incredible range of frequencies available at these wavelengths. For example, between 4 and 5 metres (75,000 kc/s and 60,000 kc/s), there is room for 1,666 transmitting stations.

LEAVES FROM A SHORT-WAVE LOG

Particulars of Some Interesting Transmissions that are Worth Listening For. By J. GODCHAUX ABRAHAMS

THIS is a busy season for short-wave fans, as DX transmissions are now rolling in nightly. Notwithstanding a careful study of my log, I have not yet been able to decide which particular weather conditions are the most favourable, as distant and relatively near broadcasts are not affected in the same manner. What I have found, however, is that when signals from the European transmitters are below par, signals from the other side of the Atlantic are fairly good and *vice versa*. Usually, when it is possible to tune in weak stations on the medium waves the higher frequencies are not at their best, but when it is a poor night for the reception of European programmes it is worth while devoting some hours to the short-wave set, when invariably many entries can be made in the log.

Above 30 Metres

At this period of the year one need not spend any time after about G.M.T. 22.00 on signals below 30 metres; it is the longer wavelengths which are most used, both for commercial and private transmitters. If you confine yourself to the 40-75 metre band you may sit up until the early morning with the full assurance that you will get good results. In the amateur band, between 41.1 metres and 42.86 metres, you will find several Spanish speaking announcements. A good landmark for this section of the condenser dial is to tune in HB9B, the Radio Club of Basle (Switzerland), on 42.14 (7,118 kc/s). Every Thursday, from G.M.T. 21.00 to 21.45, this association of amateurs relays a programme broadcast by Sottens or Beromünster, destined to Swiss nationals dwelling abroad. Just above this station, on 41.6 metres (7,211 kc/s), you should try for EA8AB (formerly EAR58), one of the old stagers, the Radio Club of Tenerife in the Canary Islands. I understand that the transmissions have been irregular, but they have usually been made on Saturdays and/or Sundays at G.M.T. 20.00-23.00. If you hear a time signal, bear in mind that Tenerife is one hour behind G.M.T.

A transmission which has been well heard is HJ4ABB, Manizales, Colombia, on 41.67 metres (7,200 kc/s), a 200-watter which styles itself (*Aqui*) *Radio Manizales, la Voz de Caldas*. Broadcasts are carried out on most nights between G.M.T. 01.00 and 03.00. The closing item is a gramophone record of *Just a Gigolo*.

I cannot recall that anybody in the British Isles has so far reported reception of CR6AA, Lobito, Angola (Portuguese West Africa), on 41.8 metres (7,177 kc/s), but I mention its schedule and call for what it may be worth. Lobito is stated to be on the ether every Wednesday and Saturday between G.M.T. 19.30 and 21.30, and calls in Portuguese: *Estaçao Radio Emissora Lobito*.

Above HB9B, Basle (42.14 metres), in the midst of a number of Rocky Point (New York) commercials, search should be made for JVT, Nazaki, Tokio, a 20-kilowatter on 44.44 metres (6,570 kc/s), and which is now used regularly for the relay of the JOAK medium-wave Tokio broadcaster. The best time for a trial is G.M.T. 09.00-12.45, although the wavelength is rather high for this time of day. JVM, Tokio, 27.93 metres (10,740 kc/s), has been temporarily suspended on weekdays, but operates on Sunday mornings.

TIEP, San José (Costa Rica), on 44.71 metres (6,710 kc/s), is a good "catch," and has been verified by a number of listeners recently. As local time is six hours behind G.M.T., it is useless making a search before midnight, and would be better still between 01.00 and 03.00. The call is put out in Spanish and English: The Voice of the Tropics (*La Voz del Tropico*). If you do log the station write to Eduardo Pinto Hernandez, Apartado 257, San José, Costa Rica; you will receive an illustrated card as a "veri."

Venezuela and Ecuador

YVQ, Maracay (Venezuela), on 44.96 metres (6,675 kc/s), is not an amateur, but the National short-wave transmitter of the State of Venezuela. However, in addition to its official duties it frequently relays programmes from Caracas broadcasters and also Colombian and other stations which have associated themselves in the Indo-Americana Chain. It is a powerful station and a worth-while log as the medium through which much weaker signals can be received.

Mention must also be made of El Prado (HC1FG), Rio Bamba, Ecuador, which, forsaking its 19-metre channel during the winter months, now solely works on 45.31 metres (6,620 kc/s). There is only one transmission weekly—namely, on Fridays at G.M.T. 02.00-04.30.

Byrd Antarctic Expedition

During the autumn months many short-wave listeners in the British Isles reported reception of signals from the Byrd Antarctic Expedition, but it was only in few cases that these were received direct. On most occasions a pick up was made of W2XE, Wayne (New Jersey)—the main short-waver of the Columbia System, which usually relays the WABC, New York, programmes on 49.02 metres (6,120 kc/s)—when it relayed messages from the Bay of Whales, Little America, at G.M.T. 02.00 on Sundays. On the other hand, it has often been possible to tune in W2XAF, Schenectady, on 31.48 metres (9,530 kc/s), which, on every other Monday morning at G.M.T. 03.00-03.30, broadcasts programmes to the hardy explorers. We are now nearing our last opportunities of tapping these messages and two-way conversations, as the members of the Expedition are leaving for New Zealand towards the beginning of February. If the KFZ channels (22.68, 25.63, 33.94, 44.95, and 45.05 metres) cannot be captured, try for LSX, Buenos Aires, on 28.99 metres (10,350 kc/s), KET, Bolinas, 31.65 metres (9,480 kc/s), or, perhaps better still, WEM, Rocky Point (New York), on 40.54 metres (7,400 kc/s). Between G.M.T. 02.00 and 03.00 on Thursdays it is sometimes possible to hear operators arranging for broadcasts. It is worth while trying for these transmissions as it may be some years before a similar opportunity comes our way again.

Convert Your Radio into a Radio-gramophone

THE Cosmocord Unigram which we have recently had under test will be found ideal for converting a wireless set into a first-class radio-gramophone. Costing 75s. as illustrated, it makes a suitable table for the wireless set, the pick-up leads being connected to the set and the electric motor to the mains.

It has a most attractive wooden cabinet of very ingenious design, and is fitted with a complete Cosmocord gramo-chassis, Model 55, mounted on a platform. As the front of the cabinet (fitted with a suitable handle) is pulled open, the platform on which the chassis is mounted slides forward, giving convenient access to the turntable and pick-up. It is certainly of very modern design and bristles with features, chief of which is that whilst the record is being played the lid may be shut in order to

The unique Cosmocord Unigram (Model 75) referred to on this page.

eliminate needle scratch coming direct from the record. If desired the gramo-chassis may be obtained separately for 55s., and is supplied on an extremely attractive bakelite unit plate ready for fixing in a cabinet. It is fitted with a silent power induction motor for A.C. 100-240 volts, 50 cycles, and a 12in. de luxe turntable. The Unigram gives you all the qualities and advantages of an up-to-date radio-gramophone, and when used in conjunction with a receiver may form a complete unit of very pleasing appearance.

A New Nine-pin Cable Plug

PLUGS for the interconnection of amplifiers, adaptors, and other apparatus often require quite a multiplicity of connections, and it is for this purpose that A. F. Bulgin and Co., Ltd., have introduced a new nine-pin cable plug, list No. P.63. The new plug is of the simplest possible construction and has hollow pins through which the cable may be passed and soldered at the tips of the pins in the manner adopted for valves. Terminals are not provided, but this plug will certainly meet a great many uses and its construction renders it inexpensive. Plenty of room is provided inside the body of the plug, the cover being detachable by loosening three screws. It costs 2s. 3d.

A W.B. Extension Speaker

THE Whiteley Electrical Radio Co., Ltd., have recently produced the attractively-designed extension cabinet speaker shown at the foot of the centre column. Its price is 29s. 6d.; yet it is a Stentorian moving-coil speaker, complete in a walnut cabinet of sensible size. It is provided at the back with plugs and sockets, enabling it to be used as a principal or extension speaker, and is provided with a magnet of the new material that this firm are exclusively using this year. It uses the new Whiteley speech coil, and will give clear, full reproduction at any volume up to a maximum of two watts undistorted.

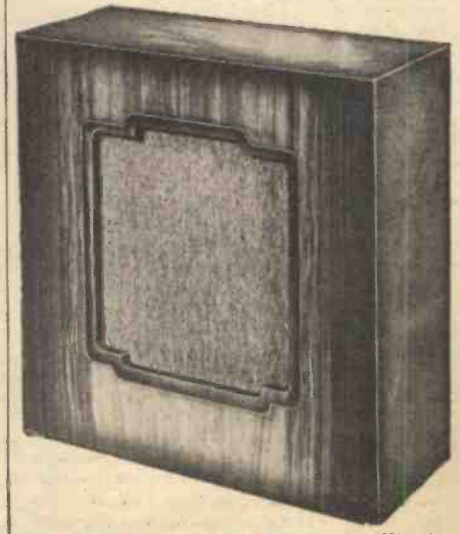
A New Mains Pentode

A NEW indirectly-heated mains pentode valve of extremely high efficiency has lately been introduced by Mullards, and is designated the Pen. 4VB. The valve is particularly suitable for use in modern receivers employing a diode detector, from which the output is not very high. In such a circuit the particularly high amplification of which the Pen. 4VB. is capable is extremely valuable—this new valve has a mutual conductance of 10 milliamps per volt. The principal characteristics of the valve are given in the table below, and from these it will be seen that the heater has a rather higher current consumption than usual, the current actually being 1.95 amps.

The Pen. 4VB. is provided with a standard 7-pin base and the connections are standard, and the same as those used for other 7-pin output pentodes.

The high degree of sensitivity of this interesting new valve may be judged from the fact that it gives an output of 3.8 watts (10 per cent. total harmonic distortion) for an input of only 3.6 volts R.M.S. For 5 per cent. total harmonic distortion the output is 2.6 watts for an input of 2.5 volts R.M.S., this representing a sensitivity of 416 mW/V².

(Continued on facing page)



The Stentorian extension Speaker by Whiteley Electrical Radio Co., Ltd.

FACTS AND FIGURES

(Continued from the facing page)

There is no doubt that this valve will meet with wide popularity by constructors and receiver manufacturers alike.

Chief Characteristics of the Mullard Pen. 4VB.

Heater voltage	4
Heater current	1.95 *amps*
Maximum anode voltage	250
Maximum aux. grid voltage	250
Optimum load	8,000 *ohms*
Mutual conductance	10 *m.a./volt*
Correct bias resistance	145 *ohms*

Push-Pull Input Transformer

THE heftily-built transformer shown on this page is the Varley type DP.6 input push-pull unit which is ideal for use in quality amplifiers where a push-pull output circuit is employed. The trans-

The Varley push-pull transformer.

former has a step-up ratio of 2.5 : 1 on each half, or of 5 : 1 overall, and its general characteristics are exceptionally good. For example, the primary winding has an inductance of 91 henries when not carrying any current, and of 27 henries with a steady current of 10 m.a. passing through it. The latter current, incidentally, is the maximum for which the component is intended, and is higher than is generally required for the preceding valve. The resistance of the primary winding is not high, being 2,300 ohms, so that the voltage-drop brought about by its inclusion in the anode circuit of a valve is only 23 volts when the full 10 m.a. is being handled. The total secondary resistance is 12,500 ohms, and the external dimensions of the unit are 3¼in. by 3⅛in. by 3⅛in. The price is 19s. 6d.

There is also a good range of push-pull components in the Varley list, this firm being one of the pioneers of push-pull. The DP.7 transformer, for instance, is an output transformer suitable for use in conjunction with a pair of large output valves and capable of carrying a primary current up to 65 m.a. (each half). The primary resistance is 125 ohms on each side of the centre tap, and the resistance of the secondary is 280 ohms and 1 ohm respectively, according to whether the 1.4 : 1, or the 28 : 1 ratio is employed. Priced at 18s., the DP.7 has the same external dimensions as the DP.6.

PRACTICAL 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).

B.B.C. and Television Broadcasts

SIR,—Since Television is still in its infancy, as compared with ordinary broadcasting, I think its standard could be raised considerably if the B.B.C. would give us more television programmes, but they say that they cannot afford more than two sessions per week, and that as there are not comparatively enough receivers it would not be worth their while. But what is preventing them from giving us daily programmes of recorded television, instead of one of the many programmes of gramophone records?

If the B.B.C. gave us such programmes, experimenters would have much more chance of improving reception. In addition, listeners-in hearing the television signals frequently will buy receivers, and thus after a time the B.B.C. will find it worth while to broadcast more "actual" programmes.—T. D. CROSLAND.

[*The B.B.C. is closely watching the Television situation and obviously has awaited publication of the Television Committee's report. It would be unwise for it to increase the number of transmissions on the 30-line system until that report had been made known. Rest assured that the B.B.C. will lose no time in giving vision programmes.*—ED.]

An Eliminator Problem

SIR,—In the answer to an Aylesbury reader's eliminator problem, you stated, in PRACTICAL WIRELESS of December 29th, that a serious hum is introduced by supplying filament current directly from an eliminator.

I would like to know how you have managed to feed the filaments from the mains current in your two-valve D.C. receiver circuit published in "Circuits and Sets for All" in PRACTICAL WIRELESS of December 29th. Is there no hum in the L.S. in this case? If there is no hum, why is it not possible to supply filament current from the eliminator? Is there any simple method of smoothing the fluctuating D.C. (rectified A.C.), if we want to feed the filaments as you have done in your D.C. two-valver?—P. S. MEPTA (Kensington).

[*Generally speaking, hum is introduced by feeding valve filaments directly from the D.C. mains, this being especially true when H.F. amplification is employed. In the circuit to which our correspondent refers there is only a slight trace of hum, due to the use of medium-amplification valves.*—ED.]

Short-waver for Overseas

SIR,—I have taken PRACTICAL WIRELESS for upwards of eighteen months, and with each succeeding issue have quickly perused the headings for a short-wave circuit. I am still looking. Now comes your query in reply to L. Buckley, of India, and R. Green, of Kenya—is the publication of such a circuit warranted? PRACTICAL WIRELESS is by far the most popular and widely-read of the wireless periodicals in these parts, and not only is such a set most emphatically warranted, but is looked forward to with growing impatience!

I agree with your correspondent from India, the circuit required is a real "hot stuff" short-waver without going into the medium bands. Empire listeners are now legion, and to my mind a straightforward short-wave receiver (not for the expert or experimenter) capable of being driven from batteries is what is required. A steady mains supply is not always "on tap" in these outlying parts, and the more fortunate Empire listeners can have mains power *via* an eliminator.

Please get busy and let us have that "hot stuff" short-waver soon. It may interest you to know that the Eddystone "Kilodyne" range are the most popular commercial receivers here.—W. H. JOHNSTON (Tabora, Tanganyika, E. Africa).

[*The Short-wave Section will include details of such a receiver.*—ED.]

A Set for Colonial Readers

SIR,—I would like to second Mr. Rumboll's suggestion that you give particulars in your journal of a short- and medium-wave set for Colonial readers. I have been a reader of most of the popular English wireless magazines for some months now, in the hope of coming across such a set.—C. HINDE (Johannesburg, S. Africa).

A Five-valve Battery Superhet.

SIR,—To celebrate the amalgamation of *Amateur Wireless* with your paper I would suggest that you publish, for your country readers, the circuit of a really good four- or five-valve battery superhet., giving 7 k/cs separation, delayed A.V.C., simple tuning, built-in whistle rejector, tone control, and Class B output, capable of delivering 2 watts undistorted output.—A. E. KNOX (Draperstown, N. Ireland).

"Common Misconceptions"

SIR,—In an article in your issue of January 19th under the above heading, the author, dealing with tone correction, makes the following statement:—

"Departures from perfect fidelity are mostly due to losses of certain audio-frequencies—usually it is the treble notes which are cut. No tone correction can put back what has been taken away. All that can be done is to suppress or partly suppress those frequencies which, owing to losses in other directions, are now unduly prominent."

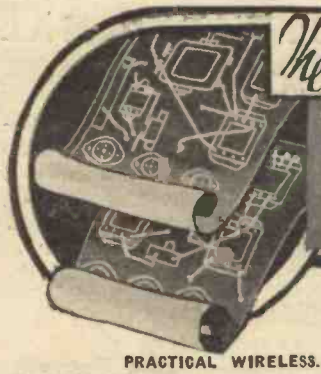
We desire very strongly to point out that the Multitone tone-control transformer is the only tone-control device which positively gives selective amplification and does not operate on a "loss" system.

Our handbook shows the amplification curves of three models of the tone-control transformer, from which it will be clearly seen that towards either extreme of the tone-control setting there is a positive gain in amplification at one or the other end of the frequency scale.

We can quite understand that your contributor would not want in such an article to advertise a specific component; it is equally clear, however, that a sweeping statement such as he has made, if it is erroneous, having regard to the performance of a particular component, is misleading to the public for whom the article is intended, and definitely unfair to the component which does just what the article says no device can do.—THE MULTITONE ELECTRIC CO., LTD. (Islington, London, N.1.).

STOP PRESS NEWS!

See the Television Report on Page 746



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

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

PRACTICAL WIRELESS.

Blueprints, 1s. each.

Dolphin Straight Three	24.9.32	PW1
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Argus Three	12.11.32	PW6
Argus Three Mains Unit	26.11.32	PW6A
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Autokoil Pentode Two	31.12.32	PW9A
Selectone Battery Three	14.1.33	PW10
Fury Four	28.1.33	PW11
Stand-By Two-Valver	18.2.33	PW11A
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Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	4.3.33	PW22
Double-Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
Class B Detector Two-Valver	17.6.33	PW24A
D.C. Ace	15.7.33	PW25
Arcady Portable Three	15.7.33	PW25A
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	4.11.33	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	10.3.34	PW35
Pocket Portable	10.3.34	PW35A
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Prima Mains Three	5.4.34	PW35D
Master Midget Two	12.5.34	PW35E
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	27.10.34	PW40
A.C. £5 Superhet Three	24.11.34	PW41
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW43
Universal £5 Superhet	15.12.34	PW44
A.C. Hall Mark	26.1.35	PW45

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	31.3.34	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	27.10.34	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.

B.B.C. One-valver	28.5.32	AW344
B.B.C. Special One-valver	6.5.33	AW387
Twenty-station Loud-speaker One-valver (Class B)	27.10.33	AW449

Two-valvers: Blueprints, 1s. each.

Melody Ranger Two (D, Trans)	13.5.33	AW388
Full-volume Two (SG, Det, Pen)	17.6.33	AW392
Iron-core Two (D, Trans)	29.7.33	AW395
Iron-core Two (D, QP21)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	17.2.34	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	17-2-34	AW388A
Lucerne Minor (D, Pen)	24.3.34	AW426
Family Two (D, Trans)	*Apr.* '32	WM278

Three-valvers: Blueprints, 1s. each.

£8 Radiogram (D, RC, Trans)	21.5.32	AW343
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	3.3.34	AW422
Cossor Melody Maker with Lucerne Coils	17.3.34	AW423
P.W.H. Mascot with Lucerne Coils (Det. R.C., Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	24.3.34	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)	9.6.34	AW437
All-Britain Three (HF Pen, D, Pen)	6.9.34	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.10.34	AW451
Transportable Three (SG, D, Pen)	*Feb.* '32	WM271
Multi-Mag Three (D, 2 Trans)	*June* '32	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.-B. Three (D, LF, Class B)	*Sep.* '33	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)	*Feb.* '34	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

Four-valvers: Blueprints, 1s. 6d. each.

65/- Four (SG, D, RC, Trans)	17.12.32	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	17.2.34	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)	*Feb.* '32	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	*Nov.* '32	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)	*Feb.* '34	WM350

Five-valvers: Blueprints, 1s. 6d. each.

Super-quality Five (2 HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (SG, D, LF, Class B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Consolectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	*June* '32	WM286

Three-valvers: Blueprints, 1s. each.

Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	26.6.34	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	WM333
Six-guinea AC/DC Three (HF, Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers: Blueprints, 1s. 6d. each.

A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	4.3.33	AW380
AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	*Apr.* '32	WM279
All Metal Four (2SG, D, Pen) A.C.	*July* '33	WM329

SUPER-HETS.

Battery Sets: Blueprints, 1s. 6d. each.

1934 Century Super	9.12.33	AW413
Super-Senior	*Oct.* '31	WM256
1932 Super 60	*Jan.* '32	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets: Blueprints, 1s. 6d. each.

1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	*Feb.* '32	WM272
Seventy-seven Super, A.C.	*Dec.* '32	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM350
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.

General-purpose Portable (SG, D, RC, Trans)	9.7.32	AW351
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM287
Two H.F. Portable, (2 SG, D, QP21)	*June* '34	WM362
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM363

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	23.1.32	AW329
S.W. One-valver for America	31.3.34	AW427
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, RC, Trans)	20.8.32	AW355
Experimenter's 5-metre Set (D, Trans. Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19,'35	AW463

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Super-hets: Blueprints, 1s. 6d. each.

Quartz-crystal Super	*Oct.* '34	WM372

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.10.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM308

Three-valvers: Blueprints, 1s. each.

Emigrator (SG, D, Pen), A.C.	*Feb.* '34	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

The coupon on Page 778 must be attached to every query.

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.

Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

Using a Microphone

"I have purchased through an advertiser in your paper a microphone guaranteed to be in good order. I joined this to the pick-up terminals in my receiver but obtained extremely poor results. I get splendid results with a pick-up and, therefore, the set cannot be blamed. I returned the mike to the shop and they tested it and sent it back guaranteed 'in order.' I still fail to get anything like readable speech or music when this is used. Can you tell me why?"—D. H. (Bournemouth).

The microphone is probably quite in order but requires the employment of a transformer when joining it direct in the grid circuit of a modern valve. The majority of microphones are of low resistance, whilst the grid circuit of a modern valve requires a high resistance for correct working. Some microphones are provided with the necessary transformer inside the container, but apparently in your case this is not so. If the seller does not state the correct ratio of transformer we would suggest you obtain a tapped transformer capable of giving ratios from 50 to 150 to 1. A value of 100 to 1 will generally be found most suitable.

Adding a Valve

"I have an old two-valve set and should like to get rather better volume on my speaker. I get plenty of stations, but in general they are only just comfortable, with the result that people talking in the room, or paper rustling, will prevent speech from being accurately followed. Can you suggest the most suitable kind of amplifier to add to this type of receiver?"—T. B. (Kentish Town, N.W.5.).

We presume that you have the normal detector and L.F. circuit, and, therefore, there are two alternatives available to you. You can add an amplifier consisting of L.F. transformer and power valve, or can substitute a pentode for the present L.F. valve. The latter would be cheaper and would no doubt give you the desired result. The extra amplifier would probably render it necessary to introduce decoupling circuits in the previous stages in order to avoid instability. If your present L.F. transformer is of low ratio you could also consider the advisability of obtaining one with a much higher ratio—say, 7 to 1—and this, with the pentode, would be the most practical way to solve your problem.

A Di-pole Aerial

"I have seen in the daily papers recently some talk about the new television systems, and the term di-pole aerial has been mentioned. I am a newcomer to your splendid paper, and have previously taken in no wireless papers of any kind. I trust you will excuse my ignorance and would like to know what the term 'di-pole' means. It seems to suggest two poles, and most aerials must have a support at each end, hence my query."—J. K. (Bow).

The term does not refer to the supporting poles or masts, but has relation to the radiation characteristics. It is rather too involved to deal with in this section of the book, but may be given in detail at a later date. In brief it may be stated that it consists of a single wire having a length equal to one-half of the wavelength of the transmission.

A Short-wave Problem

"I recently made a short-wave one-valve set, and although I got very good results, the condenser gave trouble due to grating noises. After some experiment I found that this could be cured in the following manner: I soldered a length of fine wire (actually 32 D.S.C.) to the spindle, and wound this round the spindle three or four times and soldered the other end to a terminal screwed into the metal end-plate of the condenser. I find, however, that tuning is now very erratic, and the set often bursts into oscillation with the condenser set to various positions. Can my wire pig-tail have caused this? If so, what is the cure, as some commercial condensers seem to have the same arrangement?"—W. E. A. (Hove).

No doubt the inductance formed by your covered wire pig-tail is causing the trouble. One way of avoiding it is to remove the insulation from the pig-tail so that the turns will short-circuit and thus remove the inductive effect. You will, however, probably introduce difficulties in the way of noises caused as the adjacent turns of the pig-tail coming into contact, and the adjustment of the number of turns of wire and the direction in which it is wound, etc., will have to be found by experiment. It should not be necessary to use a complete turn, as the condenser vanes usually only turn through 180 degrees. A well-made commercial short-wave condenser would save you a lot of trouble.

Screening a Valve

"I am very keen on experiments, and would like you to help me in the following particular. I am at present dabbling in H.F. amplification, and desire to try various circuits with and without metallised or screened valves. I know that ordinary aluminium paint is useless for screening, but I do not want to buy both types of valve. I should like to get ordinary valves and then try the various circuits with the valves in both conditions. What is the most satisfactory method of 'metallising' the ordinary valve for my purpose?"—B. E. D. (Liverpool).

No doubt you would find it most suitable to use some fine copper gauze. This could be wrapped round the bulb and held in position with wire, a bare connection joined to earth completing the screening. Alternatively, if you did not mind the trouble, you could wind bare wire round and round the glass bulb, adjacent turns touching, but there would be a risk with this method of introducing inductive effects, and it would not be as satisfactory as the first-mentioned method.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

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

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ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves and Magnavox Super 66 energised speaker, £12/10/0.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, condensers, resistances, and diagram, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps with 4v. 2-4 amps., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps., with 4v. 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9; 250 milliamps, 30 hys., 20/-

ALL Premier Mains Transformers have engraved panels, terminal connections, all low-tension windings centre tapped, tapped and screened primaries 200/250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps. 4 volts, 2-3 amps, 4 volts 3-4 amps., 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps, 4 volts, 2-3 amps, 4 volts 3-4 amps. 12/6.

PREMIER combined HT8 and HT9 transformer rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, either type, 18/6.

PREMIER HT10 transformer rectified output 200 volts, 100 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, 19/6.

PREMIER HT11 transformer 500 volts 120 milliamps rectified output. 4 volts 2 amps, 4 volts 2 amps, 4 volts 3-5 amps, 22/6 with Westinghouse Rectifier, 42/6.

SPECIAL offer Western Electric mains transformers input 200/250 volts output, 350-0-350 volts, 120 milliamps screened primary 4 volts 1-2 amps, 4 volts 2-3 amps, 4 volts, 3-5 amps, 9/6. Input 100/250 volts, 300-0-300 volts 60 milliamps 4 volts 1-2 amps, 4 volts 2-3 amps, 6/6. Input 200/250 volts screen primary output 500-0-500 volts 150 milliamps 4 volts 3-5 amps, 4 volts 2-3 amps, 4 volts, 2-3 amps, 4 volts, 1 amp. 4 volts, 1 amp., 19/6.

MAINS transformer with Westinghouse Rectifier output 150 volts, 30 milliamps and 4 volts, 2 amps LT., 15/- the pair.

USA. 3-gang condenser with trimmers, 3/11 a really solid job.

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

B.T.H. Truspeed Induction Type (A.C. Only), Electric Gramophone Motors, 100-250v., 30/- complete. D.C. model Truspeed, 100/250v., 42/6.

COLLARO Gramo. Unit, consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-; without volume control, 46/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire-Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CENTRALAB Potentiometers, 400 ohms, 1/-; 50,000, 100,000, ½ meg., any value, 2/-; 200 ohms, wire wound, 1/-.

RELIABLE Canned Coils with Circuit accurately matched, dual range, iron cored, 2/11.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 144, 2,500 ohms, 12/6; D.C. 152 magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 16/6; 9in. cone, 22/6.

SPECIAL offer .00015 brass short-wave tuning condensers with slow-motion and complete dial, 3/9. Short-wave chokes 10-200 metres, 9d.

DUBILIER electrolytic condensers, 12 micofarads, 20 volts 6d., 8 plus 4 micro farads 500 volts 4/-, 50 mf. 50 volts, 1/9.

AMERICAN G.E.C. auto-transformers 500 watts, one side 110 volts other 90/240 volts in 5 volt steps, 40/-.

(Continued at top of column three)

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12-in. Turntable.

5/- DOWN

Electric Motor for A.C. Mains. Send only 5/-, balance in 10 monthly payments of 5/-. Cash or C.O.D. Carriage Paid, £2/10/0.

Garrard A.C.4. Cash or C.O.D. £2/2/6 or 2/6 with order and 11 monthly payments of 4/-

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Complete with 12in. Plush-covered Turntable. Brake, Speed Indicator, Patent Winding Crank. Will play two sides of 12in. record at one wind. Send only 2/6; balance in 10 monthly payments of 2/6. Cash or C.O.D. Carriage Paid. £1/5/0.

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ANOTHER BARGAIN!

REGENTONE MAINS UNIT

List Price £2:10:0

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Model W.I.F. 120/150 v. at 12 m.a. A.C. Mains only. 200/250 volts. Seven voltage tappings. A wonderful offer you should not miss.

and 9 monthly payments of 4/-.

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New Times Sales Co.

56, (Pr.W3.) LUDGATE HILL, LONDON, E.C.4.

(Continued from foot of column one)

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MAINS transformer input, 200/250 volts, 6 volts 1 amp, 4/6. 10 volts .5 amp., 4/6.

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VARLEY Constant Square Peak Coils, bandpass type B.P.7 brand new, in maker's cartons, with instructions and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.S., band-pass, complete with instruction, in original cartons, 2/6.

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CONDENSER Blocks, H.M.V. 400v. working, 4+2+1+1+1+.5 3/9; 2+2+1+1+1+.5, 1/-; Dubilier 300v. working, 4+4+2+.1, 3/-; Phillips 6+4+2+1+1, 4/6.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World Famous Continental valve manufacturer, all the following standard main types, fully guaranteed, 4/6 each; H.L., L. power, medium, high, low mag. and variable-mu screen-grids, one, three and four watt A.C. output, directly heated pentodes, 250v. 60 m.a. full wave rectifiers D.C. types, 20v. 18 amp., filaments, screen grid V.M., H., H.L. power.

THE following Types, 5/6 each; 350v. 120 m.a., full wave rectifier, 500v. 120 m.a., full wave rectifier, 2½ watt indirectly heated pentode.

THE Following American Types, 4/6; 250, 112, 171, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 83, 27.

THE Following Types, 6/6 each: 42, 77, 78, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A5, 2A6, 267, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59. Send for Complete Valve list.

GRAMPIAN Permanent Magnet 9 inch Moving Coil Speakers, handles. 4 watts. Universal Transformers, 18/6. Ditto Energised handles 5 watts, 2,500 ohms, 21/-.

10,000, 12,000, 15,000 ohm wire-wound potentiometers with mains switch, 1/6.

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ELLIOTT Moving-coil Milliameters projecting type, 2½in. diameter, 0-10, 0-30, 0-50, 0-150, 15/-.

DARIO directly-heated 1 watt, 200v. Mains Power Valves, 2/6.

BLUE SPOT 45 P.M. Speaker, multi-ratio transformer, handles 4 watts, listed 45/-, at 25/-, or in handsome walnut cabinet, 35/-. Blue Spot 99 P.M. Speaker, multi-ratio transformer, handles 5 watts, listed 59/6, at 31/-.

BLUE SPOT Energised Speakers 2,500 ohms type 29D.C., Power and Pentode Transformer, 9/11.

SUPER Moving-Coil Speaker by world-famous radio and gramophone company, 300v. 30 m.a. field (10,000 ohms), 25/-.

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(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest station: Clapham North, Underground.

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Draws attention to following bargains. No catchpenny lines, No stunts, just a dead square deal.

RADIOMART. Radiophone super short-wave condensers, all brass, steatite bases (the finest made) offered third list, .00016, 3/6; 2 gang .00016, 5/6.

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RADIOMART. Radiophone I.F. transformers, top trimmers, 2/6; also few 117 and 126 k.c.

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RADIOMART. Utility 3-gang, as above, straight or superhet, 7/11, with dial, 8/11.

RADIOMART. Famous 8 mfd. dry electrolytics 500v., 2/11; NSF., ditto, 8 x 8 mfd., 500 v., 3/6.

RADIOMART. BTH 7in. latest 2,500 ohm. moving coils, humbucker, 4 watt model, 12/6.

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RADIOMART. Telsen 1 watt resistors, cartridge resistors, toggle switches, tubular condensers, 6d. each.

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RADIOMART. Brand new condensers, eminent makers, 500v. working, 4 mfd., 3/6; 2 mfd., 1/10; 1 mfd., 1/6.

RADIOMART. 350v. working, 4 mfd., 2/9; 2 mfd., 1/8; 1 mfd., 1/4; 250v. working, 4 mfd., 2/3; 1 mfd., 1/2; 0.5 mfd., 9d.; 0.1 x 0.1 mfd., 9d.

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RADIOMART. Transformers: Igranic, 8/6; Parvo, 3/6; 3½-1 Ericsson (15/-), 1/3; Microphone, 2/6.

RADIOMART. Screened iron-cored dual-range coils with reaction circuit, 2/11; Igranic short-wave iron-cored dual-range, 3/3.

RADIOMART. Telsen Radiophone, dolly toggle switches, 8d.; Lotus radiogram switches, 9d.

RADIOMART. Radiophone H.F. chokes (manufacturers), honeycomb wound, 1/-; Metvick, 9d.

RADIOMART. Years of transmitting experience makes possible a specialised service in short-wave material which can be relied upon.

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RADIOMART, Limited, number as above, but double spaced, .00015, 3/9. The finest condensers ever made.

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RADIOMART. Western Electric 21/- microphones, 2/9; transformer, 2/6; Telsen dual-range short-wave coils, 3/6.

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RADIO CLEARANCE.—Standard Telephones and Cables mains transformers, shrouded type, for H.T.8 rectifier with 4v. 4 amp. C.T., L.T. winding; exceptional value at 6/- each.

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RADIO CLEARANCE.—British Radiophone 3-gang superhet. condensers, unscreened, 2 .0005 sections and 110 k/c section, complete with trimmers, dial, pilot light and escutcheon; 6/6.

RADIO CLEARANCE.—British Radiophone 110 kc/s. Intermediate frequency transformers; 3/- each.

RADIO CLEARANCE.—British Radiophone set of band-pass coils, manufacturers' type, with circuit diagram, suitable for tuned grid or tuned anode; set of 3 coils, 4/-.

RADIO CLEARANCE.—British Radiophone set of superhet. coils, manufacturers' type, with circuit diagram, suitable for use with above advertised condensers, 5/6 per set.

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RADIO CLEARANCE.—1/25 h.p. motors (Gilbert), 100-115 volts A.C., for television, suitable for 200-250v. if used with suitable resistance or lamp; 8/6 each.

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RADIO CLEARANCE.—8,000 ohms volume controls. log type, with Q.M.B. switch, by G.E.C.; 2/- each.

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RADIO CLEARANCE.—25,000 ohms British Radiophone graded potentiometers; 1/9 each.

RADIO CLEARANCE.—1 watt resistances, well-known make, all sizes; 6d. each.

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RADIO CLEARANCE.—1½mm. white sleeving; 9d. per doz. lengths.

RADIO CLEARANCE.—Telsen .0001 and .00015 reaction condensers; 5d. each.

RADIO CLEARANCE.—Steel chassis, cadmium plated, drilled ready for use; 3 valve, 1/-; 4 valve, 1/6 each.

RADIO CLEARANCE.—Steel chassis, cadmium plated, 2 and 3 valve type, fitted valve holders and terminal strips; 2/- each.

RADIO CLEARANCE.—T.C.C. condensers, 0.5 mfd., 800 v. working, 1/-; T.C.C. 1 mfd., 800v. working, 1/6; T.C.C. 1 mfd., 250v. working, 1/-; T.C.C. 2 mfd., 450 v. working, 1/6; T.C.C. 4 mfd. block condensers, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, and 1 mfd. 250 A.C. working, 1/9 each.

RADIO CLEARANCE.—Earl Permanent Magnet Moving-Coil Speakers, brand new, boxed. List at 29/6; our price, 10/11.

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NOTE: We make no extra charge for deferred terms.

RECEIVERS. 3-VALVE "CLASS B" BURGOYNE RECEIVERS. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/C speaker. Artistic cabinet of highly polished Walnut. Chromium fittings. Brand new in original cartons; 1935 Model. List £6 10s. Our price £3 18 6 Carriage Paid.

VALVES. Triotron (all types) G.P., 3/6; Power, 4/6; S.G., 9/6; clear or metallized; all in makers' sealed cartons.

SPEAKERS. Lissen plaque speakers, wonderful tone. List 15/-. Our price 5/11. Lotus permanent magnet, with universal transformer giving 10 alternative tappings. Eight-inch cone—wonderful tone. List 27/6. Our price 14/11.

CONDENSERS. British Radiophone .0005 ganged, screened variable condensers with trimmers. 2-gang, 6/6; 3-gang, 8/6.

RADIOPAK by British Radiophone (Type 535 C). Comprising 3 matched coils and 3-gang condenser with trimmers. Clearly engraved scale marked in metres, pilot light fitting, engraved terminal strip showing all connections. The whole mounted on grey metal chassis. Guaranteed new. Limited quantity only, at special low price of 29/6 complete.

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CABINETS. Ultra polished walnut receiver cabinets (for set and speaker combined). Height 17in., width 15in., depth 8in. Only 5/11 each.

CROMWELL Cabinets (for set and speaker combined). Horizontal type, 23in. wide, 8in. deep, 11½in. high. Polished Walnut veneer, additional baffle behind speaker grille. Just secured on terms which enable us to offer them at the astoundingly low price of only 4/11 each.

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SPECIAL SUNDRY BARGAINS.

THESE special bargains are sent for Cash with orde only. Please add 3d. for postage.

Ormond .0003 and .0005 Variable Condensers 1/3 each. Tonastat Selectivity Unit, 1/10; Bifó static cut-out, 2/3. Igranic 1 mfd. condensers 1/3 each; 2 mfd. 1/9 each. Table Microphone complete with transformer in base, 6/11. Triotron electrolytic condensers; 8 mfd., 450 volt working, 2/11 each; 25 mfd., 350 volt working, 3/6 each. Triotron Class "B" Valves, type E220B. List 10/6; our price 5/1. Amplion Binocular H.F. Chokes. Totally enclosed in bakelite case. List 4/6. Our price, 2/3. Lots of 3 dozen assorted Dubilier fixed condensers, 1/9 each lot. 4-pin Chassis-mounting Valve holders, 5d. each; 6 for 2/-. Igranic 2-pole rotary switches, 1/- each. Double reading voltmeters, 1/9 each. Accumulator Hydrometers, complete with float, 1/- each. Sovereign lightning arresters, 6d. each.

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CABINET gramophone, three-valve band-pass set, Milnes permanent H.T.—18. Welney Place, Sheffield.

SOUTHERN RADIO'S WIRELESS BARGAINS.

RECEIVERS.—Osram 4-Valves (Actual) Sets. Complete with Four Osram Valves, Moving-Coil Speakers. Pedestal Cabinet. Ready for use on all Voltages A.C. In sealed cartons, £6/0/0 (List £15/15/-).

BURGOYNE Class "B" Sets. With three Mullard Valves. Exide Batteries and Accumulators. Moving Coil Speakers. In modern Cabinet beautifully finished in Chromium plate. Ready for use. In sealed cartons. £3/18/6 (List £6/10/-).

LISSEN 2-Valve D.C. Sets. Complete with Valves, Speakers in attractive Bakelite Cabinet. Ready for use, on all Voltages D.C. £2/15/- (List £7/7/-).

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COILS.—Igranic Superhet Four Coils (1 OSC, 2 I.F., with pigtails, 1 I.F. plain). 9/- per set (50/- List).

VARLEY Constant Square Peak Coils B.P.5, with all accessories, 2/3.

PICK-UPS.—Marconi Model K25 (1935 Issue), 21/- (List 32/6).

CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully Screened with trimmers, 7/3 each (List 45/-). LOTUS Three-Gang, 12/6; 2-Gang 8/6. All Lotus Condensers are complete with Dials, Escutcheons, fully screened with trimmers. Dubilier 4-mfd. (2+1+1) 1,000 Volt, 2/9 each; 4.5 mfd. (2.25+2.25) 3/-. T.C.C. 0.1+0.1, 1/3. Dubilier 0.1, 9d.

SPEAKERS.—Blue Spot 66R Units, 10/6. List 45/-). Blue Spot Permanent Magnet Moving, Coil Speakers. Universal Transformers for Power Super-Power, Pentode and Class "B." All Brand New 1935 Series in sealed cartons. Type 99P.M., 30/- (List 59/6); 45P.M., 24/- (List 45/-); 62P.M. (in Cabinet), 38/- (List 67/6); 32 P.M. in magnificent cabinet, 45/- (List 87/6). W.B. Permanent Magnet Speakers with universal Transformers, 21/- each (List 32/6).

ELIMINATORS.— Regentone Eliminators W.5a. Complete with Trickle Charger for 200/250 volts, 39/6 (List £3/17/6). A small Quantity only of Ekco Eliminators for 100/125 volts only, Type K25 with Trickle Charger, Output 25 m.a., 35/- (List £4/12/6). Type K. 18 with Trickle Charger output 18 m.a., 32/6 (List £4/7/6). All Brand New in original sealed cartons.

MISCELLANEOUS.—Westinghouse Metal Rectifiers. H.T.6, 7, 8, 9/3 each. Morse Tapping Keys with flash signal and buzzer. Complete with Battery and bulb, 2/-. Bifo Static Cut-outs, definitely eliminates noise and interference, 2/3 (12/6 List). Telsen Binocular H.F. Chokes, 2/4 (List 4/6). Variable Volume Controls, all capacities, 2/- each. Lewcos Spaghetti Resistances, all capacities. New and boxed, 1/6 dozen assorted.

Many More Bargains at our various Branches.

Every Article Guaranteed and sent Post Paid.

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

UTILITY SALES.—We have splendid Reports from Amateurs who made our Two-valve Short-wave. ALL parts ready to assemble, 45/-; ready assembled, 50/-.—Apply FREE Circuit.

ELIMINATORS.—With Trickle charger. "Regentone" W.A.5, 25 m/a, all variable tappings, ½ amp. charger, 40/-.

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MILLIONS of articles to be Cleared cheap during Sale. Wonderful Values.—Apply for lists.

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INDIVIDUAL SETS DESIGNED. Estimates given, theoretical or practical circuit diagrams. Queries 1/- each. Expert Radio Service Bureau, 29, Orford Road, London, E.17.

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MAGNAVOX speakers, complete with hum-bucking coil, output transformers, etc. DC152 (9in. cone), 22/6. DC154 (7in. cone), 16/-. All with 2,500 or 6,500 ohms fields.

WESTINGHOUSE rectifiers, HT8, 9/6. HT9, 10/-, HT10, LT5, LT4, 10/9. Regentone transformers for HT8 or HT9, with 4v. 4amp. LT winding, 7/-. Eliminators, first-class make. Outputs 150v. 25ma, 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 8mfds or 4mfds, 500v working, 50mfds, 50v, 200mfds, 10v, 3/3. 50mfds, 15v, and 15mfds, 100v, 2/3. 50mfds, 12v, 2/-. TCC type "M" condensers, any value up to .001mfds, 6d. Erie resistances. 1 watt type, 7d., 2 watt, 1/2, 3 watt, 1/9. Send for comprehensive list.

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ALL orders over 7/6 sent C.O.D. charges paid.

BRITISH RADIOPHONE semi-screened midget condensers, smallest made, .0005 with side trimmers. Brand new and boxed. 2 gang, 5/6, 3 gang, 7/6. Few only ordinary size, 4 gang, 9/6.

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T.C.C. dry electrolytics 8 mfd., 550v., 3/3, 4 mfd., 500v., 3/-. British Insulated Cables, dry. 8 mfd., 550v., 3/-. 4 mfd., 55v. (wet), 3/-. 50 mfd., 50v. (dry), 3/-. T.C.C. 6 mfd., 50v., 15 mfd., 100v., 25 mfd., 25v., 50 mfd., 12v., 1/3. Tubular condensers: .01, .02, .1, 6d. Dubilier wire-end resistances, all values, 6d. Truwind wire-wound resistances, all values to 50,000, 3/6 doz. Formo 1 mfd., 1,000v. test, 1/-, 2 mfd., 1,000v. test, 1/3. Wego 4 mfd., 750v. test, 2/3. Chassis mounting valve-holders, 4-5 pin, 1/3 half-doz.; 7 pin, 6d. Toggles, 6d. Sistoflex, 7yds., 6d. Pye S.W., valve-holders, 3d. Lucerne iron-cored canned coils boxed with circuit, 2/6.

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TRADE enquiries invited, send stamp and heading for list.

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MAINS Transformers, chokes, etc., to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

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VAUXHALL.—Magnavox energised types, 2,500 or 6,500: 10in. cone, 22/-; 7in. cone, 15/3. All brand new complete with humbucking coils, state power or pentode. Other speakers. Send for particulars.

VAUXHALL.—Practical Wireless Universal superhet chassis, completely built as specified with valves and Magnavox or Rola speaker, carriage paid, £8/15/0.

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VAUXHALL.—Radiophone three gang condensers, piano type superhet, or straight fully screened, 8/6; two gang, 6/6.

VAUXHALL.—Benjamin. Class B. transformers 1-1½ to 1. Terminals fixing, 6/6 boxed.

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VAUXHALL.—Westinghouse Westectors, W.4, W.X.6, 5/9. Regentone transformers with terminals and H.T.8, 17/6.

VAUXHALL.—Rothermel Piezo electric pick-ups, 30/-; Marconi K25, 21/-; B.T.H. senior, 29/-; Minor, 16/6. Sealed cartons.

VAUXHALL.—Gramophone motors: Collaro 32 model, 32/6. Universal model for 110,D.C. 200. 250 AC/DC, 47/6.

VAUXHALL.—B.T.H. Truspeed AC. 30/-; B.T.H. Universal model 110 D.C. 200/250 AC/DC. 47/6

VAUXHALL.—Utility dials and drives complete with escutcheon, state black or brown, 5/-.

VAUXHALL.—Dubilier condensers, 4 or 8 M.F.D. dry electrolytic, 500.V working, 3/-; 50 MFD.50.V. working, 1/8; 50 MFD.15V., 1/6.

VAUXHALL.—Dubilier or Radiophone tubular condensers non-inductive .1, 9d. .05, 6d.: .002, .0002, and .0005, 4d. 1 mfd. Mainsbridge, 1/3; 2 mfd, 2/-; T.C.C. .002 mica, 2,000v. test, 10d.; .01, 1/-.

VAUXHALL.—Dubilier all values, 1 watt. resistances, 7d.; Clix valveholders with terminals 5 pin, 7d.; 7 pin, 9d.; Continental 7 pin, 9d.; W.B., 4/5 pin, 4½d. Post paid, 2/6, or over or C.O.D.

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THE MOST UP-TO-DATE CONSTRUCTOR'S WEEKLY

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. X. No. 128. February 16th, 1935.

AND AMATEUR TELEVISION

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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. V. No. 125. FEB. 16th, 1935.

ROUND *the* WORLD *of* WIRELESS

Television

THE splendid news that television programmes on the high definition system are to be available this year has given a terrific fillip to the new hobby. **We were enabled, even at the moment of going to press with last week's issue, to summarise the important clauses in the Television Committee's Report. Here again "Practical and Amateur Wireless" was alert,** and we gratefully acknowledge the many tributes to our enterprise (which we have received from readers and manufacturers) in stopping the presses in order to include extracts from this historic document.

We are naturally gratified to learn that **the report confirms all of the forecasts concerning television which we have made both in this journal, and in our companion monthly "Practical Television." We were not wrong in any one particular,** and practically alone of the technical Press we stated three weeks before the report came out that television would arrive as a concrete industry and hobby this year, and that television programmes would form a regular part of our broadcast fare towards the end of this year.

The fact that we changed the title of the paper on January 20th, 1934, to PRACTICAL WIRELESS AND PRACTICAL TELEVISION is evidence of our vision and the faith we had in the ultimate perfection of television. Alone of the technical Press, we have included a Television Supplement in every issue.

The report creates a new industry and a new hobby, and PRACTICAL AND AMATEUR WIRELESS will, as in the past, take the lead in being the first to convey to its readers all of the important news and developments as and when they occur. Now is the time to make yourself *au fait* with television. **This you can easily and cheaply do by turning to the centre pages of this issue at once, and reserving a copy of "Newnes Television and Short-wave Handbook,"** which explains in a popular way, and by means of hundreds of illustrations and photographs, everything you need to know about television.

Readers do not need to be reminded of our Free Advice Bureau, should they wish to ask any question relating to television and its allied sciences. **ALL queries received are answered free.**

For first news of everything of importance you can safely turn to "Practical and Amateur Wireless," the leading and progressive Wireless and Television Weekly.

A special new series entitled "Television for the Beginner" appears in this issue.

Demonstration of Baird Television

AT the moment of going to press, we have witnessed a practical demonstration of the Baird Home Televisor. Contrary to statements which have appeared elsewhere, we can assure our readers that the picture is brilliant and may quite easily be seen in an ordinary room with ordinary lighting. As a matter of fact, with all lights switched on the image could quite clearly be seen, both on the larger home televisor giving a picture 12in. by 9in., and the smaller giving a picture 8in. by 6in. It is proposed to market a further Baird Home Televisor, giving a picture 7in. by 5in., at a price of between £25 to £30. The definition of the pictures is excellent and the image steady. Actually it is much brighter than that shown on the screen of the average home cinema.

All homes within a radius of thirty miles of the transmitting station will be able to receive satisfactory television.

The Baird Co. has at the Crystal Palace a complete television transmitting equipment in full working order.

Statements by the Baird Co. and E.M.I. appear on page 800. Next week look forward to further interesting views regarding television. As there has been a considerable demand for issues of PRACTICAL AND AMATEUR WIRELESS and our companion monthly journal, *Practical Television*, since the publication of the Television Committee's Report, you would be well advised to order next week's issue now. Recent issues have rapidly gone completely out of print.

New West Country Broadcasting Station

AS a result of a promise made by Sir John Reith last May, to a deputation of West Country M.P.s and Mayors, the B.B.C. has acquired options on three sites in the neighbourhood of Plymouth. These are now being tested to ascertain which is the most favourable for the installation of a new transmitter destined to give a better service to listeners on the South Devon and Cornish coasts.

B.B.C. Wavelength Changes

FROM February 17, when the new 70-kilowatt Midland station at Droitwich takes over its daily duties, the B.B.C. will make some alterations in the wavelengths of other transmitters. The North National, London, and West National stations will be synchronised on 261.1 metres (1,149 kc/s). The new Midland transmitter will work on 296.2 metres (1,013 kc/s), leaving the former channel of 391.1 metres (767 kc/s) to Scottish Regional. West Regional, now on 307.1 metres (977 kc/s) will go to 373.1 metres (804 kc/s) and will pass on its old wavelength to Belfast. Newcastle-on-Tyne, now on 209.9 metres, will broadcast in future on 267.4 metres (1,122 kc/s), namely, where Belfast was hitherto found on the condenser dial.

Ambassador as Director-General

EUGEN VON NELKY, who, until recently, was Hungary's Ambassador at Vienna, has been appointed to the position of Director-General of the Hungarian Broadcasting Company, with a view to the development of foreign relations; he will also act as representative at all International conferences dealing with radio matters.

High-power Latvian Station

KULDIGA, which so far has been working on 10 kilowatts on 238.5 metres (1,258 kc/s), a channel shared with Rome (3) and San Sebastian (Spain), is now increasing its power and will shortly be transmitting on 50 kilowatts. The station relays the Riga programmes.

ROUND the WORLD of WIRELESS (Continued)

"Hurdy Gurdy"

FRANCIS WORSLEY will present another edition of "Hurdy Gurdy" on February 16th, for National listeners as well as listeners in the West. He will be assisted by Elsie Eaves, Brian Gaye, John Rorke, Walter Glynne, and the Western Studio Orchestra, conducted by Leslie Bridgmont, and, as on previous occasions, the man with the hurdy gurdy will again be in the studio.

"Sea Log" Talks

THE fourth talk in the "Sea Log" series of yarns of the sea will be broadcast from Northern Ireland on February 16th. Arrangements are not yet complete, but it is likely that one of the Belfast Lough pilots will relate his experiences in bringing big ships into harbour.

The Reid Orchestra

THIS popular orchestra, conducted by Professor D. F. Tovey, the Special Choir, and Mona Benson, mezzo-contralto, will be relayed from the Usher Hall, Edinburgh, on February 14th. The programme will include Symphony No. 8 in F major, op. 93, by Beethoven.

Discussion on Art in Wales

"ART IN WALES—past, present and future," will be the subject of a discussion between Edmund D. Jones and Ewart Price for Welsh listeners on February 15th.

Young Men in Industry

HENRY BAGULEY, who is to give a talk for Midland listeners in the "Young Men in Industry" series on February 15th, is manager of a large hotel on the south coast. Anxious to perfect himself in languages, he worked as a "commis waiter" in hotels in Italy, Switzerland, France, and Germany.

Concert from Birmingham

LEONARD HENRY is the entertainer at a concert relayed from the Central Hall, Birmingham, on February 16th. Arthur Cooke is the pianist and Dorothy Canberra (soprano) sings a Rossini Aria. Lionel Field conducts the Midland Musical Society in Bainton's "Ballad of Semmerwater."

Leeds Symphony Concert

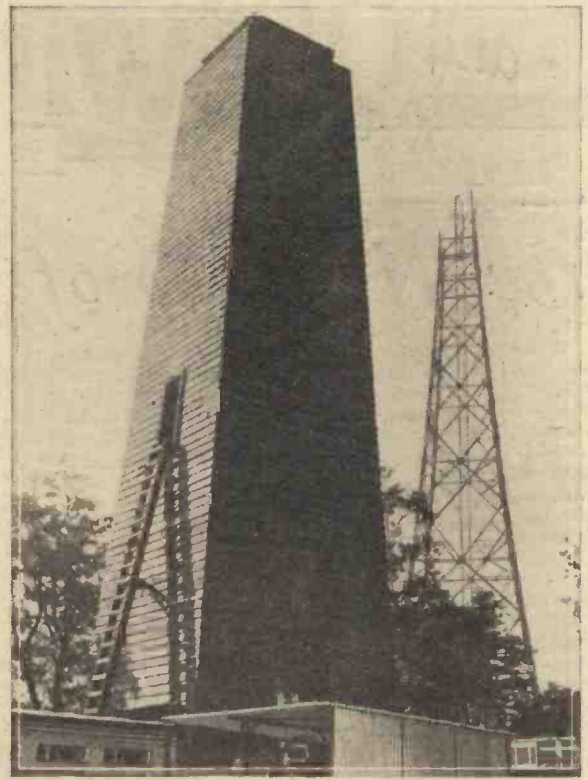
THE famous Russian pianist, Nikolai Orloff, will be soloist in the Leeds Symphony Concert which is to be relayed to Northern listeners from Leeds Town Hall on February 16th. He will play Grieg's "Concerto in A minor, opus 16."

"Northern Music-hall Parade"

THE "Northern Music-hall Parade," fixed for February 14th, will be the most ambitious variety broadcast ever projected. Variety items are to be relayed from the following five theatres: the Argyle, Birkenhead; the Garrick, Southport; the Palace, Blackpool; the Palace, Halifax; and the New Hippodrome, Darlington. Telephone lines will connect some twenty-five microphones, installed in groups of five in the various theatres, with the central Dramatic Control panel at Manchester, and the theatres will maintain contact with each other by means of portable receiving sets.

INTERESTING and TOPICAL PARAGRAPHS

GERMAN STATION'S VERTICAL AERIAL.



In connection with the new broadcasting station in the Forest of Tegel, the aerial masts are constructed entirely of wood with the aerial running vertically through the centre. In the illustration, a partly completed mast is shown, and in the foreground is a water tower for the valve-cooling apparatus.

SOLVE THIS!

Problem No. 126.

Samuels had a portable (four-valve) and a three-valve battery receiver. The latter consisted of detector and two L.F. stages, with pick-up terminals provided on the first valve. The portable enabled him to get many foreign stations, but they were not quite loud enough. He suddenly thought of using the three-valve set as a three-stage amplifier and accordingly disconnected the leads from the speaker in the portable and joined these to the pick-up terminals on the three-valver. The combination failed to function, although when a pick-up was used with the three-valver results were splendid. What was wrong? Three books will be awarded for the first three correct solutions opened. Envelopes should be marked Problem No. 126, and should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Entries must be received not later than the first post Monday, February 18th.

Solution to Problem No. 125

The extra valve increased the total H.T. consumption, and the resultant voltage drop through the smoothing circuit lowered the H.T. applied to the output valves as well as to the remaining two valves. This naturally reduced the volume. He should have modified the mains section to meet the increased current demands. The following three readers sent the first correct solutions opened in connection with Problem No. 124, and books are being sent to them: E. W. O. Young, 92, Fairfax Rd., Hornsey, N.8; F. C. W. Wickman, 45, Woolmore Rd., Erdington, Birmingham; F. Garnett, 119, King Edward Rd., Thorne, nr. Doncaster.

Through this same Garden

FEBRUARY 14th is St. Valentine's Day; and on the preceding night the old lovers' festival will be celebrated in advance, as it were, by a Northern dramatic feature. It is called "Through this same Garden"—a quotation from Omar Khayyam—and has been devised by Joyce Lustgarten, the young Manchester author of "Prelude to St. Swithin," "Every Dog has its Day," and other Northern features. The programme will include love scenes between Heloise and Abelard, Romeo and Juliet, and the war-time lovers from Ernest Hemingway's "Farewell to Arms."

Hawaiian Music from Manchester

THE KAILIMA TRIO, who are to broadcast to Northern listeners from a Manchester studio on February 14th, claim to be the only true exponents of the Hawaiian guitar and of Hawaiian music in this country. The trio consists of William Kamoku, a pure-bred Hawaiian musician and composer, his pupil, Clifford Hart, a Manchester man, and another Mancunian, Mabel Steedman, who has spent a large proportion of her life in Hawaii studying the native music at first hand. The programme which they are to broadcast—using ukuleles and Spanish guitars as well as Hawaiian guitars—will include some of Mr. Kamoku's own compositions; there will also be traditional Hawaiian tunes, including the famous farewell song, "Aloha Oe," which was composed by Queen Liliuokalani, the last reigning monarch of Hawaii.

"Hearts are Trumps"

L. DU GARDE PEACH and Victor Hely-Hutchinson, who gave listeners "The Charcoal Burner's Son," also collaborated in the operetta 'Hearts are Trumps.' This is to be broadcast on February 16th, in the Midland Children's Hour and repeated in the evening programme. Victor Hely-Hutchinson will conduct the B.B.C. Midland Orchestra and the Midland Wireless Singers. The producer is J. H. Loughlin, Senior Balance and Control Assistant at Birmingham. In the cast are Harry Saxton, Doris Nichols (formerly at the B.B.C. Bradford Station), Alex Penney, who plays the heroine, Alfred Butler, Helmar Fernback, and Geoffrey Dams.

Jugo-Slavia Wants a 40 Kilowatter

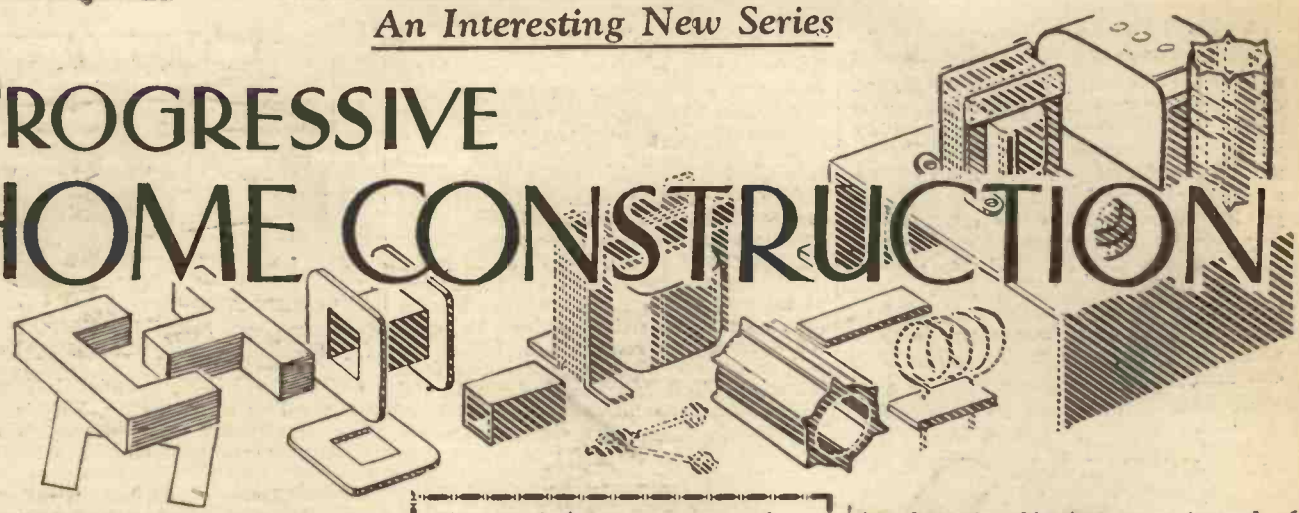
FROM Belgrade comes the report that the Government has decided that a more powerful station is required for the capital programmes. Although rumour has it that a 100-kilowatt transmitter is under consideration, it is expected that work will shortly be started on a 40-kilowatt plant, so designed that additional power may be obtained if and when required.

Combined Broadcasting Station-Lighthouse

SUGGESTIONS have been put forward to the Paris authorities to illuminate the Eiffel Tower, in order that its light may not only be useful to aeroplanes but also act as a special attraction to tourists visiting the French capital.

An Interesting New Series

PROGRESSIVE HOME CONSTRUCTION



This Week the Construction of an L.F. Transformer and Other Components is Fully Described

by The Experimenters

WHEN you have made the few simple parts for the resistance-coupled L.F. amplifier, they may be assembled either on a small baseboard or chassis, depending upon the form of construction employed for the single-valve set. It will obviously be desirable to have the unit in such a form that it may be placed side by side with the detector stage, and so that the connections between the two may be as simple as possible. Following the same idea as before, a pictorial wiring plan for the few components is given in Fig. 1, and this will apply just the same no matter how the parts are to be mounted.

It might be mentioned in passing that those who prefer might even mount the amplifier components on the same chassis as the detector stage, since they require very little space. When this is done, however, the L.F. components should be kept as far away from the tuning coil and tuning condenser as is reasonably possible, so as to avoid any trouble due to L.F. feed-back.

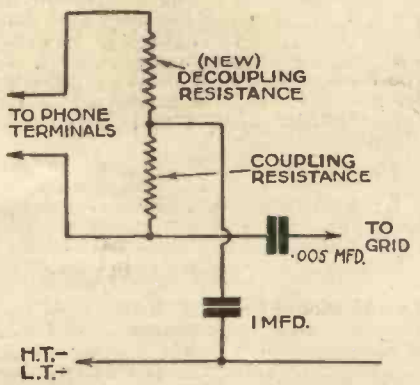


Fig. 2.—Showing how the decoupling resistance can be added to the circuit shown in Fig. 1.

External Connections

With regard to the flexible leads shown connected to the amplifier it should be explained that those marked H.T.— L.T.—, and L.T.+ should be joined to corresponding terminals on the single-valver. The simplest method of connection is to take the common negative lead to the earth terminal, attaching the low-tension positive wire to that terminal on the on-off switch which is connected to the filament terminal on the valve-holder. This method allows the single on-off switch to be used for both valves. The H.T.+ lead should go to a tapping on the high-tension battery which provides between 100 and 120 volts.

It will be found most convenient to mount the G.B. battery on the chassis or baseboard along with the other components, and the position of the negative wander plug in the G.B. battery will naturally depend upon the particular type of L.F. valve employed. If the valve is of the high-amplification small-power type (Cossor 220 PA, for example), a G.B. voltage of 3 or 4½ will be correct.

Decoupling

After the amplifier has been found to function correctly—and this it is almost sure to do when first connected—it will be desired to add a few improvements and refinements. The first step should be to add decoupling to the anode circuit of the detector, and this may be done simply by inserting a second fixed resistance between the anode-coupling resistance and the positive 'phone terminal, connecting a large-capacity fixed condenser between the junction of the two resistances and earth, as shown in Fig. 2. The decoupling resistance should have a value similar to, or rather lower than, that of the coupling resistance, and it can therefore be made in the same manner—described last week—but by using blotting paper instead of ordinary drawing paper.

The large-capacity condenser *could* be made at home, but the trouble and expense would scarcely be justified; this point will be more easily appreciated when it is considered that the capacity should be at least *three thousand* times as great as that of the grid condenser. This means that the area of overlap of the plates would have to be increased by a very considerable amount, and the resulting component would be unwieldy and rather awkward to handle. For this reason we recommend you to buy a 1-mfd. fixed condenser ready made, for this will cost no more than two shillings.

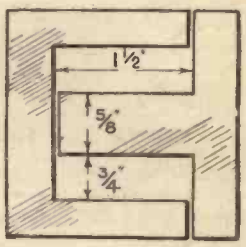


Fig. 3.—The drawing on the right shows the principal dimensions of the No. 5 stalloy stampings used for the transformer core.

When using the anode coupling and decoupling resistances it will be necessary to increase the voltage applied to the H.T.+ wander plug attached to the single-valve set to compensate for the fairly considerable voltage drop occasioned by the resistances. The most suitable voltage can easily be found by trial, but it will almost certainly be found best to apply the full voltage of the H.T. battery.

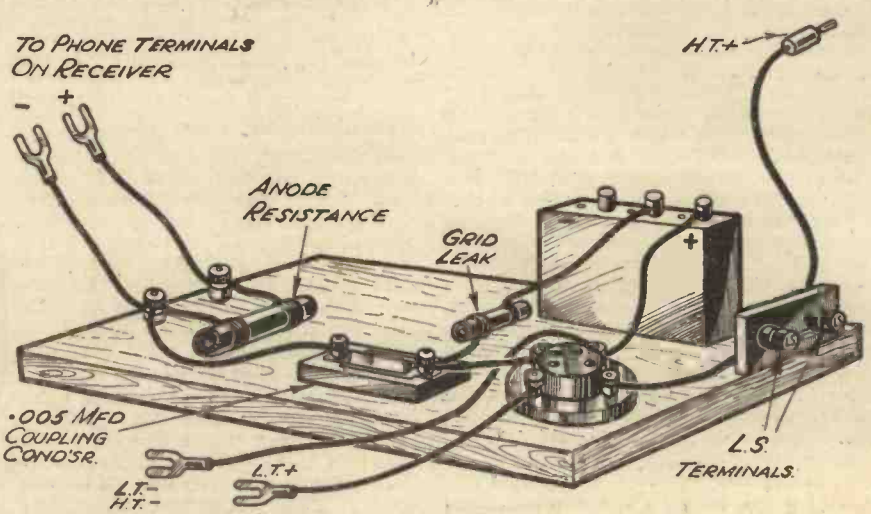


Fig. 1.—This pictorial diagram shows the connections for the simple L.F. amplifier described.

An L.F. Transformer

Although the resistance-capacity-coupled amplifier is the simplest possible type, and considered by some to give the most perfect form of amplification, it does not provide a very great increase in volume. As all readers are doubtless aware, a far greater step-up of signal voltage—and hence greater volume—is to be obtained by employing L.F. transformer coupling, so that the next step should be to make a suitable transformer. This is a rather tedious undertaking, but the work is by no means difficult or uninteresting, as those who have previously made transformers can testify.

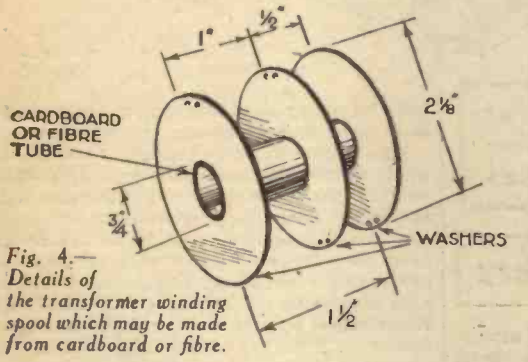


Fig. 4.—Details of the transformer winding spool which may be made from cardboard or fibre.

The first requirement is a set of stalloy stampings for the core, the most suitable size being No. 5, the dimensions of which are shown in Fig. 3. Three dozen pairs of these are needed, and can be obtained from advertisers. The next requirement is a winding spool, which can be bought ready made, or may be built up from tough fibre or cardboard tube and washers, as indicated in Fig. 4. It will be seen that three washers are required, two of these being fitted (by means of "tacky" glue) to the two ends of the tube, the third being so placed as to divide the spool into two parts, of which one is twice as long as the other. The smaller section is to take the primary winding, and the larger one is for the secondary, which will have twice the number of turns. Perhaps it will be thought that a turns ratio of only 1 : 2 will not give a very large step-up, but in practice we have found this to be best for the home constructor. To give detailed reasons would entail many theoretical explanations of the function of the transformer, and we do not wish to burden you with them. Instead, we will simply say that in order to secure a sufficiently high primary inductance for good results it is necessary to employ not less than 5,000 turns of wire on the core specified. And if the winding process is to be fairly easy the wire must not be of a finer gauge than 40 (enamelled). Further, the winding area available is about § sq. in., and 40-gauge wire can be wound just over 28,000 turns per sq. in. These facts indicate that a total number of turns not exceeding approximately 15,000 can be placed on the spool. Now you will see why we recommend the 1 : 2 (or 2 : 1, if you prefer it that way—which is incorrect) transformer! Whatever theoretical objections you may wish to raise, just bear in mind that we have made a transformer to the specification given above, and have satisfied ourselves that it will give excellent results; that is not theory, but hard practice!

Preparing the Spool

But to get back to the constructional work. After fixing the three washers, give the whole spool a coating of thin glue or of shellac varnish and allow it to dry thoroughly so that it may set quite hard, leaving a rigid former for the windings. Then make two small holes in each of the washers for anchoring the wires. As a matter of fact, *two* pairs of holes should be made in the centre washer, because the end of one winding and the beginning of another have to be anchored here. Now make a wooden handle to fit tightly inside the spool and pass a length of 22-gauge d.c.c. wire through the holes in the washer at the end of the shorter section, leaving about 6in. projecting outside the spool for making later connections. Solder the end of the 40-gauge enamelled wire from a 2oz. bobbin to the other end of this, and cover the joint with a spot of sealing-wax. You can now proceed to wind, keeping the wire at a reasonably even tension and arranging the turns as evenly as possible. It will be found best to work in layers, since this will help to keep the winding neat, and will allow the maximum number of turns to be accommodated. Continue winding until the smaller section is nearly full. There is no need to count the turns because the exact number is by no means critical.

When this section is almost full, cut off the fine wire, carefully bare the end, solder to it a 12in. length of 22-gauge d.c.c. wire, wind this once round the spool, and then anchor it by passing it backward and forward through one pair of holes in the dividing washer. That completes the primary winding. Now repeat the same process exactly

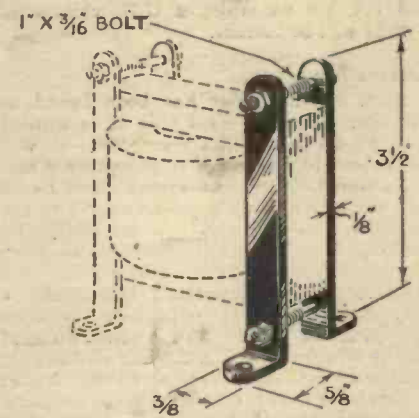


Fig. 5.—The above drawing shows how the transformer core clamps may be made.

for the secondary, using a 4oz. reel of 40-gauge wire and nearly filling the longer section of the spool.

Assembling the Core

The next step is to assemble the core stampings, which are of "T" and "U" shape, and are inserted alternately into the spool from opposite ends. That is, first a "T," and then a "U" is inserted from one end, and then the same is done from the other, this process being repeated until the spool is full and the stampings packed as tightly as possible without straining the central bobbin.

Now, two pairs of core clamps must be made (unless it is preferred to buy these), and they can be formed from a length of mild steel hoop, of the dimensions given in Fig. 5, drilled and bent as shown. These are fitted to the core at the two diametrically-opposite sides of

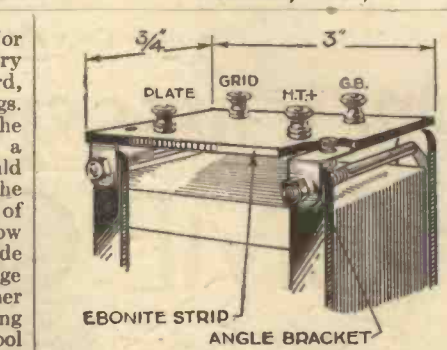


Fig. 6.—Details of the terminal platform for the L.F. transformer.

the spool by means of 1in. by ⅛in. bolts. The transformer can be finished off if desired by fitting a small terminal platform to the clamp bolts, as shown in Fig. 6. The platform consists of a strip of ebonite with four terminals mounted on it, whilst the four leads from the windings are passed through lengths of insulating sleeving and soldered to tags fitted to the terminals. In doing this, the terminals should carefully be marked to correspond with the leads, the order of the latter being as follows: beginning of the primary winding is I.P. (or Plate); the end of the primary is O.P. (or H.T+.); the beginning of the secondary is I.S. (or G.B.); and the end of the secondary is O.S. (or Grid).

The method of connecting the transformer is shown in Fig. 7, where this component is shown in place of the coupling resistance, grid condenser, and grid leak in the circuit reproduced last week, whilst the decoupling arrangements shown in Fig. 2 are included. When the transformer is first tried, however, it might be found that better results are obtained when the two connections to the secondary winding are reversed; this will be the case if the two windings were wound in opposite directions.

The L.F. transformer will probably keep you occupied until next week, when we will describe the construction of a simple mains unit.

RADIO VERSUS SHOES

IN the United States it is computed that some forty million listeners interested in the programmes stay at home daily for an average period of two and a half hours, whereas without this class of entertainment they would be wearing out their shoes "going places and doing things." This forced economy in footwear represents heavy losses to bootmakers and cobblers, and is given as the main reason for increased unemployment in this particular trade. It is suggested that the radio stations should work shorter hours.

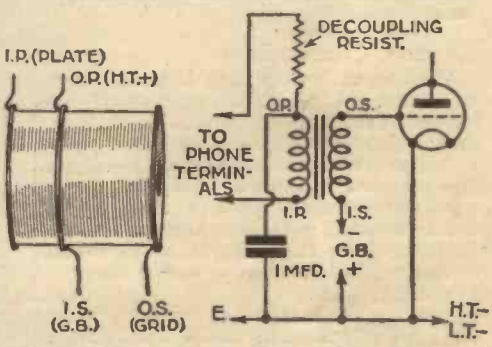


Fig. 7.—Connections for the transformer described are given here.

IMPORTANT NEW SERIES

TELEVISION FOR ALL.—1

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

AFTER a period of eight and a half months the Television Committee appointed by the Postmaster-General, with the following terms of reference: "To consider the development of Television and to advise the Postmaster-General on the relative merits of the several systems, and on the conditions under which any public service of television should be provided," have presented their report, the exact form of which was revealed on January 31st.

The general nature of the recommendations are now fairly well known, and added to this the Government have approved the Committee's suggestions. It is, therefore, appropriate that the whole situation of television should be reviewed in the light of the proposals it is intended to put into practice with the minimum of delay, especially in so far as it affects the home constructor.

The First Important Fact

Perhaps the most important fact emerging from the whole report is the acceptance of the oft-repeated statement that television has made enormous strides in development, and that it is now possible to provide a "high definition" service, using as the first degree of definition a standard of 140 lines per picture with a minimum picture frequency of 25 per second. While the degree of definition acceptable to individual taste is, of course, a matter of opinion, from the demonstrations witnessed by the committee and the mass of evidence which they sifted carefully, the standard suggested was thought preferable for the first service.

Now, since the autumn of 1929 there has been transmissions of what has come to be known popularly as low-definition television, and for four and a half years this has been maintained at various periods during every week. This has given the home constructor, who felt so disposed, ample opportunity to familiarise himself with the principles involved in the technique of combined looking and listening-in, as against listening-in alone. Transmitting apparatus for this service was built by the Baird Company, and considerable information has been disseminated concerning the standards, while this journal has provided numerous designs to enable readers to build apparatus and look in.

A Comparison

The image structure was a thirty-line one with a picture ratio of seven vertical to three horizontal, and, in consequence, the picture elements totalled 2,100. With the proposed new high-definition service, scanning will be horizontal, the picture ratio being of the order of four horizontal to three vertical. This gives a picture-element comparison of 76,800, or nearly forty times better, so the measure of improvement is very considerable.

A large number of amateur constructors have built and purchased apparatus for the purpose of taking advantage of this low-definition service, and it is natural that they should desire to have their position clarified. The committee have given careful consideration to the question, and stated that whilst low-definition television has been the path along which the infant steps of the art have naturally trod, and while this form of transmission still affords scientific interest to wireless experimenters and amateurs, they were satisfied that a service of this type would fail to secure the *sustained* interest of the public generally.

Fig. 1.—Sound and vision ultra-short-wave aerials on the Crystal Palace South Tower balcony with the new high-power U.S.W. vision aerial at the top of the tower.

It was felt, however, that it would be undesirable to deprive these "pioneer lookers" of their present facilities until at least a proportion of them have an opportunity of receiving a high-definition service. The recommendations, therefore, were to the effect that the existing television broadcasts provided by the B.B.C., with the Baird apparatus installed at Portland Place, be maintained, if practicable, for the present, and that the selection of the moment for their discontinuance be left for consideration by the Advisory Committee—a committee which is to be formed for the purpose of planning and guiding the initiation and early development of the first high-definition service. A further observation was made to the effect that these broadcasts be maintained, if practicable, with the idea that they be discontinued as soon as the first station of a high-definition service is working.

There is still some period of respite, therefore, for those amateur constructors possessing or building apparatus of the thirty-line type. Bearing in mind also that equipment made or bought for this purpose is not expensive, it provides a valuable medium for becoming acquainted with the principles of television, and amateurs should make a point of intensifying their work in this connection, both theoretically and practically, and thus be in a better position to graduate to the far superior service which will be forthcoming.

Fresh Opportunities

Having clarified the amateur constructor's and experimenter's outlook on this initial phase of the work, what will be his position when the improved facilities for looking-in become available? It can be stated straight away that his opportunities

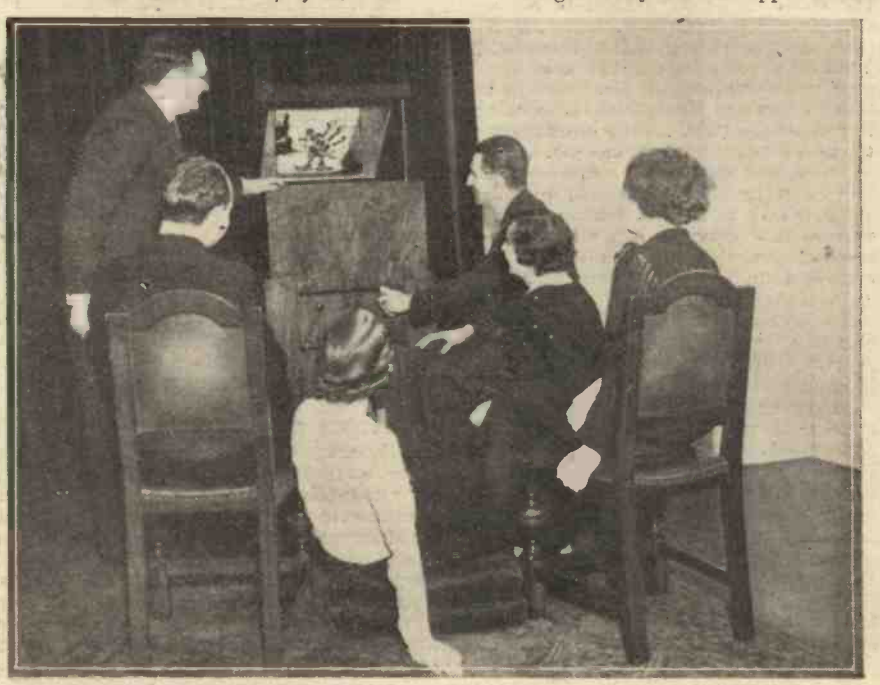


Fig. 3.—Showing one form of Baird cathode-ray tube home receiver with the images built up in the lid recess.

for experiment will be broadened very considerably, for the simple reason that the new television technique will demand a knowledge and familiarisation with many new things. The committee themselves expressed the hope that encouragement would continue to be given to all useful forms of experiment and research in television by firms or private persons, it being known that much experimental work can be done by transmission from one room to another by wire without recourse to a radio link.

First of all, to attain the degrees of definition and picture frequency required for the first service, very high modulation frequencies are involved and this necessitates the use of ultra-short waves—3 to 10 metres. It is known that these have a restricted range when compared with the medium or long waves. As an example of what can be done, however, mention can be made of the 10-kilowatt high-power 7-metre radio transmitter employed by the Baird Company for the transmission of high-definition signals to all parts of Greater London and the Home Counties. The sound and vision ultra-short-wave aerials used in conjunction with the radio transmitter are located on the balcony of the South Tower of the Crystal Palace. These are shown in Fig. 1, together with the new high-power ultra-short-wave vision transmitting aerial at the top of the tower—the eight-radial-arm structure surmounted with a small perforated disc. The signals from here cover an area embraced by a circle with a thirty-mile radius, with the Crystal Palace as the centre.

Since the reception of ultra-short waves is a new field to most amateurs, here is the first line of work that can be carried out, namely, to study and build radio sets which will conform to these new conditions.

Cathode-ray Tubes

From our present knowledge the cathode-ray tube appears to be the only satisfactory means of reproducing a high-definition television image. Originally these tubes were long with a relatively small screen area, but this is not now the case. This is substantiated by referring to Fig. 2, which shows the Baird Company's latest cathode-ray tube. It is the largest in the world and gives a picture 12in. square, and it is interesting to note that it is being held by William Taynton, whose face was the first ever to be televised by Mr. Baird in 1926. The illustration shows the big coating of fluorescent material on the inner surface of the belled-out portion of the tube. A stream of electrons emitted from a filament located in the narrow far end of the tube are projected in a narrow stream along the tube so that they impinge on the coating, the high velocity of the electron impact causing illumination at every point where the electrons meet the surface.

The intensity of each point of illumination is controlled by the incoming television signals, while "double time bases" move the point of impact in a series of straight lines over the flourescent area. By synchronising these electrical time bases from pulses included in the actual radiated television signal, it is possible to frame and phase the image automatically so that it conforms exactly to the scanning standards adopted at the transmitting end.

Good Results

Employing methods of this nature, brilliant and intimately-detailed images can be received and an excellent impression of the results obtained is gained by referring to Fig. 3. Here is a complete Baird home model set for the dual reception of both vision and sound signals, the resultant image being shown inside the recessed lid—in this case a Mickey Mouse picture from one of Walt Disney's films transmitted from a talking film television projector.

These remarks concerning cathode-ray tubes open up a big field for amateur constructor work. The building of electrical time bases for magnetic and electrostatic scanning, power packs for supplying the appropriate voltages to the various elec-

Fig. 2.—The largest Baird cathode-ray tube, giving a picture 12 in. square, being held by the youth whose face was the first to be televised in 1926.

trodes which require high operating voltages together with the knowledge of the method of working of the cathode-ray tube itself (it involves no moving parts except the silent stream of high-velocity electrons) are several points to which the home constructor can devote his attention. Data concerning these will be furnished at a later date. It is expected that kits of parts for building up the auxiliary equipment associated with the cathode-ray tube will be available so that readers can take advantage of the new television service as soon as it starts.

Receivers and Amplifiers

Then, again, knowing that high-definition television images demand a frequency response in the neighbourhood of two megacycles or more, quite a new technique will have to be developed by the amateur in connection with radio receivers and amplifiers capable of handling this figure. Broadcast receivers are considered to be in a high-fidelity class (for sound) when they embrace a frequency up to 10 or 12 kilocycles, so the difference in the two types of receiver is enormous.

The suggestions which have been made in no way exhaust the many directions in which the experimenter and amateur constructor who reads this journal can render very valuable assistance. The motive behind the foregoing remarks is a sincere effort further to stimulate the enthusiasm that is known to exist amongst all radio (and shall we now say television ?) amateurs.

In the early days of aural radio development the amateurs were justifiably proud of their efforts, and here is the golden opportunity for every practically-minded man to apply himself with equal vigour to expediting the continued development of television. Do not stop at taking a theoretical interest in the subject, but turn to it with a practical mind and use it as an outlet for all your acquired constructive capabilities. In this way you will provide yourself with a really practical hobby full of intriguing and fascinating possibilities.

KEEP YOUR MIRRORS BRIGHT

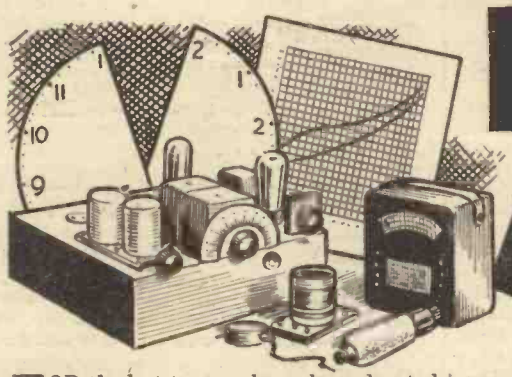
THE other day I had occasion to examine an extremely well-designed thirty-line mirror-drum television receiver. This machine appeared to function very satisfactorily, except that there seemed a lack of brilliance in the picture as seen in the translucent screen. The instrument was one incorporating a grid cell and Nicol prism combination for producing the required signal modulations on the beam of light from the bright and constant intensity projection lamp light source.

It was therefore decided to subject the whole of the apparatus to a thorough overhaul, the machine being removed bodily from its cabinet for this purpose. A complete examination of the radio receiver section with the aid of an Avometer showed that this was quite satisfactory, so attention was turned to the television chassis. Electrically, this also proved to be quite sound, but it was noticed that the rectangular mirrors on the drum, together with the reflecting mirror and focusing lens, appeared to be covered with a semi-opaque film.

This had occurred as a result of a slight dampness which had settled on the glass surface and collected a layer of dust. A slightly damp chamois leather rubbed gently but firmly over each surface of the thirty mirrors on the drum, followed by a polish with a soft, dry duster, restored the mirrors to their initial brilliance. During this operation every care had to be taken to ensure that no mirror was thrown out of alignment, otherwise the uniform strip scanning of the image area would be ruined.

The same polishing operations were carried out on the reflecting mirror, focusing lens, and also the condenser lens of the Nicol prism-grid cell combination. Then the projection lamp was removed from its holder and the glass envelope cleaned so that no light was absorbed or diffused by the glass. After restoring the lamp to its housing, the complete television chassis was replaced in its cabinet. The whole assembly was then tried out on an actual transmission, and gave images which were characterised by an extremely high brilliance, proving that it is very essential periodically to clean and polish the optical sections of any projection type television receiver.

Turn to pages 798 and 799 and Reserve a copy of "Newnes Television and Short-Wave Handbook" NOW!



HALF-HOUR EXPERIMENTS

By FRANK PRESTON

This Week's Interesting Article Deals with a Large Number of Systems of Volume Control, and Shows How These Can Be Applied

FOR the last two weeks we have devoted our experiments to what might be considered as the more theoretical aspects of wireless, and so it will now be a welcome change to revert again to experiments of a truly practical nature, and which have a bearing on the receiver itself. The question of volume control appears to be a very simple one on first thoughts, but when it is considered more deeply, and when different methods of control are tried, it becomes apparent that there is often ample scope for improvement and invention.

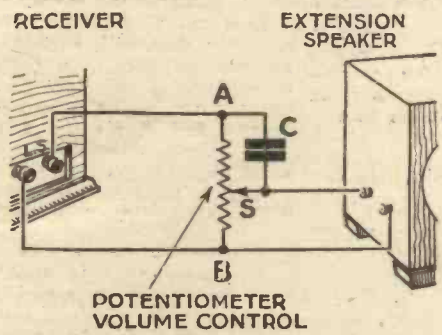


Fig. 1.—Showing how a volume control can be fitted between the receiver and speaker. As explained in the text, this arrangement is only recommended when the speaker is used away from the set.

Let us start by examining the various volume-control methods in a rather superficial way. Obviously, the purpose of volume control is to vary the volume of sound which emanates from the speaker, and this can be done by inserting some variable device at one of many points in the circuit. For example, the control might be fitted between the output valve and the loud-speaker, between the detector valve and the L.F. amplifier, between the H.F. portion of the set and the detector, in the input circuit to the H.F. valve, or between the aerial and the aerial tuning circuit. But which of these positions is the most suitable? This question might be argued along theoretical lines, but it is far better to settle it definitely by practical tests.

For Extension Speakers

Generally speaking, however, the only occasion when it is desirable to place the volume control between the speaker and the set is when the former is used as an "extension," and is therefore some distance from the receiver. In this case a potentiometer may be connected as shown in Fig. 1, and although this method gives fairly good results, it is not entirely satisfactory, because the resistance between the speaker terminals of the receiver (or the load of the output valve) is varied as the volume level is changed. This is because the primary winding of the speaker transformer is in parallel with a portion of the potentiometer element, but the value of that portion is constantly changed. Thus, when the slider of the potentiometer is at the end marked A, the load is much lower than when the slider is moved to the end marked B, as when reducing volume. And as the load is increased the voltage applied to the anode of the last valve is reduced, which causes the output to be reduced. There is also another effect: as the resistance between the points marked S and A is increased the tone of reproduction is affected, due to the fact that the resistance is in series with one speaker lead. This causes reproduction to become rather high-pitched and "thin." This latter form of trouble can be overcome to a certain extent, however, by choosing a suitable value for the condenser marked C. Generally, it will be found best to make the total potentiometer resistance between 15,000 ohms (for battery triodes) and 25,000 ohms (for pentodes) and to employ a condenser of about .1 mfd. It will be found interesting, however, to experiment with various condenser values. Incidentally, it should be pointed out that the potentiometer must be of the wire-wound variety, and preferably of the graded type, the "thin" end of the element being at the end marked A.

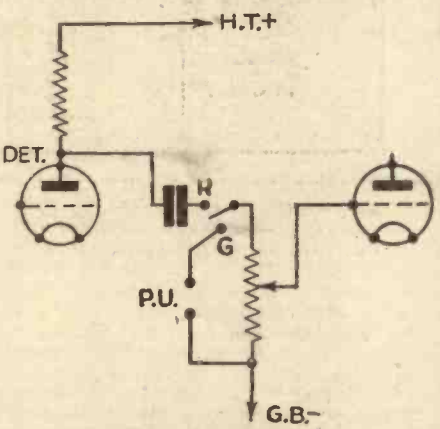


Fig. 3.—An arrangement similar to that in Fig. 2, but which is applicable when R.C. coupling is employed.

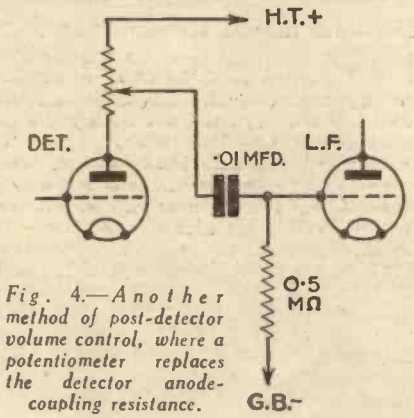


Fig. 4.—Another method of post-detector volume control, where a potentiometer replaces the detector anode-coupling resistance.

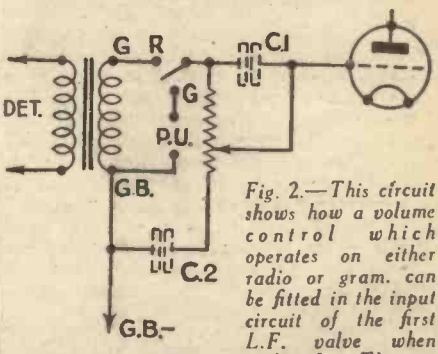


Fig. 2.—This circuit shows how a volume control which operates on either radio or gram. can be fitted in the input circuit of the first L.F. valve when transformer coupling is employed. The two condensers shown in broken lines are referred to in the text.

Combined Radio and Gramo. Volume Control

Except for extension purposes, it is better to place the volume control before the first L.F. valve, and two methods of control are shown in Figs. 2 and 3; the method in Fig. 2 applies when transformer coupling is employed, and that in Fig. 3 applies in the case of resistance-capacity or choke-capacity coupling. Both methods are identical in principle, and have the advantage that they can be used on both radio and gramophone when pick-up terminals are provided as shown. In the arrangement shown in Fig. 2, the value of the volume-control potentiometer should generally be about 250,000 ohms, but in the circuit in Fig. 3 it should have the same value as the grid leak which it replaces—this generally means that the resistance will lie between 250,000 and 500,000 ohms.

Volume and Tone

Although the two circuits referred to are widely used, both possess the disadvantage that any variation in setting of the potentiometer alters the tone of reproduction to a certain extent. In some instances, this is so slight as to pass unnoticed, but in others it is fairly pronounced, especially at low volume levels. The reason for the change in tone is that the impedance of the grid-filament (or grid-cathode in the case of indirectly-heated valves) circuit changes with the setting of the control. The difficulty can, to a certain extent, be overcome by following exactly the same method as in the arrangement shown in Fig. 1;

(Continued overleaf)

(Continued from previous page)

that is, by connecting a fixed condenser between the slider of the potentiometer and the "upper" end of the resistance element. This is shown in broken lines at C.1 in Fig. 2, whilst another fixed condenser is also shown in broken lines at C.2. By carefully choosing the values of the two condensers it is possible to secure a marked improvement at low volume levels, and experiments may be commenced by using two condensers each having a capacity of about .01 mfd.

A variation of the systems shown in Figs. 2 and 3 is shown in Fig. 4, but this latter is suitable for use on radio only. It will be seen that the normal fixed anode coupling resistance of an R.C.C. circuit is replaced by a potentiometer (of similar value), the grid condenser being connected to the slider. When using this method the detector anode load remains constant, although there is a slight variation in the impedance across the grid-filament circuit of the following valve. The variation is not great, however, due to the presence of the grid condenser. The chief objection to this method of control in practice is that it is a difficult matter to find a potentiometer which is completely "silent" in operation when carrying the anode current of the detector valve. A wire-wound component is practically out of the question, because the slider "jumps" over the adjacent turns; a really good graphite or composition unit is fairly satisfactory, however, provided that it is easily capable of carrying the anode current required by the detector valve.

In the Detector Anode Circuit

Another method of control, which is also applicable only to the radio side of the set, is that illustrated in Fig. 5, where it will be seen that a variable resistance is connected in parallel with the primary winding of the first L.F. transformer. The trouble here is that variation of the volume-control resistance causes the anode load of the detector valve to be changed. Thus, when volume is reduced—by reducing the value of the parallel resistance—the receiver becomes more responsive to the high than to the low notes. In some instances this can be counteracted in some measure by increasing reaction coupling so as to sharpen tuning and so make the tuning circuits more responsive to the lower frequencies.

Pre-Detector Control

It is evident that any form of volume control which precedes the detector valve can be operative on radio only. Despite this, however, it is very often preferable to employ such a control and to vary the input from the gramophone pick-up by means of a separate potentiometer. For one thing, if the control precedes the detector it can be employed to prevent detector overloading on nearby stations, and thus to avoid many forms of distortion. One effective method of pre-detector control is that shown in Fig. 6, where the usual fixed coupling condenser used in the tuned-grid inter-valve circuit is replaced by a differential condenser of about .0003-mfd. maximum value. The moving vanes of the condenser are connected to the anode of the preceding H.F. valves, one set of fixed vanes is joined to the "upper" end of the tuned-grid coil, and the other set of fixed vanes is connected to earth.

Maintaining Correct Matching

As the capacity between the moving vanes and the fixed vanes marked A is reduced the input to the detector valve will similarly be cut down and, therefore, volume will be diminished. Incidentally, this also causes a certain increase in selectivity, so that the arrangement is doubly useful. In addition, the method has the advantage that it does not introduce distortion or a change in the tone of reproduction. On the other hand, there is a danger that variation in capacity between the anode and A might alter the tuning and so throw the tuned circuits out of gang. This possibility is largely overcome by connecting the second set of fixed vanes to earth, but this may not prove just right. A further improvement can be effected, though, by inserting a pre-set condenser as shown in broken lines, and adjusting this so that correct matching is obtained over the complete range of the volume control. Another difficulty with this arrangement is that there are liable to be hand-capacity effects when operating the control; this can be guarded against by fitting an extension spindle to the condenser. A more serious drawback is that the arrangement is almost certain to introduce losses due to the inevitable "stray" capacities between the anode of the H.F. valve and earth.

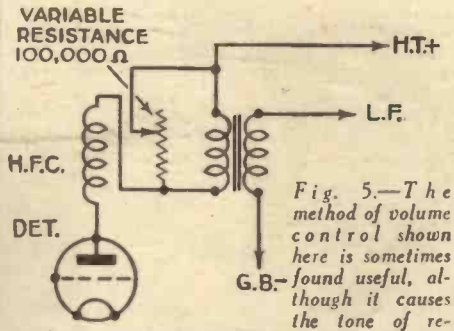


Fig. 5.—The method of volume control shown here is sometimes found useful, although it causes the tone of reproduction as well as the volume, to be changed.

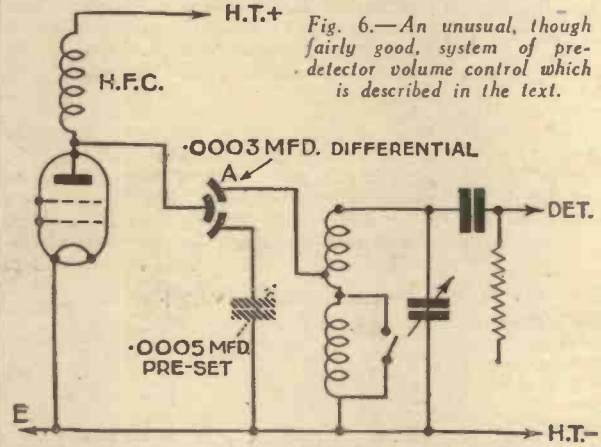


Fig. 6.—An unusual, though fairly good, system of pre-detector volume control which is described in the text.

It is not proposed in this article to deal with variable-mu volume control, although this is one of the best pre-detector systems, the reason being that it has adequately been covered in several fairly recent articles. For the same reason we need not consider the (not very good) method of volume control which functions by varying the voltage applied to the screening grid of an S.G. valve.

Aerial-Input Control

There is, however, one further method of control that is well worth considering, since it is probably the best in many respects. It is similar to the last one discussed, with the exception that the differential condenser is included in the aerial circuit, the moving vanes being joined to the aerial lead, one set of fixed vanes being connected to the aerial terminal on the coil, and the other set to earth—preferably through the pre-set condenser previously mentioned for maintaining correct ganging. This form of control is entirely distortionless, prevents overloading, and is very progressive in action. Additionally, it is practically free from all hand-capacity troubles when used in a modern circuit.

Station Notes

Progress in U.S.S.R.

THE Moscow Research Laboratory of the Ministry of Communications has succeeded in constructing a 2-kilowatt transmitter to operate on 5.8 metres. Following lengthy tests, the apparatus is now capable of radiating messages over a distance of roughly 90 miles; as it is planned it serves both as transmitter and receiver. It is also reported that the Laboratory is now trying out a 20-kilowatt transmitter which can be fed from the ordinary electric lighting system.

To Raise Those Deep Depressions

EXCEPT in the northern and north-eastern counties, it is seldom that the Reykjavik broadcasts are heard in the British Isles. If the plan matures, Iceland will be given, in 1935, a 100-kilowatt transmitter, which should make its radio entertainments heard over the greater part of Western Europe.

The Race for the Kilowatt Cup!

1935 is likely to see a considerable boosting in the power of some of the Continental broadcasting stations. Lahti (Finland) may top the list with 220 kilowatts, followed by Bod (Brasov, Romania) and Radio-Paris, with 150 kilowatts. This will also be the power of the new *Deutschlandsender*, at Brueck, near Berlin. France, in addition to the high-power station in the capital, hopes to bring into operation P.T.T. Limoges (100 kilowatts), P.T.T. Lyons (90 kilowatts), and Marseilles, Bordeaux, and Strasbourg, all 60 kilowatters. In Italy, Rome (1) is to be converted to 100 kilowatts, and a second station built to provide an alternative programme. Czecho-Slovakia proposes to boost the Kosice station to something much larger. Sottens will join the 50 kilowatt class in the summer, and finally, Hilversum some time this year will broadcast its concerts on a 60 kilowatt basis. 1935 should prove a bumper year for listeners.

Alternative Programme from Budapest (2)

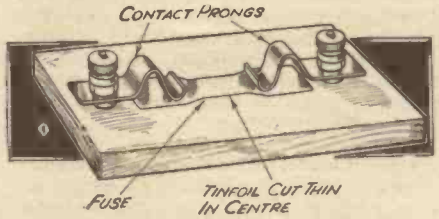
IT seems a pity that the 20-kilowatt station erected by the Hungarian authorities for this purpose should use a channel (834.5 metres, 359.5 kc/s) which is outside the range of the average wireless receiver. Even in Hungary complaints have been made to this effect. The reason, however, for the choice of wavelength is that from tests made it has been demonstrated that the transmission is peculiarly free from fading, an effect which was specially marked when using a higher frequency.

READERS' WRINKLES

THE HALF-GUINEA PAGE

A Handy Experimenter's Fuse

THIS handy fuse can be made from a few odds-and-ends usually to be found in the junk box. The parts required are:

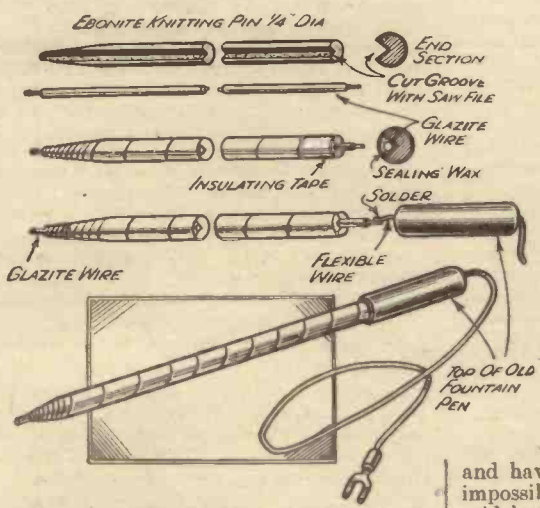


A handy experimenter's fuse, in which a piece of tinfoil is used for the fuse element.

Two terminals, two strips of brass, bent to form springs (as illustrated), a piece of wood or ebonite for the base, and a piece of tinfoil for the fuse. This is cut away in the centre (as shown) to enable it to melt should too much voltage be applied. For a two-valve set, this should be cut as narrow as possible, and for a three-valve set it should be a shade wider in the centre.—W. A. DUNCAN (Liverpool).

A Neat Testing Prod

THE accompanying sketch shows how I constructed a neat testing prod from a piece of ebonite knitting pin, a piece of Glazite wire, the top of an old fountain pen, and some insulating tape. Having placed the Glazite wire along a groove cut in the knitting pin with a saw file, some sealing-wax was run in to fix the wire. The wax was smoothed with rough glass paper. The whole is bound with insulating tape, sufficient being put on so that the pin will fit tightly in the fountain-pen top. Before fixing the pen top, a piece of flex wire is threaded through a hole drilled as shown in sketch, and soldered to the end of the



A testing prod made with an ebonite knitting pin and a piece of Glazite wire.

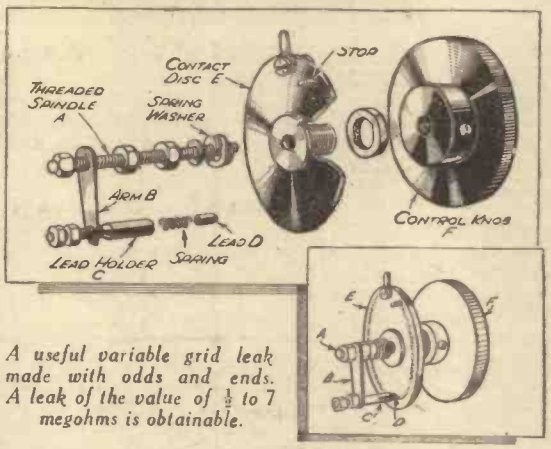
Glazite wire. The pen top is fixed on to end of the pin, and a spade terminal or wander plug is attached to the other end of flex.—F. W. RITCHIE (Macduff).

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 Variable Grid Leak

BY means of the simple device shown in the accompanying sketches, a grid leak resistance of ½ to 7 megohms is



A useful variable grid leak made with odds and ends. A leak of the value of ½ to 7 megohms is obtainable.

quickly obtainable by a turn of the knob. The parts required are: The flanged end of a cotton reel, a piece of 4 B.A. threaded rod, with nuts and spring washer, one knob, a brass screw minus the head, a valve socket to hold a small spring, and a piece of lead. These parts, details of which are given in the top diagrams, are assembled as shown in the small inset drawing. After the soldering tag and stop pin have been fixed in place in the wooden disc, the knob is partially rotated a few times to form a black-lead path, as indicated. This path must, of course, be continued under the connecting tag, which is screwed down tightly on to it. I have tried out this device as the grid of the detector valve in my set, in place of the usual 2-megohm grid leak, and have tuned in stations which were impossible to receive with the old fixed grid leak.—A. WATSON (Biggleswade).

"Hotting-up" the Short-waver

A MUCH-IMPROVED performance can often be obtained from a reacting detector used for short-waves reception by making the reaction coil serve the dual purpose of reaction coupling and aerial transformer. The circuit diagram shows the small alteration necessary.

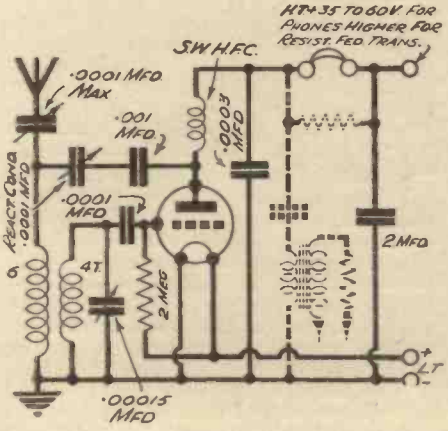
Note that *no* auxiliary by-pass condenser is used between plate and earth line, as this would by-pass the wanted aerial currents; for efficient filtering of H.F. from the telephones or following L.F. stage or stages, therefore, a small condenser of .0002 or .0003 mfds. should be connected between the other (*i.e.*, low-potential H.F.) side of the H.F. choke and earthline as shown.

The reaction coil should have more turns than the grid coil, in about the ratio given in the diagram, and coupling between the coils should be kept as "tight" as is consistent with good reaction effects. As both the moving and fixed vanes of the reaction condenser are at high potential (from an H.F. point of view), this condenser should be mounted on an insulated bracket and controlled by a 3in. ebonite extension spindle. Particular care should be given to the avoidance of capacity losses from the reaction condenser and safety condenser (.001 mfd. in diagram).

It will be found that quite a large value of aerial-feed condenser can be used, with beneficial effects on signal strength, but, of course, the effect on the tuning circuit of transferred aerial capacity should be kept in mind, as too high a value will make it impossible to "tune down" low enough. — H. J. CULPECK (Folkestone).

TELEVISION AND SHORT-WAVE HANDBOOK

Reserve a copy of this Topical and Important Work Now! Turn to pages 798 *and* 799.



Circuit diagram showing the simple alteration necessary for improving the performance of a detector valve in a short-wave set.

WORDS WHICH MISLEAD

Our Strange Wireless Nomenclature

by PERCY W. HARRIS, M.I.R.E.

EVERY occupation and hobby contains some misleading words—look at "chauffeur" for instance. It is derived from the word "chauffer," to heat, and originally applied to the man who stokes the boilers! Now it is associated with a professional motor-car driver and everybody knows what it means. Wireless bristles with such absurd nomenclature.

Disregarding the word "wireless" itself which has been done to death by humorous writers, although it seems to be re-discovered with appalling frequency, we have plenty of terms which, because they are really unsuitable, give rise to all kinds of misunderstandings. Take, for example, a "power valve." Any technical writer who keeps in contact with his readers by correspondence will tell you that he gets numbers of letters expressing disappointment that the substitution of a "power valve" for an ordinary one has not brought about any increase of power, but generally a *reduction* in volume. I have even been asked whether the fitting of a power valve would "strain" a set. If we were to call it a "power-handling valve," so as to indicate that this kind of valve is an aid to distortionless reception, half of these misunderstandings would not arise.

Is It a Valve?

But then look at the word "valve" itself. Before wireless came along everybody knew what a valve meant—it was something which opened in one direction and not in the other, or let something through forwards and not backwards. Although it was first applied to a thermionic device, we had before this a true valve in the crystal, which is a real "one-way traffic" device, allowing the passage of high-frequency currents in one way and preventing them in the other, thus enabling us to rectify and hear our wireless signals in the telephones. Sir Ambrose Fleming, when he invented the thermionic device, consisting of a hot electron-emitting filament sealed in a vacuum with a cold plate, was actually producing a one-way device and the Fleming valve was correctly termed; but with the introduction by de Forest of the third electrode, not only was the structure altered but the functioning as well. Save in a few cases (the rectifier in a mains set and the various kinds of diodes used in superhets are examples) what we in this country still call a valve really acts as an electron relay.

Mains Aerial?

What an absurd misnomer is "mains aerial." Aerial is, of course, a contraction of aerial wire, although "wave collector" would be a better term. My dictionary defines aerial as "belonging to the air; inhabiting or existing in the air; elevated, lofty, ethereal." Try and fit that to "mains aerial" and see where you get! And when that has ceased to worry you pause awhile and ruminate on the word "condenser."

Does It Condense?

Does it condense, squeeze, or reduce the volume of anything? Can you by any stretch of imagination connect the dictionary, or for that matter any other, definition of "condense" with it? "To compress or reduce by pressure into smaller compass; to reduce to a denser form, as vapour to liquid." Just because the very earliest experimenters in electricity got completely wrong ideas about the functioning of the Leyden jar this ridiculous word has tagged along with us for a couple of centuries or more. From time to time an endeavour has been used to substitute the word "capacitor" as much more sensible, but no, we still stick to a term which confuses all new-comers to the art.

Of all the absurd terms with which the art of radio is bespattered commend to me the word "escutcheon," which is used to designate the piece of stamped tin round the aperture into which you gaze to find a dial reading.

What Is an Escutcheon?

"Escutcheon: Noun. A shield on which a coat of arms is represented: a family shield: the part of a vessel's stern bearing her name." Perfectly suitable for a wireless set, is it not? And while we are at it, what about the word "dial" itself? It originally meant "an instrument for showing the time of day by the sun's shadow (Latin *dies*, a day)." And as time went on it was applied to the face of a watch or clock. The meaning was then stretched farther to cover the circular plates over which an indicator moves and from this it was a fairly simple step to a disc engraved with degrees which moves past a pointer, at which stage it came into use on wireless sets, which at first had dials marked in 180 degrees. From that it seems entitled to go anywhere without a passport.

The "Loud"-speaker is Quiet!

They are not difficult to find, are they, these absurd words? When somebody says to you, "That music sounds very quiet in the loud-speaker, does it not?" you do not laugh, although you should. Why pick out speech as the only kind of sound reproduction with which the name of this instrument should be connected? And why "loud"? The answer is that the wireless instrument with which we are now so familiar grew out of a special device invented for use, in noisy conditions, in place of the usual telephone receiver, so that the speech of the man at the other end of the wire could be made sufficiently loud to be heard above the din, as on battleships.

A Dry Battery is Wet!

A dry battery will not work if it is dry, because the cells become inactive immediately the paste filling a part of the space within the zinc container loses its moisture. A wireless engineer will tell you, without batting an eyelid, that a certain valve works best on the straight portion of its curve, and in the same breath will talk about soft and hard valves. Just because a plate means something flat you can be perfectly sure that the last property you will ever find in a valve plate is flatness, and as a grid means "a grating of parallel bars" you are quite prepared to find that it is a spiral of thin wire. Indeed, about the only part of a valve which could be recognised by a non-technical man by means of its name is the filament, which does, strangely enough, resemble a thread.

If you did not know anything about wireless what would you imagine a "ganged condenser" meant? "Trimming" the gang sounds almost piratical. If I go on like this much longer I shall not get any sleep to-night so I had better turn on my Jacobean radiogram.

On Your Wavelength

by Thermion

Amplifier Ratings

STUDYING the specifications of a number of public address amplifiers the other day, I was struck by the lack of standardisation in the way the sizes of the various equipments were quoted. The same remarks also apply to the descriptions of output valves. For example, two almost identical amplifiers were described by different makers, the one as a 50-watt amplifier, and the other as a 10-watt amplifier.

It was known that each amplifier employed two "25-watt" output valves in push-pull, that is, two valves each taking an anode current of 63 milliamps at 400 volts high tension, and each capable of an output of 5 watts. Thus, two valves each consuming 25 watts high tension, *i.e.* 50 watts in all, result in a "50-watt" amplifier. But then these two valves give 5 watts output each, *i.e.* 10 watts in all, resulting in a "10-watt" amplifier. So equipments, or valves, can be rated in terms of their *consumption* or of their *output*, which is rather misleading.

The dissipation figure is the larger, and, of course, is more impressive, and for this reason is very widely used. But it tells us little or nothing about the performance of the apparatus. To my mind, since amplifiers are used because they give a certain useful output, this is the figure which should be quoted in the description.

Extension Speaker Leads

MANY listeners fail to obtain the best results from a speaker extension system because they do not use the most suitable kind of wiring. Where the extension speakers are of the "high impedance" type, as, for example, moving-coil speakers having their own transformers, high note losses due to the capacity existing between the two wires may be serious. Twin or twisted wires should never be used, therefore, for such extension lines, but separate wires which, moreover, should be kept as far apart as practicable. Two separate lead-covered wires—*not* twin lead covered—are the best for this purpose.

When, however, low impedance speakers are used, as in the case of moving coil speakers without separate transformers, and working from a step-down transformer incorporated in the receiver, capacity losses are inconsiderable, and the chief difficulty will be loss of power due to the resistance of the extension wires. In this connection it is useful to know that the cheap red and black flex which is so largely used by amateurs has a resistance of 1 ohm per 25 yards of single conductor. This means that an extension system using 25 yards of this twin flex has a resistance of 2 ohms, which is comparable with the resistance of the speaker itself. Anything up to one half of the total power may therefore be wasted in heating the extension leads, so it is very advisable to use good heavy wiring for a low-impedance extension line.

Using the Earth Lead

TESTING out a new receiver recently, I dived into the recess under my bench to retrieve the aerial and earth leads which were connected to a pair of terminals at the back and had slipped down. In the darkness I could only locate one wire, and being in a hurry to get the set into operation I pulled the solitary wire forth and plugged it into the aerial socket of the receiver. Results were quite good, but not brilliant so far as power on distant stations was concerned so, thinking that reception would be improved by adding an earth connection, I found a flashlamp, explored the dark corner and found the second wire. Now my aerial and earth leads are formed of identically the same kind of wire and have identical plugs (of course I *ought* to have distinctive colours, but there it is), and on examining the connections it was discovered that the set had been working with the aerial terminal connected to my earth wire.

Now there is nothing very astonishing about this, for many receivers will often give good results of a sort under similar conditions, that is, when using an earth instead of an aerial. The fact is mentioned, however, partly to point out to you that there may be quite a considerable signal "pick-up" on an earth lead, and partly because it shows the very high sensitivity of a modern receiver.

Mention of the signal pick-up on the earth lead is a reminder that this wire is equally susceptible to interference signals, whether radiated from electrical apparatus or picked up by induction from electrical house wiring. In a recent instance which came under my notice, mains hum still persisted even after every known device for obviating it had been applied. A cure was only effected when the earth lead, which was really quite short and direct, was taken by a rather longer and more devious route, in order to avoid a run of flexible wire used to connect a floor standard on the other side of the room.

Mr. Alfred D. Webber, who is making a trip overseas in connection with Messrs. Pifco's new agencies in various colonies and foreign countries, including Africa, India, China, Japan, Canada and America, for the sale of Pifco test meters.

The Quality Problem

WHILST discussing quality reproduction with some friends the other evening it was suggested that good quality could not be obtained from a battery-operated receiver owing to the invariable overloading of the detector valve. It is true that the leaky-grid triode detector introduces a certain amount of distortion, especially when using two H.F. stages for long distance reception. I find, however, that this distortion can be overcome by using a Westector as detector, retaining the old triode detector as first L.F. amplifier. Provided that a WX6 Westector is used, this procedure actually increases the output volume and certainly provides an improvement in quality. There are two points worthy of mention when this addition is effected, however. The maximum volume will not be obtained unless the Westector is biased 1½ volts negative, and owing to the high impedance of this component the following coupling should constitute a high-value resistance or a high-inductance choke. These remarks apply to straight receivers using one or two S.G.-H.F. stages, of course; when the Westector is used as second detector in a superhet I have found that best results are obtained with an unbiased W6.

Station Marked Dials

THERE seems to be a craze for station marked dials amongst set owners at the moment. It has been my experience, however, that this type of dial is usually unreliable, especially in selective superhets. Apart from the fact that some stations do not strictly adhere to their allotted wavelengths, the stray capacities in the tuned circuits vary, and trimming the various condensers to provide the exact station dial reading becomes a difficult problem. Seemingly, the only satisfactory way out of the difficulty is to calibrate each set independently and mark the dial accordingly—I understand that this procedure is adopted with some of the high-class British receivers. In some cases it is found that dial readings vary slightly after the set has been in use for a short time, however, thus increasing the listener's difficulties.

The reason for this is not very obvious—it may be due to slight heating of the iron cores of the coils, causing a variation of inductance, but perhaps one of my readers can suggest an alternative reason. I am told that it is a problem that is baffling some of our largest manufacturers, and is therefore worthy of consideration. Another cause of the calibration not holding throughout the scale range is that the tuning condenser itself is not truly square-law. Some years ago, I spent some days arriving at the formula for the polar radii of square-law condenser plates. Upon comparing the result with commercial square-law plates I did not find a single

(Continued overleaf)

(*Continued from previous page*)

one which was accurate. They all had a tendency to spread on their mid-points. Another source of trouble with variable condensers is a badly-fitting spindle or lack of alignment between the fixed and moving plates. Condensers and coils need to be considered as a unit and designed to suit one another. Commercial attempts to do this have not in my experience been successful. Whether permeability tuning solves this trouble I am not competent to say, having had practically no experience with it. I have, however, received the Varley and Morley Permeability tuners for test and will pass along results as soon as I have anything useful to report.

Valve Data

THE data given in present-day valve catalogues is remarkably complete, especially when it is compared with the very scrappy information available concerning valves in the earlier days of radio. In a recently-issued catalogue no fewer than fourteen columns of data are provided, giving practically everything it is required to know about the operating conditions and performance of every valve.

It was interesting to see that, in order to accommodate all these columns on a single page, the compiler had found it necessary to use "engineer's shorthand" for the various characteristics, *e.g.*, V_a for anode voltage and so forth. A key to these symbols was printed at the top of the page, but, as similar symbols are frequently met with in technical articles, it seems worth while to explain them here.

No difficulty should be experienced in interpreting V_a, V_{aux}, V_s, V_f, and V_g as "anode volts," "auxiliary grid volts," "screen volts," "filaments volts" and "grid volts" respectively, for it is easy to remember that "V" stands for volts. The next lot was not so obvious, however. I stands for "filament current," the letter "I" being always used for current. Time was when "C" stood for current, but this symbol is now used for "capacity." Why "I" was chosen is not known definitely, but anyway "I_f" is now "filament current," "I_s" is "screen current" and "I_a" is "anode current."

Valve impedance is signified by "R_a" (anode resistance); the amplification factor is now "m" (magnification) and the mutual conductance is "G_m"—something to do with "goodness," I suppose.

I'll Be Seeing You

THE above Yankeeism, in view of the forthcoming television programmes, seems almost prophetic! Which reminds me that many people abhor the very thought of vision by radio because they think it will enable them to see into one another's homes! Perish the thought! Anyway, television will improve the technique of broadcasting no end, for when you can *see* the scene in the studio, the effects department will be able to work half-time. I am looking forward to acrobatic and conjuring turns by radio. Let us hope the industry will not permit the rackets which ushered in radio—wonderful crystals at 5s. each, amazing transformers which were merely swindles in a box, gadgets at a guinea which would revolutionise your radio, office-boy experts who explained in popular papers what they did not understand themselves. Fortunately, you can swindle some of the public all of the time, and all of the public some of the time, but not all of the public all of the time—or words to that effect.

Notes from the Test Bench

Short-wave Reception

THE Television Committee's report will, undoubtedly, have the effect of increasing the interest taken in short-wave reception. Up to the present, reception of the higher frequencies has been mainly confined to the experimenter, this being due to the difficulty which the average listener experiences in obtaining reliable reception of the short-wave stations. It is recognised that the best type of set for short-wave telephony reception is the superhet. When a straight receiver is used, it is necessary to keep the detector on the verge of oscillation in order to obtain satisfactory reception; this is very difficult when the detector is the first valve, as the aerial-earth system tends to cause dead spots in the tuning range, *i.e.*, spots where no reaction can be obtained. To those who suffer from this trouble, the addition of an untuned S.G. H.F. stage is strongly recommended.

Superhet Frequency Changers

MODERN frequency changers are very efficient and give very little trouble provided that the oscillator coil is moderately well designed. It is sometimes found, however, that the valve refuses to oscillate over the entire tuning range, due either to a defective valve or to a defective or badly-designed coil. When this condition exists, no signals are received, as the intermediate-frequency note is not produced. An easy method of checking whether the valve is oscillating or not should, therefore, prove very useful to the home constructor. At the tuning point, where the valve stops oscillating, a sudden variation of current consumption will occur, and therefore the condition of the valve can easily be ascertained by connecting a milliammeter in the anode circuit of the oscillator section, *i.e.*, between terminal 6 of Coil 3 and No. 1 pin of the 210 P.G. in the case of the £5 Superhet. A reading should be taken with the oscillator reaction coil short-circuited, *i.e.*, with a wire connected across terminals 4 and 6 of Coil No. 3. If no variation in current is registered when the shorting wire is removed, it will indicate that the valve is not oscillating.

Trimming the £5 Superhet

THE unsatisfactory results obtained with most of the £5 Superhets which have been sent to our laboratory for test have been due to inaccurate adjustment of the various trimmer condensers. Very accurate adjustment can be effected with the aid of a signal generator, of course, but this instrument is not readily available to the average constructor and, therefore, the following simple method of trimming should be adopted. The aerial and earth leads should be connected to terminals 4 and 6 of the centre coil instead of to the first coil, C2 trimmer adjusted to approximately half-way setting, and C3 between a quarter and half a turn from the full-in position. A weak signal should then be tuned in and the I.F. trimmers adjusted until maximum volume is obtained. Incorrect setting of this trimmer will cause loss of volume, and in some cases excessive whistling will be heard when the tuning dial is rotated.

The Home Constructor Will Score

I SEE that the early television receivers are going to cost from £30 to £80. The home constructor will, of course, be able to make a television receiver cheaper than that, even with cathode-ray tubes at their present price of £7 10s. But I expect valve firms will, by mass production, soon get the price down to thirty bob; within three years, I think, the price will be no more than that of a screen-grid valve. Thank heaven that within a few months I shan't have to depend upon my *ear* so much in order to build up in my mind the scene in the studio. And Pa and Ma will not need tactfully to retire so that Ermyntrude and Eric may have the drawing-room to themselves. With a television programme going all can remain, and Eric will be able with impunity to hold the hand of Ermyntrude in the dim, religious light required for television! Or is it?

Cheap Batteries

A READER takes me to task regarding my recent paragraph anent cheap H.T. batteries. He says that there has been no reduction in price, but that cheaper batteries have been produced. Is not this rather begging the question? I agree that 12s. 6d. batteries remain at 12s. 6d. and that battery manufacturers have extended their ranges by producing cheaper versions. I do not suggest for one moment that a 6s. 6d. battery is so good as a 12s. 6d. battery, and for really lengthy service I would recommend you to buy the dearer product. My point was rather that home-construction has been considerably cheapened and that many thousands who formerly were unable to make a set may now do so. These cheap batteries seem to be standardised at 6 volts for 4½d. Hence a 60-volt battery will cost 3s. 9d., a 120-volt battery 7s. 6d., and pro rata.

Terminals

WHAT a thorny subject! Every time I screw down a terminal I resort to the vernacular. Why must they make sloppy screws or sloppy terminals with the business end of the latter cut away to nothing? The clamping area is totally inadequate. I want a terminal with plenty of nice contact area which grips the wire and enables me to make a good contact. As it is, the contact face of the terminal is so small that when you tighten it down it merely squeezes the wire outside—the point of contact apparently being within the diameter represented by the highest point of the loop of wire. Abler pens than mine have indited opprobrium about this point, but still it goes on. Let us have clamping area, and lots of it. Let us have a length of terminal screw which will enable you to grip more than one piece of 20-gauge wire. Let us have our terminals made to screw limits as recommended by the Engineering Standard Committee so that when we tighten our terminals we don't strip the thread. There is no reason, now that the Radio Component Manufacturers' Federation has its own Standardisation Committee, for this state of affairs to continue. It is annoying to ruin a 30s. transformer because the threads strip. And whilst I am on the point, let us have plenty of ebonite round the terminal. Quite often this breaks off like a piece of biscuit, particularly where the ebonite lug carrying the terminal has been badly designed and is unwebbed.

VALVE SENSITIVITY

An Article Dealing with the Amplification Obtainable from Various Types of Valves.

A RADIO valve can be looked upon in many ways, depending upon the manner in which it is used. It may be considered as a "one-way traffic" device for electric currents; or as a voltage-amplifying device: or as a power relay. In the case of all valves except diodes (of either the detector or mains-rectifying types), the amplifying power is the most important feature. Even the detector, unless it be a diode, functions by reason of its amplifying power, the amplification being greater for one-half of each high-frequency cycle than for the other half.

It is, therefore, very important to know, with a fair measure of accuracy, the degree of amplification obtainable from various types and makes of valves—in other words, their sensitivity—not only in order to compare and assess the merits of individual specimens, but also to facilitate the quantitative design of the associated circuits with a view to obtaining optimum working.

Important Quantities

A certain amount of useful information concerning a given valve is obtainable from the characteristic data published by valve manufacturers. This data usually comprises the impedance (or A.C. resistance) of the valve; its amplification factor, and its mutual conductance, all these being measured under some standard conditions such as at anode volts=100 and grid volts=zero.

These quantities are known as the "static" characteristics, because they are determined under laboratory conditions with no signal on the grid, and with a non-inductive load in the anode circuit. It must be realised, therefore, that they do not represent the performance of the valve under working conditions. They do, however, furnish a rough guide to the sensitivity of different valves.

In order to explain this it is necessary to point out that the impedance of a valve is mainly a guide to the type of anode load into which the valve will work, and in choosing a valve for any purpose the first selection should be made on the basis of seeing that the impedance is of a suitable value for the anode-circuit component values. Alternatively, in designing a set, the components in the circuit of the valve should be selected so that their impedance is of the correct value for the valve preceding them. This point will be referred to again later.

Simplifying Matters

Comparison of valve sensitivities, therefore, must be made on valves of similar impedance and working into identical, or, at any rate, similar loads. Under these conditions the valve having the higher amplification factor will have the greatest sensitivity, the gain being directly proportional to the amplification factor.

The actual gain can be calculated quite accurately from the formula which has been given many times in this journal, namely:—

$$\text{Stage gain} = \frac{mZ}{Z+R}$$

Where Z=impedance of anode load.
R=impedance of valve.
m=amplification factor of valve.

Many listeners find it a little difficult to understand why the factor $\frac{Z}{Z+R}$ should appear in this formula, but it can be explained very simply. Fig. 1 represents an amplifying valve with its anode load and high-tension supply, a triode valve being chosen in this case, the load being a resistance. Owing to the action of the signal upon the grid, a signal-frequency current passes through the circuit, and as the circuit has impedance there will be an A.C. voltage drop across the points A and B. The impedance of the circuit A to B consists of two parts—the impedance of the load AC and the impedance of the valve CB.

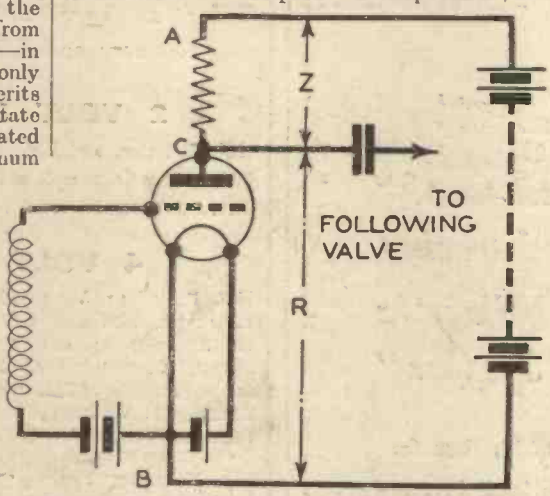


Fig. 1.—A simple diagram to illustrate stage gain.

It is possible, therefore, to re-draw Fig. 1 as in Fig. 2, in which the load AC (Z) remains as before and the valve CB is represented by another impedance, R. It will be appreciated that the part AB is now in effect a potentiometer of total impedance Z+R, and the signal voltage which is tapped off for application to the grid of the following valve is the alternating voltage drop across Z. As in all potentiometers, this voltage bears the same proportion to the total voltage across the potentiometer as the resistance of the part AC bears to the total resistance. The impedance of the part AC is Z, and of the whole Z+R, so that the desired ratio is $\frac{Z}{Z+R}$.

Mutual Conductance

The mutual conductance of a valve is a measure of the change in anode current for a given change of grid voltage. As the voltage developed across the anode load (Z), in the case of a voltage-amplifying valve, depends upon the value of the anode current fluctuations as well as upon the impedance of the load, it is clear that the value of the mutual conductance can also be considered as a measure of the sensitivity of the valve. This can also be demonstrated by simple arithmetic, since the mutual conductance is equal to the amplification factor divided by the valve impedance and multiplied by 1,000, the result being expressed as the milliamps. change of anode current per volt change of grid voltage.

This formula can be written in another form because the amplification factor is equal to mutual conductance multiplied by the valve impedance and divided by 1,000, so that the original formula for stage gain can also be re-written as follows:—

$$\text{Stage gain} = \frac{gZR}{Z+R}$$

Where g=mutual conductance.

Hence, taking valves of similar impedance and with similar loads, the stage gain is proportional to the mutual conductance.

In the case of output valves, where operation is not a matter of mere voltage amplification, but of the production of a substantial amount of power in the output circuit, the significance of this characteristic is not quite the same. The power output in the anode load is equal to the alternating voltage developed across the load multiplied by the value of the alternating current component flowing in the load. It will thus be seen that the mutual conductance which takes account only of the changes in anode current with changes in signal voltage is not a true measure of *power* sensitivity of the valve.

Power Sensitivity

Actually, while voltage amplification can be estimated on the basis of the characteristics already described, the power sensitivity of different output valves is best expressed in milliwatts of output per (volt)^2 of grid signal voltage. Thus, a valve which will give a maximum undistorted output of 2.5 watts for a grid signal of 20 volts would be said to have a sensitivity of:—

$$\frac{2{,}500}{20\times 20} = \frac{2{,}500}{400} = 6.25 \text{ mW./V}_2$$

It should be borne in mind that the power sensitivity of a valve is not constant for all values of load impedance. For example, the value calculated above might have been taken for the valve when working in the optimum load, and for 5 per cent. second harmonic distortion. Had the measurement been taken with a smaller or larger

(Continued on page 801)

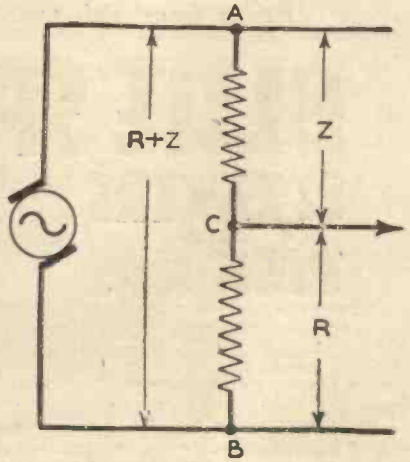
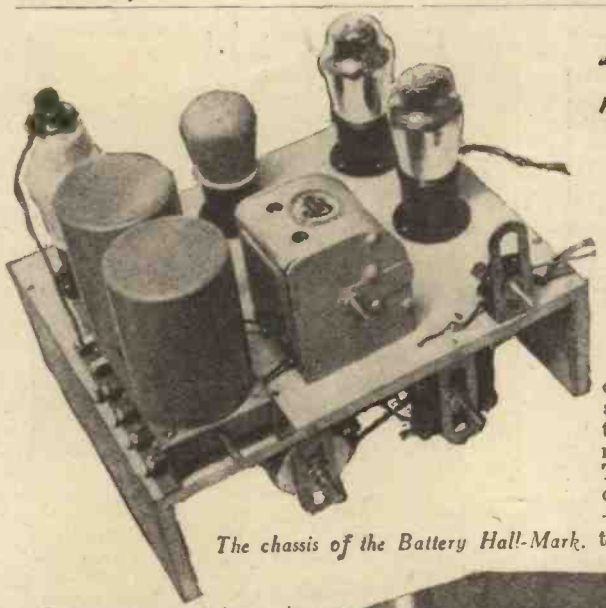


Fig. 2.—A circuit which is electrically equivalent to Fig. 1.

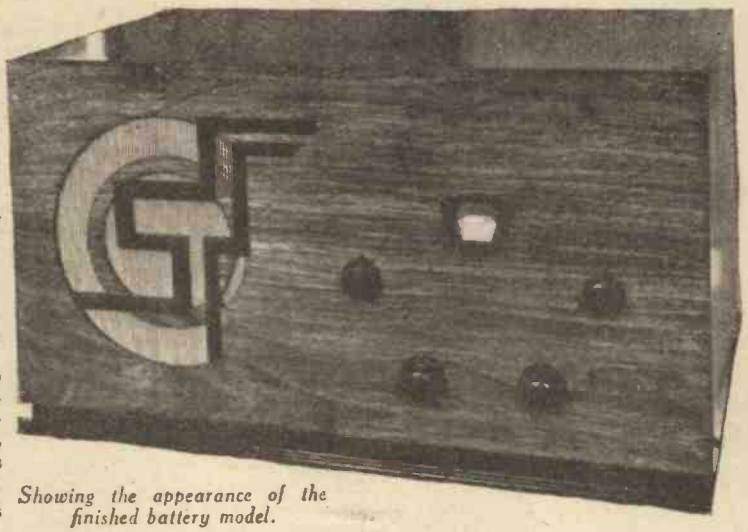


The chassis of the Battery Hall-Mark.

FURTHER NOTES ABOUT THE HALL-MARK FOUR SERIES

Details are Given for the Connection of a Pick-up when desired, the Information Covering all Three Models

ALL three receivers in the Hall-Mark range have obviously created a tremendous amount of interest, for our postbag has been crowded with letters from enthusiastic constructors, and prospective constructors, of one or other of these interesting sets. Those who have already built one of the sets are full of praise, and most of those who have not yet taken the plunge have expressed their enthusiasm for the designs. No matter which of the sets is considered, the simplicity of construction is apparent, whilst the symmetrical layouts have called forth admiration.



Showing the appearance of the finished battery model.

Use the Components Specified!

Despite the fact that we have on so many previous occasions emphasised the fact that alternative components to those specified cannot satisfactorily be employed, we still continue to receive letters from readers who ask if the circuit could be modified to include such-and-such a component, or if results would be affected if different valves were substituted, if another type of coil (which the reader generally has on hand) could be used, or if it would be better to employ more expensive parts in certain parts of the circuit. It is extremely important that alterations of this character should not be introduced, for, as we have clearly stated, the sets have definitely been designed around components which have specially suitable characteristics, and which are therefore best for the function which they have to fulfil. We would therefore like to say, *with emphasis*, once again that our guarantee does not hold good if the constructor deviates from the exact specification as published. We would also emphasise that we cannot, in any circumstances, undertake to modify the designs or to recommend any modifications. This is done with the interests of readers at heart, for we know—and every designer knows—that if a receiver is to give a definite standard of performance it must be made in a definite manner. We are also aware that if we attempted to assist individual readers by saying that alternatives could be used, these readers would not obtain the results of which the sets are capable, and which have been obtained in our laboratories, and in "outside" tests with the original models.

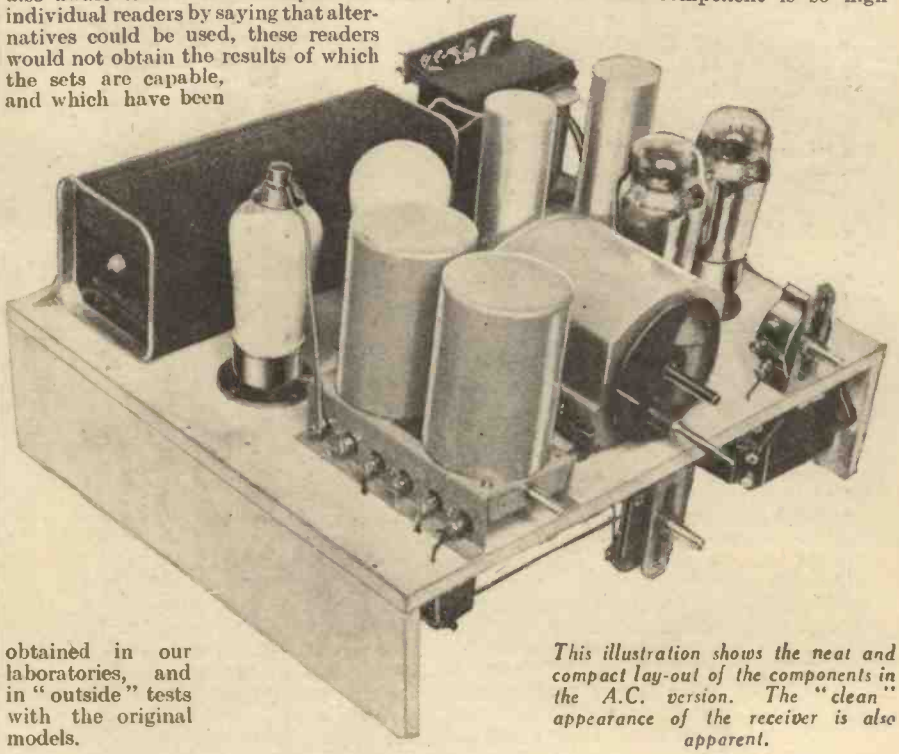
A FEW FEATURES OF THE BATTERY HALL-MARK

- Undistorted output of over 1 watt—which may be increased to 2 watts by using two 220 PT pentode valves.
- Suitable for use with H.T. battery or good mains unit.
- Compensated tone—by means of two fixed condensers in push-pull circuit.
- Easy construction.
- Simple tuning.
- Economy of construction and operation.

Pick-up Connections

The original receivers were not provided with pick-up terminals, but that is no reason why any one of them should not be employed, with every satisfaction, for reproducing gramophone records. Provision was made for the use of a pick-up when required, and in the Universal and A.C. versions suitable bias resistors were purposely included in the cathode leads from the detector valves. This means that when a pick-up is connected, the valves will automatically be transformed from detectors to efficient low-frequency amplifiers. In the case of the battery receiver a pick-up can be connected in the usual manner by joining the leads to the grid terminal on the detector valve-holder and to a tapping point on the G.B. battery respectively. When that is done the optimum G.B. voltage will probably be found to be about 1½ volts, but the tapping point can easily be altered and the most suitable voltage found by trial.

When a pick-up is connected this will be in parallel with the grid leak, but the resistance of that component is so high



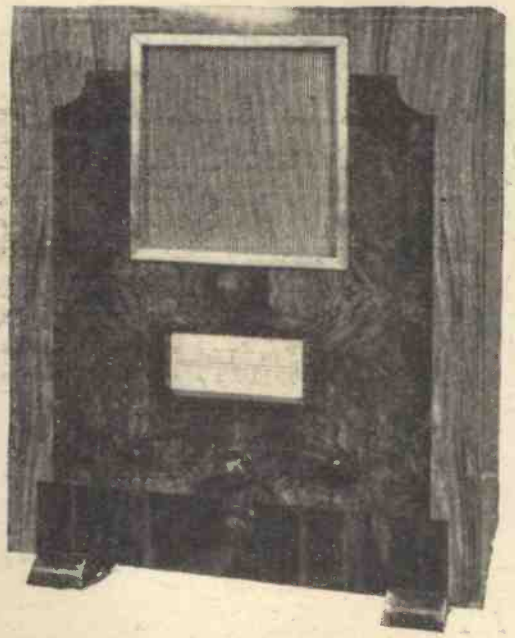
This illustration shows the neat and compact lay-out of the components in the A.C. version. The "clean" appearance of the receiver is also apparent.

that it will not have any adverse effect upon the quality of reproduction.

When a pick-up is to be connected to the A.C. model the leads should be joined to the grid terminal and to earth (the metallised chassis makes the most convenient form of earth-return). If desired, a radio-gram. switch could easily be fitted by connecting the centre terminal to the grid of the detector valve, a second terminal to the junction of the grid leak and grid condenser, and the third terminal to one pick-up terminal. When this is done the lead from the grid condenser to the grid of the valve must, of course, be removed. The very same idea may be applied in the case of the other two models, and this will be found advisable when the receiver is built into a radiogram cabinet, or is to be used as a combined instrument. It is rather important when fitting the switch that this should be placed as near as possible to the detector valve-holder. If, for any reason, this is inconvenient, the leads to the switch should be screened to avoid any possibility of inter-action of L.F. oscillation.

FEATURES OF THE UNIVERSAL MODEL

- Suitable for use on A.C. or D.C. mains of 200 to 250 volts.
- Undistorted output of 6 watts.
- Variable control of pentode screen voltage to provide accurate matching of output valves.
- Use of high-ratio push-pull transformer ensures full loading of output stage.
- Automatic bias on detector comes into action when pick-up is connected.



Here is the Universal Hall-Mark in its attractive cabinet.

This is the chassis of the Universal Hall-Mark.

A Pick-up with the Universal Mode

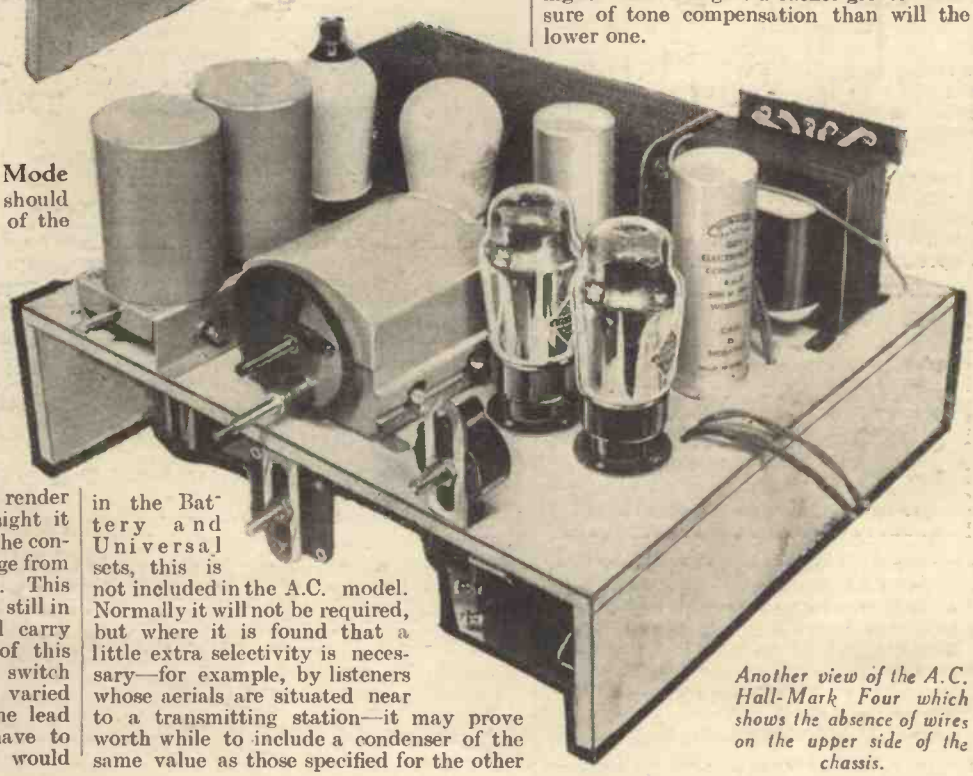
A rather different procedure should preferably, be adopted in the case of the Universal model, because if the positive mains lead (on D.C.) were earthed the pick-up would be "live." If this were so there would be a possibility of the user receiving a shock when handling the pick-up. To avoid any possible difficulty in this respect it is a wise precaution to include a fixed condenser of about .5-mfd. capacity in series with each of the pick-up leads. The condensers will not affect performance in any way, but they will render the set completely safe. At first sight it might appear that the inclusion of the condensers would prevent the bias voltage from being applied to the grid of the valve. This is not the case, since the grid leak is still in parallel, and that component will carry the biasing potential. Because of this the method of fitting a radio-gram. switch described above would have to be varied slightly. This means that only the lead from the grid condenser would have to be broken, and that the grid leak would remain in circuit between the grid and the end of the bias resistance.

Additional Selectivity

It will have been observed that although a pre-set condenser is shown in series with the aerial lead in the Battery and Universal sets, this is not included in the A.C. model. Normally it will not be required, but where it is found that a little extra selectivity is necessary—for example, by listeners whose aerials are situated near to a transmitting station—it may prove worth while to include a condenser of the same value as those specified for the other sets. Another slight addition to the A.C. model which some readers might prefer to make concerns the fixed condensers connected in parallel with the two halves of the secondary of the push-pull transformer in the Battery and Universal sets. If it is desired slightly to lower the tone of reproduction two condensers of from .0001 mfd. to .0002 mfd. may be connected; the higher value will give a rather greater measure of tone compensation than will the lower one.

FEATURES OF THE A.C. HALL-MARK

- Detector and L.F. circuits specially designed for good quality on radio or gram.
- Energised moving-coil speaker, with field winding used as smoothing choke.
- Adequate selectivity due to use of H.F. transformer coupling.
- Undistorted output of nearly 3 watts.



Another view of the A.C. Hall-Mark Four which shows the absence of wires on the upper side of the chassis.

CIRCUITS AND SETS FOR ALL

Two Circuits are Described This Week, These Being Alternatives For An Efficient and Simple High-Frequency Amplifier.

A FEW weeks ago we described a receiver of the simple det.-2 L.F. type, using plug-in coils, and a number of readers have expressed interest in this, whilst several have made the set. As plug-in coils are apparently still popular with many constructors it was thought that details of a simple and efficient H.F. amplifier of modern design, but using the old kind of coils, would prove of interest.

The circuit shown in Fig. 1 gives a good idea of the general arrangement, and it can be seen that very few parts are required and that the connections are of the simplest possible kind. This amplifier is eminently suitable for use in conjunction with any receiver not including an H.F. stage, although it is particularly intended for use with older sets which employ plug-in coils. In order to satisfy the requirements of other readers, however, who have a more modern type of receiver and who prefer to use a dual-range tuner of modern type, another circuit is given in Fig. 2. Both circuits are similar in principle, but the second includes variable-mu volume control; at the same time, it would be a perfectly simple matter to modify either of the circuits to include or exclude variable-mu.

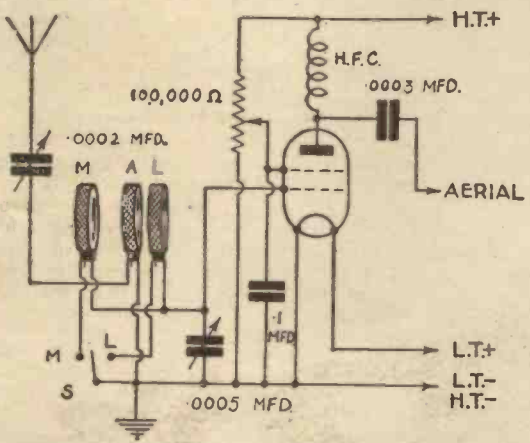


Fig. 1.—This is the H.F. amplifier described, in which plug-in coils are employed.

Increased Selectivity

High-frequency amplifiers are generally looked upon as being valuable only when it is desired to increase the sensitivity of an existing receiver, and hence to increase the range of reception. It is an important fact, however, that the addition of an H.F. amplifier, besides increasing the range, also gives a marked improvement in the way of selectivity. In many instances the additional selectivity is of far greater importance than the increased range, especially during winter when the range of reception with any type of receiver is much greater than during the lighter months. It should be mentioned in passing that either of the high-frequency amplifier units represented by the two circuits is entirely suitable for use with any of the det.-L.F. receivers that have been described in PRACTICAL WIRELESS and *Amateur Wireless*, and although constructional details of similar units have been given previously, these have all been designed to include definite components, which have been specified. In the present instance, although a list of suitable parts is given, the exact choice is not so critical and many readers will be able to make use of parts that are on hand without impairing the performance.

For Plug-in Coils

We may first of all consider the circuit shown in Fig. 1, for this is the more interesting in many respects, largely due to the fact that the use of plug-in coils with modern circuits is unconventional. At the same time it should be made perfectly clear that these coils do not necessarily make the unit any less efficient than if more elaborate and more up-to-date tuning circuits were incorporated. The circuit is so arranged that there is no necessity for coil changing; this is because a two-way change-over switch is included for changing from the long-wave to the medium-wave coil. To ensure reasonable selectivity without sacrifice of sensitivity the aerial coil (marked A) is loose-coupled, and the same coil serves for both wavelengths. In order to obtain the optimum degree of coupling on both wavebands a comparatively large aerial coil is employed (a No. 50), but this is placed close against the long-wave coil (marked L) and about an inch away from the medium-wave coil. With regard to the size of the two tuned coils, a size No. 35 or 50 will be found suitable for medium waves, and a 200 for long waves; these coils will cover approximately the same wavelength ranges as those covered by the average dual-range tuner.

Chassis Construction

The construction of the amplifier is perfectly simple, and a shallow wooden chassis is employed in conjunction with a ply-wood or ebonite panel. The three coil-holders should be placed side by side near the left-hand end of the chassis with their axes at right angles to the panel. As mentioned above, the holder for the aerial-coupling coil is placed between the other two, and is so positioned that the coil, when inserted, just touches the long-wave coil, but is approximately 1in. away from the other one. The valve-holder should be placed towards the other end of the chassis, the .0005-mfd. tuning condenser being mounted in the centre of the panel. The Q.M.B. change-over switch used for wave-changing should be placed on the panel just in front of the coil-holders, whilst the 100,000-ohm screening-grid potentiometer should be positioned so that it "balances" with the wave-change switch, so giving a symmetrical panel appearance.

Aerial and earth terminals should be fitted to the mount specified and placed just behind the coil-holders, so that the leads

(*Continued on page 800*)

COMPONENTS REQUIRED FOR FIRST CIRCUIT

- One Wooden Chassis, 10in. by 8in., with 1in. runners.
- One Ply-wood or Ebonite Panel, 10in. by 7in. (Peto-Scott).
- One .0005 mfd. Variable Condenser, with drive (Formo).
- One 100,000-ohm Potentiometer (Graham Farish).
- One Screened H.F. Choke (Wearite, type H.F. P.A.).
- Three Single Coil-holders and Plug-in Coils (These are probably on hand).
- One .0002 mfd. Pre-set Condenser (Polar).
- One .0003 mfd. Tubular Condenser (T.M.C.).
- One .1 mfd. Tubular Condenser (T.M.C.).
- One Q.M.B. Change-over Switch (Bulgin, type S.81).
- One Terminal Mount, with A. and E. Terminals (Belling Lee).
- One 4-pin Valve-holder (Clix).
- Connecting wire, flex, spade terminals, etc.
- One 215 S.G. Valve (Cossor).

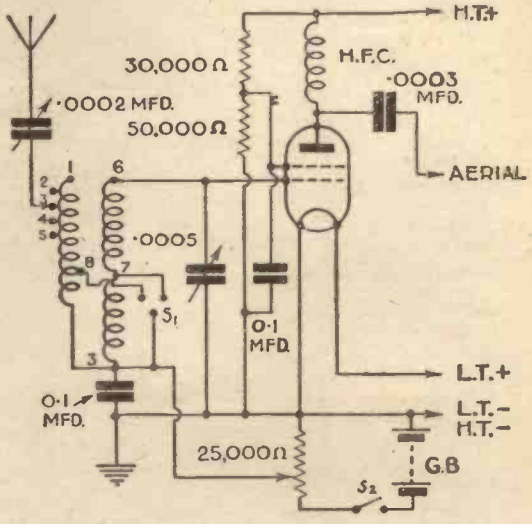
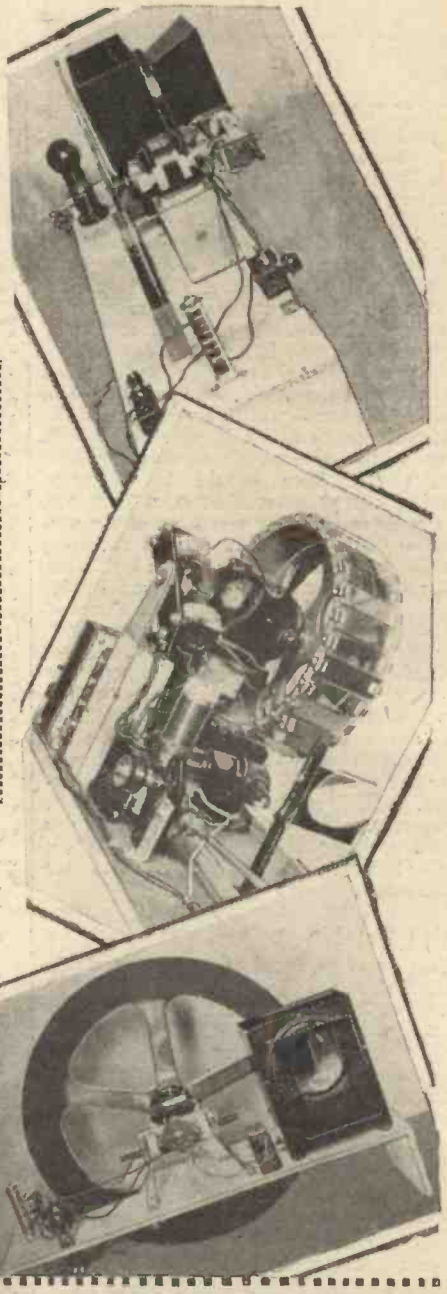


Fig. 2.—A modified circuit, including a dual-range tuner and variable-mu control.

IR GREATEST FT BOOK *Reprinted*



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HOME TELEVISION HIGH-DEFINITION RECEIVERS

Announcements by Baird Ltd. and E.M.I. Ltd.

BAIRD TELEVISION have ready for immediate production two types of receiving sets (a third, giving a 7in. by 5in. picture, is promised at a price between £25 and £30.) Both of these are suitable for receiving pictures and sound from the Baird Radio Transmitters at the Crystal Palace, and have been tested out in all parts of the Greater London area within a radius of twenty-five miles from the Crystal Palace. They are both extremely simple to operate and have two connections only, one to the electric light mains (A.C. or D.C.) and the other to a special form of aerial. The aerial will be supplied with the set and consists of a stiff wire about 10ft. long, with a connecting cable. For best results this wire should be mounted vertically on a mast on the roof of the house, but quite satisfactory reception of pictures can be obtained if this wire is mounted on the side of the house or even inside the room of the house or flat, as an indoor aerial. Once the set has been installed and the aerial set up and mains connection established, then it is only a matter of switching on the set to obtain immediately a picture, properly framed, with the synchronised sound. The correct brilliancy and contrast is obtained directly the set is switched on. It can, therefore, be operated quite easily by a child. Furthermore, there is no danger in using either of these sets. The designs have been fully tested out for reliability and long life, and, therefore, no service troubles are anticipated.

Baird Set No. 1

The complete sound and vision receiving components are mounted in a cabinet 4ft. high, 2ft. wide and 2ft. deep. The size of the picture produced on this set is 8in. by 6in., and it is sufficiently brilliant to be seen quite clearly in ordinary room lighting. It is capable of being used with any type of high-definition transmission, having from 100 to 500 lines, and from twelve to fifty pictures per second. A slight adjustment of a knob sets the receiver once and for all to operate on any particular standard of transmission, for instance, on a 240-line picture with 25 pictures per second. There are five control knobs; two of these are for the sound receiver as follows: one is for tuning the sound on wavelengths from 5 to 9 metres, the other for controlling the volume of the sound. The other three knobs are for the vision control as follows: one for tuning the vision receiver from 5 to 9 metres, one for controlling the contrast of the picture in accordance with individual preference; that is to say, to be varied from a picture with soft tones, to a picture with very contrasted tones, popularly described as "soot and whitewash." The third knob controls the average brilliance of the picture. Tuning in for vision and sound is even more simple than tuning an ordinary radio broadcast receiver. Furthermore, the wide range of wavelengths provided, makes the set available for any number of transmitting stations up to 10, which may be set up in a given area. The size of the picture is sufficient to give a programme of real entertainment value to an audience of up to 10 people in the home. The colour of the picture is black and white, and there is a complete absence of flicker.

On account of the adaptability of the set, it is not likely to become obsolete by any changes in transmission technique during the next three years.

The selling price will be, at first, approximately £50, likely to be reduced considerably in quantity production.

Baird Set No. 2

The components are mounted in a cabinet 4ft. high, 2ft. 3in. wide and 2ft. deep. The size of the picture produced on this set is 12in. by 9in., extremely brilliant and sufficient to see a picture in ordinary room lighting. It can be adjusted in definition of from 100 to 500 lines, and from 12 to 50 pictures per second. There are five control knobs, as in the case of Set No. 1, and the wavelengths covered are similar. The size and brilliancy of the picture are sufficient to give a programme of real entertainment value to an audience of up to thirty people in the home. The colour of the picture is black and white, with a complete absence of flicker. On account of the universal adaptability of the set, it is not likely to become obsolete by any changes in transmission technique during the next four years.

The selling price will be, at first, approximately £80, which is likely to be reduced in quantity production.

E.M.I. Express Satisfaction

ELECTRIC & MUSICAL INDUSTRIES, LTD., express very great satisfaction with the report of the Television Committee (extracts from which appeared last week), which states that television broadcasting will be started in Great Britain.

As and when the B.B.C. begin broadcasting high-definition television, Electric & Musical Industries will be ready to market television receiving sets. It is much too early to state at the present time what the price of these sets will be, but it is believed that the price mentioned in the Committee's report of £50 to £80 will be more or less correct.

They quite agree with the Committee's report that radio sound broadcasting will still, for many a year to come, dominate the B.B.C. programmes. Moreover, they do not believe that television will in any way interfere with the developments in radio sound broadcasting, with its ever increasing entertainment value. Therefore their Company, as well as all other manufacturers in the radio industry, are going right ahead with the development of the manufacture and sale of radio sets for sound.

CIRCUITS AND SETS FOR ALL

(*Continued from page 797*)

from the terminals to the coils are as short as possible. It will be seen that four output leads are shown, and these may well consist of lengths of flex with spade terminals attached. The lead marked H.T.+ should be joined to the terminal on the receiver to which the full voltage of the H.T. battery or mains unit is applied; the lead marked Aerial should be connected to the aerial terminal of the receiver (the aerial lead having been transferred to the unit), whilst the two other battery leads may conveniently be connected to the corresponding terminals on one of the valve-holders in the set, so that the one on-off switch will be operative on both the receiver proper and the H.F. unit.

There is little that need be written concerning the use of the amplifier, for there are only two controls, of which one is not generally manipulated. It will be evident that the tuning condenser must be operated in conjunction with that fitted to the receiver, and a little experience will be required before both controls can correctly be used simultaneously. When first bringing the amplifier into use it will be best to screw down the knob of the pre-set aerial condenser so as to obtain the maximum capacity, and also to set the knob of the potentiometer to its midway position. Then increase the reaction setting on the receiver and turn the tuning knob of the receiver until a whistle is heard. Now tune the amplifier until the whistle becomes louder and slack off the reaction. The approximately-correct settings of both tuning condensers will then have been found so that it only remains finally to adjust both of them.

COMPONENTS REQUIRED FOR SECOND CIRCUIT

As for the first circuit excepting:
One 25,000-ohm Potentiometer (Graham Farish).
One Dual-range Coil (Colvern, type T.D.).
One Three-point W/C Switch (British Radiogram).
Two .1 mfd. Tubular Condensers (T.M.C.).
One On-off Switch (British Radiogram).
Two Fixed Resistances; 30,000 ohms and 50,000 ohms (Dubilier 1-watt).
One 220 VS Valve (Cossor).

After having gained a little experience in tuning, the pre-set condenser and potentiometer may be set to the optimum points. It is not necessary to describe the adjustment of the pre-set condenser, for every reader knows that the object of this is to strike a "happy medium" between maximum selectivity and maximum signal strength. The potentiometer will be found to have a fairly pronounced effect on signal strength, as well as affecting selectivity to a certain extent. Normally, however, this control will be set to the point at which greatest signal strength is obtained; after that it can be used for controlling volume and also slightly to sharpen tuning when receiving "difficult" stations.

A unit employing the circuit given in Fig. 2 can be made up in almost the same manner as that for the arrangement just described. The principal difference is that the plug-in coils and holders will be replaced by the dual-range coil specified (or by a similar component) whilst the 100,000-ohm potentiometer employed for controlling the screening-grid voltage will be replaced by a 25,000-ohm potentiometer which serves to vary the G.B. voltage. It is desirable to employ a separate G.B. battery for the H.F. unit, and a switch is also included for cutting this out of circuit.

VALVE SENSITIVITY

(*Continued from page 794*)

load, or the maximum grid input voltage decreased in order to permit greater output with correspondingly increased distortion, the sensitivity figure would have been different.

It may be interesting to compare typical output valves in different classes on the basis of mutual conductance and mW./V². This is done in the following table, the figures in the third column being calculated on the basis of optimum load impedance and approximately 5 per cent. second harmonic distortion :—

Type of Valve.	Mutual Conductance (mA./V)	Approx. Sensitivity (mW./V²)
Small Power ..	3.5	6
Super Power ..	3.5	9
Small Pentode ..	2.5	40
A.C. Mains Types.		
Pentode	3.5	18
Triode	4.0	6.5

These indicate very clearly the superior sensitivity of the pentode type of valve, and in this connection it is interesting to remember that the latest development in output valves for A.C. mains is a highly-sensitive pentode which will give its full output of over 3½ watts for a grid input in the neighbourhood of 4 volts. Valves of this type are available in several makes, and are particularly suitable for use immediately following a diode detector. The sensitivity of this class of valve is of the order of 300/400 mW./V² according to load conditions.

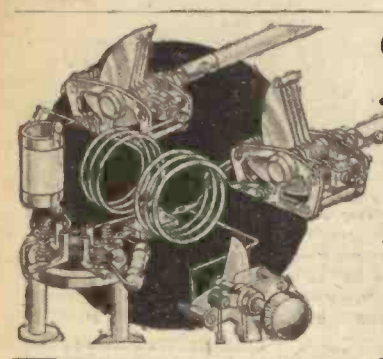
BOOKS RECEIVED

PHOTOELECTRIC CELLS

"PHOTOELECTRIC CELL APPLICATIONS," by R. C. Walker, B.Sc., A.M.I.E.E., A.M.I. Mech. E., and T. M. C. Lance, Associate I.R.E. (Sir Isaac Pitman and Sons, Ltd., 8s. 6d. net), in essentially practical form, describes the uses of such cells in television, talking pictures, electrical alarms, counting devices, and similar mechanical apparatus. A second edition is now available of what may well be regarded as a standard text-book on the subject, and in this mention has been made of the latest developments. Throughout the book the authors have kept before them one ideal, namely that their descriptions may prove helpful to the practical man and suggest to him new means of attacking some of his problems. The first chapter is devoted to a simple description of photo-electric effect. The subject is built up step by step in subsequent chapters, and various applications are considered, including advertising, sound reproduction, phototelegraphy, and television. Dealing as it does with important practical developments of the photo-electric cell and showing how the latter may be applied to specialised requirements in the solving of technical and industrial problems, this authoritative treatise demands a place amongst the stock-in-trade of all keen and up-to-date electricians.

LOUD-SPEAKER PRACTICE

THERE can be few authorities more competent to deal with loud-speakers, as regards theory, performance, testing, and design, than N. W. McLachlan, D.Sc., M.I.E.E., and in his new work, "Elements of Loud-speaker Practice" (Humphrey Milford, Oxford University Press, 5s net.) it has been his object to tell the average man all that he can conceivably require to know on the subject. No special knowledge is required to understand the text, which is devoid of mathematics and intricate technical details. It may not always be realised that the modern loud-speaker, like modern wireless telephony, was developed from the ideas of some thirty years ago. In his introductory chapter the author gives a brief historical survey, and follows it with a short discussion of the functions of a loud-speaker, admitting such limitations as it has, and pointing the way to their minimisation. In succeeding chapters the reader is enlightened on a host of interesting points, and the fact clearly emerges that matters discussed are treated as informatively as comprehensive knowledge and a thoroughly up-to-date point of view can possibly achieve. Of the twenty-one chapters, those dealing with power-valve circuits for loud-speakers, room effects in reproduction, and recent developments, were considered particularly interesting, but individual readers will have their own preferences. The book is well bound and well produced, and the numerous illustrations are admirably clear.



Short Wave Section

IMPROVING S.-W. RECEIVER PERFORMANCE

The Advantages of the Untuned H.F. Stage.

By AUSTIN FORSYTH

THE beginner, or for the matter of that, the practised amateur, is always anxious to improve his reception, and no true short-wave enthusiast is entirely satisfied with his results for long. This is as it should be, and is one of the reasons why we progress.

The question of the use of S.G. valves in short-wave receivers, both as detectors and in pre-detector tuned or untuned H.F. stages, has always been a matter for argument and discussion. There is no doubt that, generally speaking, a tuned H.F. stage is of little use below 80 metres as regards the actual voltage magnification it can give; though it is possible, by careful design, to make the receiver more lively down to about 30 metres by tuning the pre-detector circuit. But the gain with increase of frequency is so small as only to merit the extra complication in exceptional circumstances.

The ease of handling and general "sweetness" of the receiver can, however, be greatly improved by the incorporation of an *untuned* H.F. stage, for which there is much to be said. The effect is to separate the aerial from the detector grid-circuit, and leads to the following definite advantages: (1) The elimination of blind spots due to the aerial; (2) signals unaffected by aerial movement; (3) smoother reaction; (4) reaction setting holds constant through larger frequency ranges; (5) elimination in most cases of threshold howl; (6) reduction in hand-capacity effects; and (7) possibly some slight voltage amplification from aerial to detector. In a short-wave receiver, for whatever purpose it may be used, these are advantages worth having, more especially as the installation of an untuned H.F. stage is a simple matter.

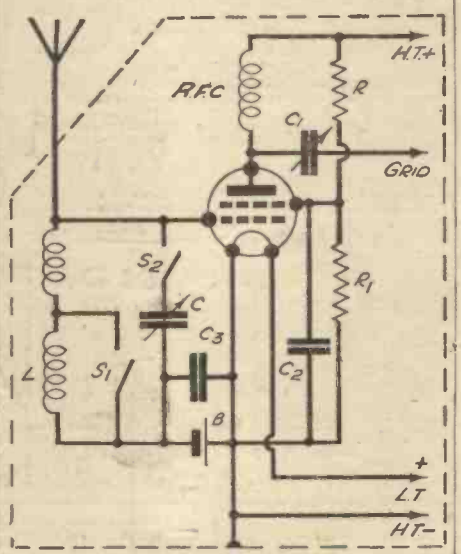
A Special Circuit

The sketch (right) shows a special arrangement devised by the writer for a short-wave receiver operated on the amateur bands from 160-10 metres, and also used for S.-W. broadcast listening. The circuit needs some explanation, if only for the tuning condenser and switching connected in the grid of the S.G. valve.

As the receiver is required for 160 metres, where a tuned H.F. stage is not only desirable but effective in that it gives considerable amplification, the tuning system shown as LC was evolved. C is a .0003 mfd. variable condenser fitted with slow-motion, and L is a specially-wound two-section coil. When the receiver is on 160 m., switches S1 and S2 are closed, which converts the H.F. stage from the untuned to the tuned condition, thus giving the required efficiency on this band. For use below 100 metres, the switches are open, which cuts the condenser C out of circuit and puts the two windings of L in series. These switches are, of course, the two arms of one switch of the D.P.S.T. push-pull anti-capacity type. The two sections of the coil are wound on a 1in. diameter ribbed ebonite former (ribbed rod), about 1¼in. long. This is mounted on valve pins and plugged into a valve-holder to which the necessary connections are made. Twenty-eight turns of No. 32 enamelled wire, close wound, are used for the top section to form the 160-m. coil, and the bottom section consists of fifty turns of No. 40 enamelled, the two windings in series constituting the H.F. choke.

S.-W. Inductances

In view of the prevailing fashion in the design of S.-W. inductances, it may be asked why such small formers and light wire are employed, for, as a matter of interest, coils similar in construction to that described above are used in the detector grid-circuit of this particular receiver right down to ten metres. The reason is that after exhaustive tests between the larger low-loss coils commonly used and the much smaller and seemingly inefficient type of coil suggested here, it was found that as regards signal-strength



The special short-wave circuit referred to in the article.

there was nothing to choose between them, while for stability and freedom from hand-capacity, the small coils were infinitely preferable. That this should be so is clear from a consideration of the fundamental principles involved.

Signal strength is dependent on the voltage developed across the grid-filament circuit of the valve, and this again depends upon the number of turns in the coil. At a given frequency, the more turns there are in a tuning coil, the greater the voltage across its ends. Therefore, in this particular case, we see that any loss of electrical efficiency due to the coils being small and close-wound is made up by the increase in voltage generated across the grid-filament circuit, as a greater number of turns are required in the small coil than in the large to tune to a given frequency. Further, as the coils are so small, their fields are very restricted, which improves stability by nullifying stray-capacity effects, always somewhat of a problem in short-wave work. As an instance of the gain in stability, the coil used for 40-metre reception in the detector grid-circuit consists of seventeen turns of No. 32 enamelled wire, close wound as before, on a similar former less than an inch long. The parallel capacity is about .00015 mfd. of a .0003 mfd. variable band-setting condenser, with an additional very low capacity condenser for actual tuning (band-spreading). If the coil is enclosed with the hand, without actually touching it, the frequency of a c.w. signal is so little affected, that it is still readable without re-tuning. These coils were evolved by the writer from the valve-base type, which were, and still are, much in vogue in amateur-band receivers. They are well worth a trial.

Neutralising Condenser

To get back to the circuit shown, there is another innovation, not commonly used, at C1. This is a very low maximum capacity condenser, of the old H.F. neutralising type, which, while normally being left set, serves to vary the input to the detector grid-circuit. It is very useful under conditions of severe local interference.

The rest of the circuit follows standard practice. It is often an advantage to put two chokes in series at R.F.C., one a short-wave, and the other of the broadcast type. This will prevent the circuit resonating at a low-frequency and injecting long-wave signals into the detector when the latter is oscillating, as for the reception of c.w. signals. Unless an exceptionally long aerial is used, say over 60ft., no series condenser is required in the aerial. Note that the condenser C1 must be a good one, as otherwise the H.T. will be shorted through the detector grid coil to earth. C2 is 2 mfd. and C3 .005 mfd., both non-inductive, while R is 30,000 ohms and R1 20,000. B is a 1½-volt grid-bias battery for the S.G. valve, though the bias can be obtained by means of the usual potentiometer connection. The method shown is recommended as being more conducive to silent operation. The circuit could be put together as a separate unit, and should be totally screened as indicated. The valve used can be of the ordinary S.G. type.

Operating Details

In use, the grid circuit of the H.F. stage should tune fairly sharply with the detector grid circuit when the two are in resonance through the 160-metre band, and it should be possible to keep them in step through the greater part of the tuning range with one setting of the reaction condenser. On the other bands, when the H.F. stage operates untuned, tuning is carried out in the usual way on the detector side, but note that there will, of course, be some alteration in the dial settings, due to the changed input conditions. The experienced amateur will naturally look out for these points, and, if he is interested in testing the amplification properties of the S.G. H.F. stage below 100 metres, it is simply a matter of winding the appropriate coil for L, which need not have the choke winding. In the same way, those whose short-wave listening is confined to "below 100 metres" can dispense with the switching and condenser C, and simply connect a suitable S.-W. choke across the grid-filament of the H.F. stage. One final point; it is very likely that some experimenting with coil values will be necessary for tuning the H.F. stage, as so much depends on the size of aerial employed. The values given for 160 metres should

(Continued on page 804)

SHORT-WAVE SECTION

(Continued from page 802)

hold good in the average case, while any experiments carried out with the H.F. stage tuned below 100 metres should preferably be with a small series condenser in the aerial, to reduce the damping on the grid circuit of the S.G. valve.

RECEPTION ON 5-10 METRES

ALL radio enthusiasts have probably read, at some time or other, remarks relating to reception on the ultra-short waves. The recent Television Committee's Report makes it appear that in the near future a vision service will be started in the region of 6 metres.

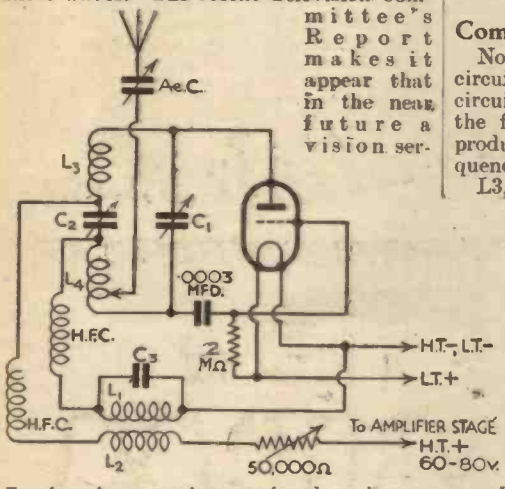


Fig. 1.—An unusual circuit for ultra-short waves. It will be seen that the anode and grid coils are joined together by a variable condenser.

The increase, also, in the number of broadcasting stations, coupled with the fact that higher and higher power is being used, makes it obvious that ultimately other channels will have to be found for broadcast services, if bad interference is to be avoided in the present medium- and long-wave bands.

However, it is intended to give here some simple circuits to enable the amateur to make a start at ultra-short-wave reception, also, some information concerning their construction and operation.

It should be pointed out at the start that there is a great difference between reception at 5 metres and reception at 10 metres, although the separation may sound small from a wavelength point of view. Nevertheless, this represents a very high frequency range when worked out in kilocycles, so that though an ordinary circuit may work perfectly well at 10 metres, it will probably fail to function at all on 5 metres.

Super-regenerative Circuit

Fig. 1 gives a simple super-regenerative circuit suitable for reception from as low as 4 and up to 10 metres. It will be noticed that no amplifier circuit is shown, and this is because the majority of experimenters have already an amplifier on hand, to which they can couple an experimental circuit. Alternatively, of course, the low-frequency portion of any standard receiver can be used.

First, a word about the principle of super-regeneration. It is well known that for short-wave work a detector valve is only at maximum sensitivity when it is worked just below oscillating point; this is very difficult to maintain at frequencies as high as 60 megacycles.

In the super-regenerative system, however, a frequency of super-audibility is "injected" into the plate or grid circuit of the detector valve, thereby bringing about immense regeneration, the voltage swing of the long-wave oscillator in the anode of the detector valve preventing it from actually bursting into oscillation.

Approximate circuit values only are given in Fig. 1, though by experiment these have been found to be the best. The choice of valve is not by any means critical; any 2-volt medium impedance H.F. valve can be used, though if several types happen to be on hand, all should be tried.

Component Values

Now a few words of explanation of the circuits and component values. In the circuit shown in Fig. 1, one valve combines the function of a detector with that of producing its own super-regenerative frequency, or "quench" oscillation.

L3, L4, consists of 3 turns each of 14-gauge copper wire, just under 1in. diameter. L1, L2, the "quench" coils, may be made by winding 700 turns for each coil side by side, also on a 1in. former, and the winding may take the form of a "hank," that is, winding the turns in a bunch on top of each other. The high-frequency chokes feeding the plate and grid circuits are of midget size, consisting of 60 turns of 34-gauge wire, silk-covered, on a ½in. former. Incidentally, the same size wire may be used for winding the "quench" coils.

For the condenser C2, any old type neutralising condenser can be used, of .00005 of a microfarad. The actual tuning condenser, C1, should be of approximately .000075 microfarads, and this can always be obtained from an air-spaced reaction condenser of .0001 capacity by stripping off a quarter of the vanes.

C3, the capacity across L1, is a fixed condenser of .006, and here again it might be wise to try various capacities up to .01, for best results.

The aerial coupling condenser, AC, is another midget air-spaced condenser of very low capacity. The aerial is tapped direct on to the grid coil, this form of coupling being found to give best results from experiment.

There can be no mistake as to whether the circuit is working or not, as a pronounced hiss will be heard when the circuit is "quenching" properly. This hiss can be controlled in volume by the resistance in the positive H.T. lead. Incidentally, the super-regenerative hiss will disappear as soon as a station is tuned in.

The series tuning condenser C2 enables the operator to vary the frequency band the set will tune up or down to, it will also have considerable effect on the "quench" oscillation. The actual tuning is carried out by C1 in the usual manner.

A Single-valve Converter

Fig. 2 represents a single-valve converter that can be attached to any set with one or more H.F. stages, the single valve acting this time as oscillator and first detector.

The tuning coils L1, L2, which should have four turns each, are about three-quarters of an inch in diameter. The tuning capacity C1 should be somewhat smaller than that of Fig. 1, being about 35 micro-microfarads (.000035).

H.F.C.1 can be any standard H.F. choke, and H.F.C.2 has already been described. The coupling capacity C3 can be any preset condenser having a capacity of .0001 to .00005.

The operation of this little unit is remarkably simple; the aerial is taken off the standard set and tapped on to the short-wave converter, through the usual series aerial condenser. The condenser C3 is then attached to the aerial terminal of the broadcast set, which should be tuned to approximately 10,000 metres. The converter is then set into oscillation in the usual manner by the reaction condenser C2, and tuning is then carried by one control only, the tuning condenser on the converter C1.

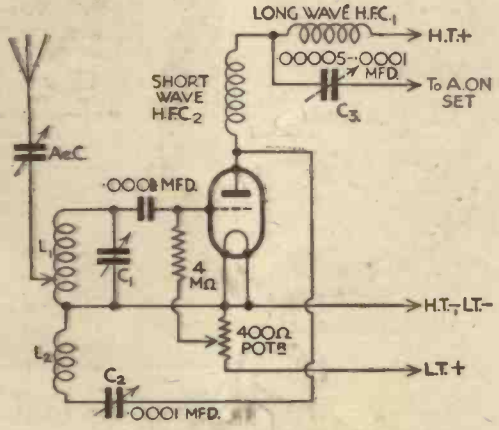


Fig. 2.—A standard circuit for a short-wave converter, in which Reinartz reaction is employed.

Series-reaction Circuit

It may happen that there is not a suitable broadcast set on hand with one or more H.F. stages to enable the experimenter to use the superheterodyne converter just described, so the well-known series reaction circuit is shown in Fig. 3, with values that will make the circuit suitable for use on the ultra-short waves.

The wiring of any of the circuits just described should be carried out very carefully, being as short and as direct as possible, particularly the grid circuits.

In the case of Fig. 1 a separate valve can be used to induce the "quench" oscillation into the detector, but although this gives slightly better results it robs the circuit of its simplicity and ease of construction. The same can be said of Fig. 2.

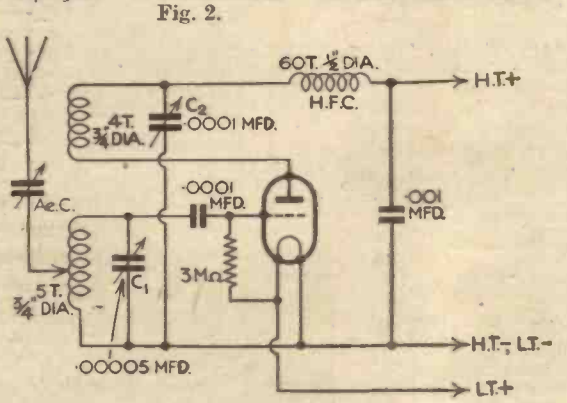


Fig. 3.—The circuit shown here is for an ultra-short-wave receiver in which throttle-controlled reaction is used.

SHORT-WAVE GOSSIP

ALTHOUGH at present the ether is chock-full of radio transmissions, the searcher on short waves, if he wants good results, should make a point of setting out on his tour with a definite object. It happens frequently that a casual twirl of the condenser may lead to a capture or that, when trying for some particular transmission, he tunes in, purely by sheer luck, a much more coveted prize. The best way is to divide the short-wave band into sections, and to limit the search to the particular band. As a rough classification, you may take it that transmissions on channels between 16 and 18 metres are not heard well before G.M.T. 13.00 or after 17.00; that broadcasts on the 20-metre band are quite strong from 15.00—17.30 or 18.00. Towards dusk, switch over to 25-30 metres, and from about 18.00—24.00 for the transmitters working between 30-40 metres.

If you take a list of short-wave stations and chop it up in this manner, with the landmarks you will secure when you log a station, it will be an easy matter to judge within what range of condenser dial degrees it will be necessary for you to travel to tune in any wanted transmission.

Keeping a Log

It is essential to keep a log, and in particular to make a note of the times the broadcasters are on the air, in order to avoid discouragement by wasting precious time on a station that is not there! Moreover, time schedules vary fairly frequently, and these alterations should be noted at once. Now for some up-to-date information regarding some captures recently made.

A powerful broadcast which should be sought for, and which provides excellent jumping off points, is that of the League of Nations station at Prangins (Switzerland), HBL, on 31.27 metres (9,595 kc/s), and HBP, 38.48 metres (7,797 kc/s), which simultaneously transmit the League's news bulletin every Saturday evening from G.M.T. 22.30—23.15. Occasionally, HBJ, 20.64 metres (14,535 kc/s), and HBQ, 44.94 metres (6,675 kc/s), are used, in particular for broadcasts to the entire world of important events, such as the Saar plebiscite, and so on.

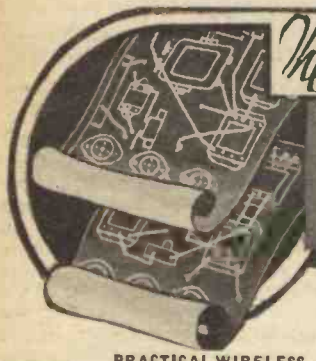
Another transmitter, HBO, on 24.94 metres (12,030 kc/s), is brought into operation for the relay of Swiss and Austrian programmes destined to the U.S.A. On two dates, I see from my log that I heard through this channel a concert from Prague for Czech listeners overseas. When the League of Nations controls the station the call is given out in French, English, and Spanish, and it is repeated two or three times. The English version is: *This is the wireless station of the Information Department of the Secretariat of the League of Nations at Geneva, Switzerland.*

VE9GW, Bowmanville, the short-wave outlet of CRCT Toronto (Canada), one of the principal stations of the Canadian Radio Broadcasting Commission, is now working to a regular schedule on 49.26 metres (6,090 kc/s), with a power of 4 kilowatts. Although the call is usually in English, bear in mind that, as programmes relayed from the Toronto and Montreal stations are frequently destined to French-Canadians, you may pick up announcements in that language. Occasionally, also, Toronto links up with the N.B.C. network, in which case you will receive the U.S.A. call. The present winter schedule is as follows: G.M.T. 19.00—04.00 (Monday, Tuesday, Wednesday), and on Thursdays from 20.00—05.00.

W1XAL, Boston (Mass.), on 49.67 metres (6,040 kc/s), which mostly relays WEEI, the medium-wave station of the same city, has also altered its times of transmission. With an increased power of 5 kilowatts, the broadcasts are now to be picked up on Sundays between G.M.T. 22.00 and midnight, and on Tuesdays and Thursdays between G.M.T. 00.30—02.15. For the present channels of higher frequency have been abandoned, but will be used again in the spring and summer. W1XAL is entitled to work on 25.45 metres (11,790 kc/s), 19.67 metres (15,250 kc/s), and 13.98 metres (21,460 kc/s). The call is: *These are the Edison Electric Stations W1XAL and WEEI, Boston, operating on* 6,040 *and* 590 *kilocycles.* The stations are in the N.B.C. Red Network, and consequently transmit the WEAF, New York, radio entertainments.

Italian Stations

HVJ, Vatican (Rome), which is usually so easily picked up on its two wavelengths, namely, 19.84 metres (15,120 kc/s), and 50.27 metres (5,968 kc/s), has abandoned the daily G.M.T. 10.00 broadcast on the lower channel, and is now putting out this transmission at G.M.T. 15.00. On 50.27 metres it works daily at G.M.T. 19.00 and on Sundays and holidays at 10.00. Different languages are used daily, and the English broadcast is now on Tuesdays. It is easy to identify this station, apart from its call (Radio Citta Vaticano), owing to the continuous ticking of a clock in the background of speech. The studio opens and closes with the words: *Laudatur Jesu Christus.*



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Lucerne Straight Four (SG, D, LF, Trans)	*Feb.* '34	WM350

Five-valvers: Blueprints, 1s. 6d. each.

Super-quality Five (2 HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (SG, D, LF, Class B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	*June* '32	WM286
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	26.6.34	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	WM333
Six-guinea AC/DC Three (HF, Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers: Blueprints, 1s. 6d. each.

A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	4.3.33	AW380
AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	*Apr.* '32	WM279
All Metal Four (2SG, D, Pen) A.C.	*July* '33	WM329

SUPER-HETS.

Battery Sets: Blueprints, 1s. 6d. each.

1934 Century Super	9.12.33	AW413
Super Senior	*Oct.* '31	WM256
1932 Super 60	*Jan.* '32	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets: Blueprints, 1s. 6d. each.

1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	*Feb.* '32	WM272
Seventy-seven Super, A.C.	*Dec.* '32	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM350
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.

General-purpose Portable (SG, D, R.C, Trans)	9.7.32	AW351
Midget Class-B Portable (SG, D, LF, Class-B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM297
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM362
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM368

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	23.1.32	AW329
S.W. One-valver for America	31.3.34	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, R.C, Trans)	20.8.32	AW355
Experimenter's 5-metre Set (D, Trans. Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19,'35	AW463
Short-wave Adapter	*Dec.* 1.'34	AW456
Superhet Converter	*Dec.* 1.'34	AW457

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Super-hets: Blueprints, 1s. 6d. each.

Quartz-crystal Super	*Oct.* '34	WM372

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.10.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368

Three-valvers: Blueprints, 1s. each.

Emigrator (S.G, D, Pen), A.C.	*Feb.* '34	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292

CONSTRUCTOR CRUSADERS' CORNER

WE much appreciate the hundreds of messages of goodwill which we have received from Constructor Crusaders on the amalgamation of PRACTICAL WIRELESS and *Amateur Wireless*. We assure them that we shall continue and intensify the policy inaugurated by its sponsors. Every Crusader has been notified through the post of the change of headquarters, but in case you have mislaid the letter may we repeat that you should address your letters in future, giving your official number, to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

* * *

QUITE naturally, there are many Crusader problems to be considered. We are carefully analysing their correspondence and their suggestions for future receivers. Many of them have asked for a superhet, and hence the moment is appropriate to remind them that a design for a highly satisfactory three-valve superhet—Mr. F. J. Camm's Five-Pound Three-valve Superhet appeared in our issue dated October 27th, 1934. This receiver has been made in its thousands, and has yielded universally satisfactory results. Designs were given for battery, A.C., universal, and D.C. models. Whatever your requirements, therefore, one of these receivers will suit you.

* * *

WE are considering our next design, and would appreciate a line from you regarding your requirements. The design, of course, will be decided on a ballot, so it is important that you drop us a card at once. Make quite sure before writing that the particular design you require has not formed the subject of a design which we have already published. Check up by consulting the Blue Print list on page 806.

* * *

WE have been somewhat surprised to learn of the great number of readers who are still operating antiquated one- and two-valve receivers. Here is a chance for Crusaders to perform yeoman service in the interests of constructors and to persuade them to make an up-to-date set. If you know anyone whose set is out of date why not ask him to listen to yours and offer him a helping hand? We should be glad to hear from Crusaders who are prepared to do this, and to publish their names and addresses. Please state when writing what particular evening is most suitable for local readers to call upon you.

* * *

MANY Crusaders have forwarded the suggestion that local Crusaders' Clubs should be formed. Here again everything depends upon the members. If you are willing to form a local branch, would you please indicate that fact on a postcard? Where a local wireless club already exists it might be possible to form a Crusaders' branch of it.

PRACTICAL 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).

Good Wishes for Our Future

SIR,—Please allow me to offer you my very good wishes for a most successful future. The amalgamation of *Amateur Wireless* with your journal must ensure excellent future reading and increased utility to the amateur.

This unity of control will enable the reader to have the advantages of both journals at the cost of one.—H. ASHLEY SCARLETT, Lt.-Col. (Vice-President, Golder's Green and Hendon Radio Society).

Portuguese Station CT1GO

SIR,—I noticed in your "Short-wave Gossip" recently that you referred to a new station CSL, which you say is CT1GO on 48.4 metres. This, however, is not the case. From my log book I see I have logged a Portuguese station, CT1GO on 48.4 metres on three nights in the first week of December, 1934. I reported to the address given: Portuguese Radio Club, Parede, near Lisbon, Portugal, and received their card. On it they say that on Wednesday, December 5th, one of the dates I gave, they were not broadcasting, but that there was another station—The *National* Short-wave Station at Lisbon, on 48.78m.

On Friday, December 21st, at approximately 11.30 p.m.-12 midnight, I logged CSL on 48.78 asking, in English, for reports, and giving their address as "The National Broadcasting Station, Lisbon, Portugal." Since then I have heard CSL repeatedly, and they always close down at 12 midnight approx.

Perhaps the following information about CT1GO and CT1GL may be of interest to other readers.

CT1GO.
Radio Club Português,
Parede, Portugal.

Transmitter—250 watts crystal controlled, 100 per cent. mod. on 48.40 m. and 24.20 m.
On 24.20 m.—Tuesdays, Thursdays, and Fridays, 6-7.15 p.m. G.M.T. Sundays—3.0-4.30 p.m.
On 48.40 m.—Mondays, Wednesdays, Thursdays, Fridays, and Saturdays, 12.20 a.m.-1.30 a.m. Sundays—4.30-6.0 p.m.

CT1GL (5kW), 291 m.
Every day: 12.30-2.0 p.m.; 7.30 p.m.-12.15 a.m.
All transmitters built by Portuguese amateurs located in a building comprising two studios, one 44 feet by 24 feet, with library and workshop.—WM. L. HOWAT (Strathaven).

Without a Rival

SIR,—Let me compliment you on the first and second numbers of PRACTICAL AND AMATEUR WIRELESS. Thus another Newnes publication has become first in its class, for there is no rival for PRACTICAL AND AMATEUR WIRELESS. Chatty, topical, and frequently humorous, it makes easy reading, without sacrificing anything in the way of technical value. Keep up the standard, and raise the status of Wednesday among the days of the week.

Can anything be done about a *straight* 4v. mains receiver with D.A. A.V.C.?—A. E. WARNER (Barking).

[*A receiver of the type requested was described in last week's issue.*—ED.]

Our Radio Play a Success

SIR,—The play entitled "Séance," published in the Christmas Number dated December 8th, was a wonderful success. I saw it acted at my school.—R. R. HUGHES (Croydon).

Our Presentation Books

SIR,—I have received the three presentation books offered by PRACTICAL AND AMATEUR WIRELESS, and I must say they are the finest and most complete wireless books I have seen. I am a very keen Television wireless enthusiast, and have built and repaired several sets with success. But there was always the fear of coming up against a difficult problem, and having to admit failure. Now, with these three fine books beside me I have a feeling of confidence, and can overcome any obstacle which might arise.—JOHN HINTON (Glasgow).

"All the Best"

SIR,—I have read your new combined paper and I must write to express my enthusiasm. As my means are limited I can only buy a journal every few weeks. In the past I had to decide whether I would have an entertaining and instructive half-hour with "Thermion," or read the interesting replies to your readers' inquiries. There was also another problem: would I like to read about and possibly make the finished product of the "Experimenters" or should I, for half an hour, become a practical experimenter learning technical facts? Now these troubles are at an end—I have only to ask for PRACTICAL AND AMATEUR WIRELESS and I will get all I want. Criticisms of new products, a catalogue service and reviews of the latest records; added to this there are designs for the very latest sets. I notice the short-wave section is retained, but I could read more on this fascinating subject—I hope others write and support my view! I wish the new venture "all the best."—F. COLLINS (Wallington).

Visual Tuning Indicator

SIR,—As a reader of your excellent paper from the first number I feel that a letter of thanks, praise, and general gratitude is long overdue. I received my de luxe copy of the *Television and Short-Wave Handbook*, and think that it is splendid value. I have also availed myself of other book offers from time to time, amongst them being a first edition of the "Constructors' Encyclopædia," which has been of great service.

I should be very grateful if you would consider the following suggestion. I am sure there are other readers besides myself who would like to see published details for the construction and connection of a visual tuning indicator for attachment to the panel of a constructor's set.—J. G. SIMPSON (Kensington).

A S.W.4-valver

SIR,—Having read many letters which have appeared in PRACTICAL WIRELESS during the past few weeks, I am of the same opinion as those readers, that the appearance of an efficient short-wave 4-valver would be greatly appreciated.—H. CROUCH (Ladysmith, S. Africa).

A Receiver for Overseas

SIR,—In a recent issue I noticed a letter from an Overseas reader, suggesting that you publish particulars of a short and medium-wave battery-operated set. This would be the ideal set for all Empire listeners, giving them their Overseas short-wave bands, and their local medium bands.

(Continued on facing page)

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For preference a set to tune from 14 metres to 550 metres would be ample.—DAVID V. KEMP (Johannesburg, S. Africa).

Our New Venture

SIR,—It is with great pleasure that I welcome the innovation concerning the amalgamation of *Amateur Wireless* with PRACTICAL WIRELESS. I wish you every success in your new venture; it will surely be an acquisition to all concerned.—A. KNOWLES (Tolworth, Surrey).

Is A.V.C. Worth While?

SIR,—I have noticed with interest that most modern receivers of commercial type are provided with A.V.C., yet it seems significant that receivers described in PRACTICAL AND AMATEUR WIRELESS have not been so fitted. After trying A.V.C. I think it is over-rated and feel sure that you are right in not fitting it to your sets.—B. J. (Watford).

CUT THIS OUT EACH WEEK

Do you know

—THAT for distortionless resistance-capacity L.F. amplification the anode resistance should be non-inductive.

—THAT an anti-microphonic valve mounting will not always prevent microphonic troubles.

—THAT it is sometimes necessary to prevent sound waves from impinging on the valve bulb in addition to the special valve mounting.

—THAT tone-control arrangements may be included in the anode or the grid circuit of a valve.

—THAT when an S.G. stage can only be stabilised by the use of a very low S.G. potential, it indicates loss of amplification.

—THAT in a case similar to the above every endeavour should be made to obtain correct working figures.

—THAT a closely-wound coil of wire is ineffective as an H.F. screen unless adjacent turns are short-circuited.

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.

The Mains-time Synchronous Clock Movement. Special Notice!

ON page 730 of our February 2nd issue we illustrated a very ingenious synchronous clock movement made by the Cabaret Electrical Co., Ltd., of 182, Vauxhall Bridge Road, London, S.W.1, which would convert any ordinary mechanical clock into a modern infallible electrical timepiece of the synchronous variety which are so popular to-day and which are gradually ousting the older type of mechanical clocks. Will readers please note that the makers are the Cabaret Electrical Co., Ltd., of 182, Vauxhall Bridge Road, London, S.W.1, and not the Automatic Coil Winder Co., as stated in our February 2nd issue. Further details and descriptive leaflets of this synchronous conversion unit are obtainable from the Cabaret Electrical Co., Ltd., 182, Vauxhall Bridge Road, London, S.W.1.

"A W.B. Extension Speaker"

UNDER the above heading we gave last week a brief description of the W.B. "Stentorian Baby" loud-speaker which can be used as an extension or as a principal speaker at will. Since writing our previous notes we have subjected the speaker to extensive tests with very gratifying results. We were at once impressed by the remarkable fidelity of reproduction which it gives, and were set to wonder how it could be produced at the phenomenally low price of 29s. 6d. (at which it is listed). The speaker is mounted in a most attractive walnut cabinet which is in keeping with any type of furniture, and it is provided with a range of sockets into which a plug can be inserted in order to obtain various transformer ratios, when the speaker follows a Q.P.P. class B, triode or pentode output valve. The high ratios provided are: 97½ : 1, 74 : 1, 55½ : 1, 42 : 1 and 31.6 : 1, these providing optimum loads varying between 34,000 ohms and 3,500 ohms. The low-ratio sockets are suitable for use when an output transformer is fitted to the receiver, and these provide impedances of 11, 6.2, 3.5, 2, and 1.1 ohms respectively.

The primary winding of the transformer fitted will safely carry D.C. currents up to about 30 m.a., which is sufficient for nearly all purposes. The speech coil has an impedance of 3½ ohms, and the speaker will handle an output of 2 watts.

A New Universal Valve

WE have recently received for test a new Cossor valve, type 402 P., which is an indirectly-heated triode output valve for use in universal mains receivers. The valve is provided with an indirectly-heated cathode, the heater of which consumes .2 amp. at 40 volts, and the valve is therefore suitable for use in sets in which the heaters are wired in series.

A 7-pin base is fitted, in keeping with the usual custom for universal valves, and of the pins provided only four are used. The normal heater pins are as standard, and when viewing the base from the underside, with the heater pins towards the bottom, the cathode and anode pins are the second and third respectively on the right. The grid terminal is mounted on top of the bulb, and this avoids the possible introduction of mains hum.

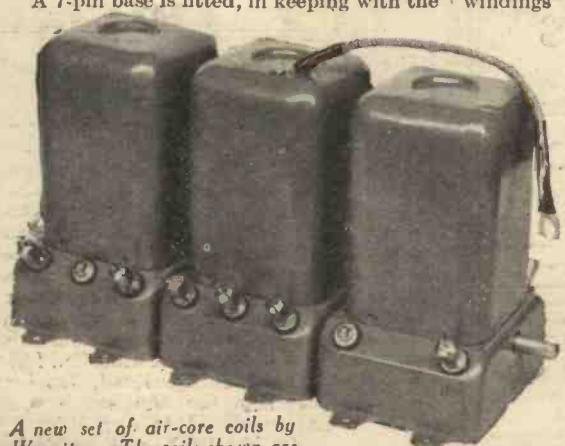
The new Cossor valve, type 402 P.

The 402 P. is designed to operate with a maximum anode voltage of 200, but it will give a really useful output when this voltage is reduced to 150; this is, of course, an important point when the receiver is being operated from D.C., since in that case a voltage of 200 is generally more than can be provided.

The valve has excellent characteristics, the amplification factor being 10, and the mutual conductance 7.5 m.a./volt. The optimum load is 2,500 ohms.

New Superhet Coils

A NEW set of superhet coils for 110-kilocycle operation has been introduced by Wearite. These coils are of the air-core type and are, of course, completely screened and fitted with an integral wave-change switch. As may be seen from the illustration on this page, the coils are of the same shape as previous popular Wearite tuning units, and they are well made, the windings being on rigid paxolin formers. The three coils comprising the set are types WSA, WSG, and WSO, and of these the first two provide a band-pass combination and the third is an oscillator.



A new set of air-core coils by Wearite. The coils shown are the types WLR, WLT and WLQ, but these are identical in appearance with those described, with the exception of the pigtail, which is not fitted to the superhet coils. All coils are interchangeable.

The coils are mounted on separate base-plates which are fitted with conveniently-placed and accessible terminals, and are attractively finished in the standard Wearite battleship grey. We gave them a thorough test and found that the coils were well matched, the inductances of medium-and long-wave windings being extremely close to their rated values. By using the recommended pattern of Polar three-gang condenser, and a .002-mfd. pre-set condenser, as specified by the makers, it was found that accurate matching

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held perfectly over the complete ranges of wavelengths. The price of the set illustrated is 22s. 6d.

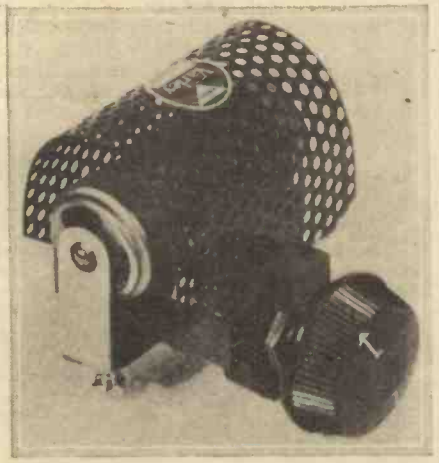
When it is desired to employ a preliminary H.F. stage an additional coil (WSHF) can be added simply by using a longer switch-operating spindle, which passes through the bases of all the coils in use.

A Valuable Range of Power Potentiometers

THE power potentiometers made by Varley have a wide variety of applications in home construction, and can be used for hum-suppression in mains receivers (for obtaining an "artificial" centre tapping) and for almost every other purpose when a heavy current-carrying capacity is required. The potentiometers are obtainable in all standard values between 10 and 50,000 ohms, the current ratings ranging from 1.3 amps to 20 milliamps. The price of the complete components is the same in every case, namely, 7s. 6d., whilst the resistance elements can be bought separately for 3s. 6d. An interesting and valuable point is that the various elements are interchangeable. Thus, the value of the original component can be changed at will according to the particular circuit in which it is to be employed. Another advantage is that, should an element burn out due to overloading or incorrect use, a new one can be fitted in a few seconds and at low cost.

Almost needless to say, the resistance units are wire wound, and the bobbin containing the winding is protected by a stout cover which is perforated to permit of easy air circulation for cooling.

We recently tested a number of these



A Varley power potentiometer for dealing with heavy currents.

components and found them completely satisfactory in every way. The movement of the slider is smooth, and the potentiometers are therefore quiet in action. Yet another point that is worth stressing is that if the slider track becomes rather worn after prolonged use the resistance bobbin can be rotated and a new face thus presented to the slider.

An illustration of one of the Varley power potentiometers appears on this page, and this shows the main features. The experimenter will find them invaluable for use as voltage dividers in eliminator circuits, for providing variable bias in powerful mains receivers, and for a variety of other uses in connection with both power amplifiers and low-power transmitters.

RADIO CLUBS AND SOCIETIES

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

INTERNATIONAL SHORT-WAVE CLUB (MANCHESTER CHAPTER)

THE above Chapter held its first meeting of the new year on Monday, January 7th, at 8 p.m. There was a good attendance, and a demonstration was given by Mr. J. W. Baggs of a short-wave receiver and converter of Messrs. Ferranti, Ltd., of Hollinwood. All the receivers displayed and demonstrated are available as constructors' kits, thereby making the demonstration a good attraction for the amateur. On January 22nd another meeting was held, and after the usual business was completed a junk sale was held, and that was followed by a demonstration by Mr. R. Lawton, the secretary, of a Philco 16B eleven-valve receiver. This is an A.C. electric screen-grid superheterodyne, and tuned from 520 to 23,000 kilocycles; it incorporates A.V.C. and the Philco shadow tuning device. A number of short-wave stations were tuned in, and the receiver gave very satisfactory results. Meetings of this Chapter are held at the British Legion, Long Street, Middleton, near Manchester, at 8 p.m. Two meetings will be held in February, one on the 15th and another on the 19th. All radio enthusiasts are invited to these meetings, and further particulars can be obtained from the secretary, Mr. R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

SLADE RADIO

AT a meeting of this society held on Thursday, January 24th, a member, Mr. C. R. Jefferies, of Celestion, Ltd., gave a lecture and demonstration on "High Fidelity Reproduction." The speakers, of which there were two mounted in a cabinet, consisted of a large cone moving-coil speaker having a frequency range from 30 to 8,000 cycles, and a small moving-coil tweeter having an aluminium diaphragm weighing just over 2 grammes, and an aluminium horn with a carefully developed rate of expansion in order to bring resonance at 6,000 cycles. The total range of the tweeter was from 3 to 12,000 cycles. The speakers were operated both singly and together, and a number of experiments carried out in the way of transformer matching, etc. Mr. Jefferies gave a technical description and made many drawings upon the blackboard.—Hon. Secretary, Chas. Game, 49, West Drive, Heathfield Park, Handsworth.

BOLDON AMATEUR RADIO CLUB

THIS club was formed three years ago in the colliery village of Boldon, to assist and inform members on wireless matters, and also for the repairing of members' sets and the building of sets. Lectures are held every Tuesday evening, given by one of our own instructors. The club, which has a membership of thirty, has its own hut, known as the Radio Hut, Boldon Colliery, Co. Durham.—Hon. Secretary, R. Hepple, North Road, Boldon Colliery.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

A LARGE gathering of the London Chapter members listened to a most interesting lecture by Mr. A. F. Marner, of the Mullard Wireless Service, Ltd., entitled "New Valves and Their Uses," at the meeting held on Friday, February 1st. Mr. Marner illustrated his lecture with some very fine lantern slides, and began by reviewing valves from the days of the bright emitters until the valves in use at the present day. It was agreed that the lecture had proved very helpful, and the functions of some of the very latest valves were better understood.

We shall be pleased to reserve a limited number of seats for readers of PRACTICAL AND AMATEUR WIRELESS at the meeting of the London Chapter to be held at the R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8, at 8.30 p.m., Friday, February 22nd, when Mr. R. Naismith, A.M.I.E.E., of the Radio Research Station, Slough, will lecture on the "British Polar Expedition to Tromso." His lecture will be illustrated by lantern slides and an electrical experiment to illustrate the work of the Expedition.—A. E. Bear, Secretary, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

THE CROYDON RADIO SOCIETY

THIS society's Dual Loud-speaker Night attracted many PRACTICAL AND AMATEUR WIRELESS readers on Tuesday, January 29th, at St. Peter's Hall, S. Croydon. Among interesting dual speakers were two Piezo electric units with associated moving coils, and the hon. secretary's super-dual Blue Spot was also remarked upon. Nor were the society's home-constructors in the background, for Mr. A. J. Betteridge came forward with his dual cone unit. This had a Lissen unit for top and an N. and K. unit for bass reproduction, the whole costing but a fraction of its rivals.

Each speaker had to undergo frequency tests on the society's oscillator, and on the bass Mr. Betteridge's home-made model was the best present, yet it fell away above 2,400 cycles. In the final voting on all-round performance, the smaller of the Piezo electric combinations obtained the verdict. For February 19th Mr. W. J. Bird, vice-chairman, is lecturing on "Electrical Condensers." Visitors will be welcome.—Hon. Secretary: E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

THE Concerto in B flat major by Mozart is indeed a welcome addition to Schnabel's "His Master's Voice" records, as hitherto his recording of concertos has been confined to Beethoven. It is hard to realise that the composer was suffering want and ill-health when he wrote this most attractive work. Composed in January, 1791, it was his last concerto—he died eleven months later. These beautiful records, *H.M.V. DB*2249 to *DB*2252, are a triumph of playing and recording, Schnabel excelling himself particularly in the infectiously gay last movement. The concerto is for piano and orchestra, and Artur Schnabel and the London Symphony Orchestra, conducted by John Barbirolli, certainly make these records outstanding. The records are obtainable in an album, and are also available for use with H.M.V. automatic couplings (sequence *DB*7733-36).

New Eighteen-penny H.M.V. Dance Records

"His Master's Voice" have led the way in the movement for cheaper dance records, and the almost unbelievable has happened—records with the world-famous trade mark for 1s. 6d. each. The first new issues are now obtainable and offer wonderful value. Teddy Joyce and his Orchestra play "In the Valley of Yesterday," a waltz, and "London on a Rainy Night," a foxtrot, with just the skill expected from this orchestra (*H.M.V. BD*100). The New Mayfair Orchestra excel in "Congratulate Me" and "Goodbye, Hawaii" (*H.M.V. BD*110), "The Object of My Affection" and "In the quiet of Autumn's Night" (*H.M.V. BD*111). All are foxtrots played in first class style. Jack Jackson and his Orchestra play a fine onestep "On Ilkla Moor" and a foxtrot "Nobody Loves a Fairy when she's Forty" (*H.M.V. BD*101), "Yip! Neddy" and "Little Girl what now?" (*H.M.V. BD*108), all foxtrots. There are some good numbers from our American friends, Eddie Duchin and his Orchestra, and the High Hatters. The former play "Hands across the Table" and "Here is my Heart" (*H.M.V. BD*104), two foxtrots, and the latter "I've got an Invitation to a Dance," backed by Richard Himber and his Orchestra playing "Winter Wonderland" (*H.M.V. BD*105). Mills Blue Rhythm Band and Henry Allen Junr.'s Orchestra provide the "Hot" Dance Record for this month, with "Break it Down" and "Feeling Drowsy" (*H.M.V. BD*103).

Sterno Records

The thirteenth syncopated pianoforte medley, by Charlie King, appears in the British Homophone Company's February list. This record, *Sterno* 1561, introduces such popular tunes as "If I had a Million dollars"; "The very thought of you"; "As long as I live"; "You have taken my Heart"; "Waltzing alone"; and "Love for Ever I adore you." It is marvellous how the "Kunz touch" makes the perfect piano record.

The Casani Club Orchestra, under the direction of Charlie Kunz, have made three very fine records this month—some of the tunes being humorous and others little gems of melody. On *Sterno* 1562 we have "Home, James, and don't spare the Horses," which is a very popular comedy number much in evidence at the moment, and on the reverse side of this disc appears a successful dance number in "I'm on a see-saw," from the musical comedy play "Jill Darling," which is now running in London. The other two records by this band are "If I love again" and "Goodbye, Hawaii," *Sterno* 1563, and "There's no green grass round the old North Pole" and "Looking for a little bit of Blue," *Sterno* 1564.

Mantovani and his Tipica Orchestra make two very fine records this month, namely, *Sterno* 1565, "Hebrew Dances" and "Vienna, you've stolen my heart" and *Sterno* 1566 "Hands across the table" and "The moon was yellow." Each of these records are full of those touches of the master musician, which has always been prominent in Mantovani's work.

Two tunes very popular at the moment are "My Kid's a Crooner" and "His Majesty the Baby," and both of these songs are well sung by Helen Raymond (accompanied by the Eight Rhythm Kings) on *Sterno* 1567. This artist does full justice to both of these melodies, and this disc should prove very popular.

A New Record

A feature of the British Homophone Company's lists for this month is the introduction of a new record called the "Solex," which sells at 1s. It is a full-size 10in. record, and many popular stars make their appearance on these discs. At the price mentioned these discs are very good value for money, and I have every confidence in recommending them to readers.

If you like humorous records then you should hear Leonard Henry on *Solex SX*125. On this record he sings "Henry the Ninth" and "I must have one of those," both of these songs being from Leonard Henry's new film "Henry the Ninth." Other records that will enable you to have a good laugh are "The Fire Station" (parts 1 and 2), which is a humorous sketch by Robb Wilton and Company on *Solex SX*122, "No! no! a thousand times no!" and the "Bricklayers Arms," both of which are comedy duets by Fred Douglas and Bertha Wilmott on *Solex SX*120, and "The Crooner" (parts 1 and 2), a sketch by Charles Heslop and Company on *Solex SX*120.

Two organ solos by Reginald Dixon, the well-known radio star, appear on *Solex SX*116. Both tunes, "The Penguin's Patrol" and "The Swing of the Kilt," are typical of this famous organist.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

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

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.

Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

Choosing the Output Stage

"I have just obtained a mains transformer giving 500 volts, 120 m.a., together with an appropriate rectifying valve. I should like to know which is the best type of output stage to adopt for a quality radiogram, using these parts. Is the push-pull stage (for which I should use two 250-volt-type valves) to be preferred to one of the 500-volt single super-power valves? I should like your ruling and your reasons so as to be able to build a really good amplifier."—R. E. A. (Highbury, N.).

Push-pull tends to balance out hum and distortion of certain kinds, and owing to this latter fact it is possible to obtain rather more than double the amplification afforded by the two valves used in the normal manner. Therefore, from the volume point of view, the push-pull and the single super-power valve will probably deliver the same output. Your choice will be governed by your musical ear. If you can detect second-harmonic distortion use the push-pull arrangement. If you require simplicity of construction the single valve is to be preferred. This will also be the case if low price is a point to be considered. From the majority of points of view the push-pull stage, especially if R.C. coupling is employed, will be found to produce the best results.

A Choke for U.S. Waves

"I am building a simple receiver in order to hear the television test broadcasts on 7 metres, and wish to make this really a sound job so that it may be used when the actual B.B.C. transmissions come into effect. I have made air-spaced coils and various other components, but am not quite certain regarding the H.F. choke. I have small-diameter tubes of ebonite, paxolin, and glass and should like to know which is to be preferred. I propose to use 100 turns of 22 D.C.C. for the winding. Is this correct? "—R. B. (Kingsbury).

On these ultra-short wavelengths, every endeavour should be made to keep the losses at a minimum. Therefore, the glass former will be found most desirable. We do not know what circuit you intend to use for experiment and, therefore, cannot give you any further assistance.

Television Detail

"I read in the daily Press that the proposed television broadcasts are to be '400-line'. I cannot see how such detail can be obtained in view of the fact that only thirty lines are used now. I have followed your Television Supplement, but have never seen a full description of this line transmission. Can you explain how 400 lines can be obtained? "—G. B. (Bedford).

The method of dividing the broadcast picture into lines has been described, as well as the production of high-definition pictures employing 240 lines or more. However, the subject will be more fully dealt with in future issues, and if you are very keen on television, and wish to keep fully in touch with developments, we would also recommend our companion journal, *Practical Television*, published at 6d. per month. This magazine, as its name implies, is devoted entirely to television, and deals with every phase of the subject.

D.C. Hum

"I have built a D.C. three, but am troubled with hum. I thought this only occurred with A.C. sets and cannot understand how direct current can produce a perfect rippling hum. I am dropping the mains volts through a good wire-wound resistance, and using proper D.C. valves. Can you tell me where the hum is coming from, and how to cure it? "—O. V. D. (Surbiton).

D.C. mains are certainly not hum-free, and the cause of the trouble may be found in the type of the supply. In some cases the commutator is the cause of quite a pronounced ripple, whilst in others the mercury rectifier which is employed gives rise to a different type of hum. You state that you are using a wire-wound resistance to drop the volts. Have you no choke in the H.T. voltage supply to the anode of the valves? If not, then that accounts for the hum.

Earth Efficiency

"I have been troubled with instability in my 2-H.F. receiver, and after trying practically everything I altered the earth. Originally I used a buried metal plate, but I found that a short wire, roughly three feet long, attached to the earth terminal and lying on the ground, cured the trouble. Can you explain this, as I always understood the earth should be highly efficient."—L. K. (Blackpool).

There are two possible explanations of your problem. Firstly, your earth plate may have become disconnected or partially disconnected below ground, and thus be setting up a high resistance which is introducing the instability in your receiver. On the other hand, the short lead which you find gives better results may be acting as a small counterpoise owing to its position relative to the aerial or lead-in, and thus is more efficient than the broken earth lead. You must consider, however, whether the receiver circuit is incorrect or faulty in some respect, and a lead to the earth terminal is introducing a short (through earth), or otherwise causing trouble. A careful examination should reveal this, or a fixed condenser (2 mfd.) in the earth lead will perhaps prove effective.

Pictures by Wireless

"I should like to know how the pictures one occasionally sees in the Press are sent by wireless. These seem extraordinarily clear and I cannot understand how they can be sent by ordinary wireless waves."—G. T. (Brecon).

There are various methods of transmitting pictures, systems being adopted in different countries according to the individual companies, etc. Generally speaking, the original picture is scanned by a spot of light, and a photo-electric cell is modulated by the reflections from the picture. The resultant varying current is transmitted and at the receiver is converted back to a fluctuating light by a Kerr-cell arrangement, and this affects either a film or photographic paper according to whether the picture being sent is negative or positive. Of course, variations of this basic scheme are employed in different types of apparatus.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

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

OFFER the Following Manufacturers' Surplus New 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 for illustrated catalogue, post free.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves and Magnavox Super 66 energised speaker, £12/10/0.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, condensers, resistances, and diagram, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps with 4v. 2-4 amps., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps., with 4v. 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9; 250 milliamps, 30 hys., 20/-

ALL Premier Mains Transformers have engraved panels, terminal connections, all low-tension windings centre tapped, tapped and screened primaries 200/250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps, 4 volts, 2-3 amps, 4 volts 3-4 amps., 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps, 4 volts, 2-3 amps, 4 volts 3-4 amps, 12/6.

PREMIER combined HT8 and HT9 transformer rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, either type, 18/6.

PREMIER HT10 transformer rectified output 200 volts, 100 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, 10/6.

PREMIER HT11 transformer 500 volts 120 milliamps rectified output. 4 volts 2 amps, 4 volts 2 amps, 4 volts 3-5 amps, 22/6 with Westinghouse Rectifier, 42/6.

SPECIAL offer Western Electric mains transformers input 200/250 volts, output 350-0-350 volts, 120 milliamps screened primary 4 volts 1-2 amps, 4 volts 2-3 amps, 4 volts, 3-5 amps, 9/6. Input 100/250 volts, 300-0-300 volts 60 milliamps 4 volts 1-2 amps, 4 volts 2-3 amps, 6/6. Input 200/250 volts screen primary output 500-0-500 volts 150 milliamps 4 volts 3-5 amps, 4 volts 2-3 amps, 4 volts, 2-3 amps, 4 volts, 1 amp. 4 volts, 1 amp., 19/6.

MAINS transformer with Westinghouse Rectifier output 150 volts, 30 milliamps and 4 volts, 2 amps LT., 15/- the pair.

USA. 3-gang condenser with trimmers, 3/11 a really solid job.

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

B.T.H. Truspeed Induction Type (A.C. Only), Electric Gramophone Motors, 100-250v., 30/- complete. D.C. model Truspeed, 100/250v., 42/6.

COLLARO Gramo. Unit, consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-; without volume control, 46/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire-Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CENTRALAB Potentiometers, 400 ohms, 1/-; 50,000, 100,000, ½ meg., any value, 2/-; 200 ohms, wire wound, 1/-.

RELIABLE Canned Coils with Circuit accurately matched, dual range, iron cored, 2/11.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 144, 2,500 ohms, 12/6; D.C. 152 magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 16/6; 9in. cone, 22/6.

SPECIAL offer .00015 brass short-wave tuning condensers with slow-motion and complete dial, 3/9. Short-wave chokes 10-200 metres, 9d.

DUBILIER electrolytic condensers, 12 microfarads, 20 volts 6d., 8 plus 4 microfarads 500 volts 4/-, 50 mf. 50 volts, 1/9.

AMERICAN G.E.C. auto-transformers 500 watts, one side 110 volts other 90/240 volts in 5 volt steps, 40/-.

BRITISH Radiophone fully screened .0005, top trimmers with complete slow-motion drive, 7/6.

MAINS transformer input, 200/250 volts, 6 volts 1 amp, 4/6. 10 volts .5 amp., 4/6.

SPECIAL OFFER. Koister-Brandes (shop-soiled) Receivers, 2-valve Battery Pup, with self-contained Speaker, Valves and Batteries, 27/6.

POLAR Star manufacturers' model, 3-gang condensers, fully screened, 7/9, with trimmers; unscreened, 5/-.

RELIABLE Intervalve Transformers, 2/-; multi-ratio output transformers, 2/6; Microphone transformers, 50-1 and 100-1, 2/6; 1-1 or 2-1 Output Transformers, 2/6.

UTILITY 3-gang Condensers. 0.0005, fully screened, with trimmers, ball bearing straight- or superhet, 6/9, complete; with disc drive, 7/11; the best 3-gang available.

T.C.C. Condensers, 4mf. 450v. working, 4/-; 4mf., 750v. working, 6/-.

VARLEY Constant Square Peak Coils, bandpass type B.P.7 brand new, in maker's cartons, with instructions and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.S., band-pass, complete with instruction, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron, flush mounting, accurate, 0-10, 0-15, 0-50 m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps.; all at 6/-.

WESTERN Electric Condensers, 250v. working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 400v. working, 1 mf., 1/-; 2 mf., 1/6.

WIRE-WOUND Potentiometers, 1,000, 2,500, 50,000, 500,000, 2/- each; 1,000 ohm, semi-variable, carry 150 m.a., 2/-.

A LARGE Selection of Pedestal, Table and Radiogram cabinets, by best manufacturers at a fraction of original cost. Send for list.

THE following Lines 6d. each, or 5/- per dozen.—Chassis valve holders 5-, 6-, or 7-pin, screened screen-grid leads, any value 1-watt wire resistances, wire end condensers 0.0001 to 0.1, 3 amp. mainswitches, Cyldon capacitors, double trimmers.

SUPER-MOVING Coil Speakers, handle 10 watts, energised directly from A.C. mains, manufactured by world-famous radio and gramophone company, 40/-.

T.C.C. Electrolytic condensers, 8 mfd. 440v. working, 3/-; 4 mf. 440v. working, 3/-; 15 mf. 50v. working 1/-; 50 mfd. 12v. working, 1/-; 15 mf. 100v. working, 1/3; 6 mf. 50v. working, 6d.; 2 mf. 100v. working, 6d.

CONDENSER Blocks, H.M.V. 400v. working, 4+2+1+1+1+.5 3/9; 2+2+1+1+1+.5, 1/-; Dubilier 300v. working, 4+4+2+.1, 3/-; Phillips 6+4+2+1+1, 4/6.

VALVES. See our displayed advertisement on page 793.

GRAMPIAN Permanent Magnet 9 inch Moving Coil Speakers, handles. 4 watts. Universal Transformers, 18/6. Ditto Energised handles 5 watts, 2,500 ohms, 21/-.

10,000, 12,000, 15,000 ohm wire-wound potentiometers with mains switch, 1/6.

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ELLIOTT Moving-coil Milliameters projecting type, 2½in. diameter, 0-10, 0-30, 0-50, 0-150, 15/-.

DARIO directly-heated 1 watt, 200v. Mains Power Valves, 2/6.

BLUE SPOT 45 P.M. Speaker, multi-ratio transformer, handles 4 watts, listed 45/-, at 25/-, or in handsome walnut cabinet, 35/-. Blue Spot 99 P.M. Speaker, multi-ratio transformer, handles 5 watts, listed 50/6, at 31/-.

BLUE SPOT Energised Speakers 2,500 ohms type 29D.C., Power and Pentode Transformer, 9/11.

SUPER Moving-Coil Speaker by world-famous radio and gramophone company, 300v. 30 m.a. field (10,000 ohms), 25/-.

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(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest station: Clapham North, Underground.

RADIALADDIN (Disposals), Ltd. Exchange your old set for any new model, balance cash or H.P. Write for free quotation to largest radio exchange in U.K. Also clearance sale of reconditioned sets and radiograms at gift prices £1 to £10. Write for list.—46, Brewer Street, Piccadilly Circus, W.1. Gerrard 4055.

REPAIRS to Moving Coil Speakers, Cones and Coils fitted, or rewound. Fields Altered. Prices Quoted Including Eliminators. Loud-Speakers Repaired, 4/-. L.F. and Speech Transformers, 4/- Post Free. Trade Invited. Guaranteed Satisfaction. Prompt Service. Estimates Free. L.S. Repair Service.—5, Balham Grove, London, S.W.12. Battersea 1321.

MAINS Transformers, chokes, etc., to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

WEEDON P.L.R. Co., SPEAKER and REWINDING SERVICE. Mains transformers, etc. Cones, Coils and Centres fitted all M/C speakers, 5/-. Receiver repairs, including American and Midgets. Trade invited.—Dept. C, 80,1 Lonsdale Avenue, London, E.6.

TRANSFORMER and Choke Stampings, instrument and Resistance wires, spools and insulation. Lists Free.—Lumen Electric Co., 9, Scarisbrick Ave., Litherland, Liverpool 21.

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Draws attention to following bargains. No catchpenny lines. No stunts, just a dead square deal.

RADIOMART. Radiophone super short-wave condensers, all brass, steatite bases (the finest made) offered third list, .00016, 3/6; 2 gang .00016, 5/6.

RADIOMART. British Radiophone, fully screened 2-gang .0005 top trimmers, latest compact type, 5/11.

RADIOMART. Radiophone 3-gang, as above, 8/6; Radiophone 4-gang superhet, 9/6.

RADIOMART. Radiophone as above 2-gang but unknob with wavelength dials, 8/3.

RADIOMART. Radiophone Full Vision illuminated Dials oxydised escutcheon (list 7/6), 3/6.

RADIOMART. Pushback—the wire used by set-makers; ready tinned and sleeved, 6yds., 9d.

RADIOMART. Screened flex, H.F. or pick-up; single, 6d. yd.; twin, 9d. yd.

RADIOMART. Resin-cored solder, 10d. per lb.; Bulgin lamp fuses, 2d.; Bulgin twin fuseholders, 4d.

RADIOMART. Non-inductive tubulars, 1,500vt. .0003, .002, 4d.; .01, .02, .04, .05, 0.1, 6d.; .2, .25, 8d.; .5, 9d.

RADIOMART. Differentials; Telsen .0001, .00015, 1/-; Polar .0003, 1/3; all knobs.

RADIOMART. Radiophone I.F. transformers, top trimmers, 2/6; also few 117 and 126 k.c.

RADIOMART. Utility super 2-gang .0005 ball-bearing, fully screened with trimmers, 5/11; with disc dial, 6/11.

RADIOMART. Utility 3-gang, as above, straight or superhet, 7/11, with dial, 8/11.

RADIOMART. Famous 8 mfd. dry electrolytics 500v., 2/11; NSF., ditto, 8 x 8 mfd., 500 v., 3/6.

RADIOMART. BTH 7in. latest 2,500 ohm. moving coils, humbucker, 4 watt model, 12/6.

RADIOMART. Sonochorde super sensitive PMs. "Class B" or Universal (ideal battery sets), 16/6.

RADIOMART. Variable condensers Solus .0003, Ready Radio .0003, .0005, .00075, 1/-; Telsen .0001, .00015, 10d.; Utility .0005, 1/3.

RADIOMART. Special offer dozen all different wire-ended resistances by most famous makers, our assortment, 2/6.

RADIOMART. Telsen 1 watt resistors, cartridge resistors, toggle switches, tubular condensers, 6d. each.

RADIOMART. Igranic non-inductive condensers, bakelite case, terminals, 700 v., makers' cartons, 1 mfd, 1/4; 2 mfd., 1/8.

RADIOMART. Brand new condensers, eminent makers, 500v. working, 4 mfd., 3/6; 2 mfd., 1/10; 1 mfd., 1/6.

RADIOMART. 350v. working, 4 mfd., 2/9; 2 mfd., 1/8; 1 mfd., 1/4; 250v. working, 4 mfd., 2/3; 1 mfd., 1/2; 0.5 mfd., 9d.; 0.1 x 0.1 mfd., 9d.

RADIOMART. Supremus battery economisers, incorporating Westinghouse rectifier; halves consumption (list 27/6), 7/6.

RADIOMART. Triotron "Class B" 7in. cone PM. unit, with driver transformer, valveholder (list 49/6), 25/-.

RADIOMART. Staltapped "Class B" chokes (list 9/6), 3/6; Igranic driver transformers, 1/11.

RADIOMART. Transformers: Igranic, 8/6; Parvo, 3/6; 3½-1 Ericsson (15/-), 1/3; Microphone, 2/6.

RADIOMART. Screened iron-cored dual-range coils with reaction circuit, 2/11; Igranic short-wave iron-cored dual-range, 3/3.

RADIOMART. Telsen Radiophone, dolly toggle switches, 8d.; Lotus radiogram switches, 9d.

RADIOMART. Radiophone H.F. chokes (manufacturers), honeycomb wound, 1/-; Metvick, 9d.

RADIOMART. Years of transmitting experience makes possible a specialised service in short-wave material which can be relied upon.

RADIOMART. G.E.C. all brass .0003 condensers, with real slow-motion; Ideal short-wave (listed over £1), 2/9.

RADIOMART, Limited, number as above, but double spaced, .00015, 3/9. The finest condensers ever made.

RADIOMART. Brass ball-bearing 100 mmfd. short-wave, pigtail, noiseless, 1/6; brass band-spread or neutralising micro-variables, 1/-; extension brackets, 3d.

RADIOMART. Pye loloss short-wave valveholders, 4d.; 1½-in. coil forms, 4-prong, 1/3; 6-prong, 1/6.

RADIOMART, Western Electric 21/- microphones, 2/9; transformer, 2/6; Telsen dual-range short-wave coils, 3/6.

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

RADIOMART. Fintglass aerial insulators, 3½in., 6d.; Beehive stand-off insulators, 8d.

RADIOMART. American stand-off insulators, "Tinymite," 6d.; "Midget," 7d.; "Standard," 8d.; Frequentite English valveholders, 8d.

RADIOMART. Purchase over-produced stock leading Continental valvemaker; Super valves; sensational prices.

RADIOMART. A.C. types at 4/6; H.F. Pen., MH, MHL, VMSG., PT4, SGLA, SGHA, from 2/11.

RADIOMART. 2 volt types, H.F., Detector, L.F., 2/3; Power, 2/9; Super power, 3/3; Screen-grid, Pentode, 5/6.

RADIOMART. American types, 4/6. Catalogue gives characteristics and hundred other bargains.

RADIOMART sends catalogue or answers enquiries only if stamp enclosed. Goods over 6/- post free or C.O.D.

THE SQUARE DEALERS

RADIOMART, 19, John Bright Street, Birmingham.

SOUTHERN RADIO'S WIRELESS BARGAINS.

RECEIVERS.—Osram 4-Valves (Actual) Sets. Complete with Four Osram Valves, Moving-Coil Speakers. Pedestal Cabinet. Ready for use on all Voltages A.C. In sealed cartons, £6/0/0 (List £15/15/-).

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VARLEY Constant Square Peak Coils B.P.5, with all accessories, 2/3.

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CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully Screened with trimmers, 7/3 each (List 45/-). LOTUS Three-Gang, 12/6; 2-Gang 8/6. All Lotus Condensers are complete with Dials, Escutcheons, fnily screened with trimmers. Dubilier 4-mfd. (2+1+1) 1,000 Volt, 2/9 each; 4.5 mfd. (2.25+2.25) 3/-. T.C.C. 0.1+0.1, 1/3. Dubilier 0.1, 9d.

SPEAKERS.—Blue Spot Permanent Magnet Moving Coil Speakers. Universal Transformers for Power Super-Power, Pentode and Class "B." All Brand New 1935 Series in sealed cartons. Type 99P.M., 30/- (List 59/6); 45P.M., 24/- (List 45/-); 62P.M. (in Cabinet), 38/- (List 67/6); 32 P.M. in magnificent cabinet, 45/- (List 87/6). W.B. Permanent Magnet Speakers with universal Transformers, 21/- each (List 32/6).

ELIMINATORS.— Regentone Eliminators W.5a. Complete with Trickle Charger for 200/250 volts, 39/6 (List £3/17/6). A small Quantity only of Ekco Eliminators for 100/125 volts only, Type K25 with Trickle Charger, Output 25 m.a., 35/- (List £4/12/6). Type K. 18 with Trickle Charger output 18 m.a., 32/6 (List £4/7/6). All New in original sealed cartons.

MISCELLANEOUS.—Westinghouse Metal Rectifiers. H.T.6, 7, 8, 9/3 each. Morse Tapping Keys with flash signal and buzzer. Complete with Battery and bulb, 2/-. Bifo Static Cut-outs, definitely eliminates noise and interference, 2/3 (12/6 List). Telsen Binocular H.F. Chokes, 2/4 (List 4/6). Variable Volume Controls, all capacities, 2/- each. Lewcos Spaghetti Resistances, all capacities. New and boxed, 1/6 dozen assorted.

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RADIO CLEARANCE.—British Radiophone set of superhet. coils, manufacturers' type, with circuit diagram, suitable for use with above advertised condensers, 5/6 per set.

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RADIO CLEARANCE.—1½mm. white sleeving; 9d. per doz. lengths.

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NOTE: We make no extra charge for deferred terms.

RECEIVERS. 3-VALVE "CLASS B" BURGOYNE RECEIVERS. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/C speaker. Artistic cabinet of highly polished Walnut. Chromium fittings. Brand new in original cartons; 1935 Model. List £6 10s. Our price £3 18 6. Carriage Paid.

SPEAKERS. Lissen plaque speakers, wonderful tone. List 15/-. Our price 5/11. Lotus permanent magnet, with universal transformer giving 10 alternative tappings. Eight-inch cone—wonderful tone. List 27/6. Our price 14/11.

CONDENSERS. British Radiophone .0005 ganged, screened variable condensers with trimmers. 2-gang, 6/6; 3-gang, 8/6.

COILS. Lincoln-Stewart screened dual-range iron cored coils; complete with circuits and wiring diagrams. List price 6/6, our price 2/6. Lotus triple-ganged bandpass coil unit, complete. Suitable for mains or battery sets. Comprises 3 screened coils on metal base, wavechange and radiogram switch; all terminal connections shown engraved. Full instructions with every unit. List 27/6. An outstanding bargain at 12/11 each. Lissen L.N.5181 3-ganged superhet coil units for A.C. or battery sets; with circuits and diagrams. Over 1,250 already sold to "Pr.W." readers. List price 30/-; now offered at special price, 6/6 only. New Lucerne coils 1/8 each.

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RADIOPAK by British Radiophone (Type 535 C). Comprising 3 matched coils and 3-gang condenser with trimmers. Clearly engraved scale marked in metres, pilot light fitting, engraved terminal strip showing all connections. The whole mounted on grey metal chassis. Guaranteed new. Limited quantity only, at special low price of 29/6 complete.

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Ormond .0003 and .0005 Variable Condensers 1/3 each. Tonastat Selectivity Unit, 1/10; Bifo static cut-out, 2/3. Igranic 1 mfd. condensers 1/3 each; 2 mfd. 1/9 each. Table Microphone complete with transformer in base, 6/11. Triotron electrolytic condensers; 8 mfd., 450 volt working, 2/11 each; 25 mfd., 350 volt working, 3/6 each. Triotron Class "B" Valves, type E220B. List 10/6; our price 5/1. Amplion Binocular H.F. Chokes. Totally enclosed in bakelite case. List 4/6. Our price, 2/3. Lots of 3 dozen assorted Dubilier fixed condensers, 1/9 each lot. 4-pin Chassis-mounting Valve holders, 5d. each; 6 for 2/-. Igranic 2-pole rotary switches, 1/- each. Double reading voltmeters, 1/9 each. Accumulator Hydrometers, complete with float, 1/- each. Sovereign lightning arresters, 6d. each.

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T.C.C. low voltage electrolitics. 50 mf., 12v., 25 mf., 25v., 15 mf., 100v., and 6 mf., 50v.; all 1/- each.

T.C.C. mica condensers, "M" type. 0001, 0002, 0005, 001, 005, 3d. each. H.M.V. block condensers, 250v., working, 4 x 4 x 1 x 1 x .5, 3/- each, post 9d.

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HEAYBERD Mains transformers, 500/500, 120ma., 4v. 4a., 4v. 6a., 4v. 2½a., all CT and clearly marked input 200/250v., screened primary, 32/6, carr. fwd., fine heavy job, fully shrouded.

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ODDMENTS in slightly used Regentone Atlas, etc., eliminators, with Westinghouse rectifiers incorporated, at 15/- each, post 1/-. 150v. 20 ma. input 200/250v. 40/100c.

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NEW Ekco K. 25 Eliminators, 150 v. 20 ma., with ½ amp. trickle charger, 45/-; Sonochorde 2,500 ohm speakers, with tapped transformer, 10/6; Metvick 250v. transformers, 4v. 2a., 4v. 5a. input, 200-250v., with terminals, 11/-, new; Varley Pentode Nichokes, new, 6/-.

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

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VAUXHALL.—Radiophone radio-paks R.F. superhets complete with volume control, escutcheon, new Lucerne station named dial, 34/-.

VAUXHALL.—Radiophone Intermediate frequency transformers, centre tapped primary, secondary on bases with terminals, 5/6.

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VAUXHALL.—Benjamin Class B. transformers 1-1¼ to 1. Terminals fixing, 6/6 boxed.

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VAUXHALL.—Westinghouse rectifiers set, manufacturers surplus skeleton type H.T.8, 9/6; HT9-10, 10/-.

VAUXHALL.—Westinghouse Westectors, W.4, W.X.6, 5/9. Regentone transformers with terminals and H.T.8, 17/6.

VAUXHALL.—Rothermel Piezo electric pick-ups, 30/-; Marconi K25, 21/-; B.T.H. senior, 29/-; Minor, 16/6. Sealed cartons.

VAUXHALL.—Gramophone motors: Collaro 32 model, 32/6. Universal model for 110, D.C. 200/250 AC/DC, 47/6.

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VAUXHALL.—Utility dials and drives complete with escutcheon, state black or brown, 5/-.

VAUXHALL.—Dubilier condensers, 4 or 8 M.F.D. dry electrolytic, 500.V working, 3/-; 50 MFD.50.V. working, 1/3; 50 MFD.15V., 1/6.

VAUXHALL.—Dubilier or Radiophone tubular condensers non-inductive .1, 9d. .05, 6d.; .002, .0002, and .0005, 4d. 1 mfd. Mainsbridge, 1/3; 2 mfd. 2/-; T.C.C. .002 mica, 2,000v. test, 10d.; .01, 1/-.

VAUXHALL.—Dubilier all values, 1 watt. resistances, 7d.; Clix valveholders with terminals 5 pin, 7d.; 7 pin, 9d.; Continental 7 pin, 9d.; W.B., 4/5 pin, 4½d. Post paid, 2/6, or over or C.O.D.

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KIT A.—Cadmium plated chassis (ex-Murphy), with new type fully-screened Radiophone 2-gang condenser, curved dial with bronze escutcheon, and four chassis valveholders, 12/6.

KIT B.—As above, and including two iron-cored canned coils, 16/6.

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RADIOPHONE semi-screened midget condensers, with side trimmers .0005: 2-gang, 5/-; 3-gang, 7/6; 4-gang, 8/11.

DUBILIER dry electrolytic condensers: 8 mfd., 500v., 3/-; 4 mfd., 500v., 3/-; T.C.C. 8 mfd., 500v., 3/-; 4 mfd., 500v., 3/-. British Insulated Cables, 8 mfd., 550v., 2/10; 50 mfd., 50v., 200 mfd., 15v., 2/10; 2,000 mfd., 12v., 8/6. T.C.C. 6 mfd., 50v., 15 mfd., 100v., 25 mfd., 25v., 50 mfd., 12 v., 1/3.

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TRUWIND resistances: All values from 100 to 50,000, 3½d. Erie resistances, all values, 6d. Grid Leaks, ½ meg., 1 meg. and 4 meg., 3d.

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Vol. 5. No. 127. February 23rd, 1935.

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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. V. No. 127. Feb. 23rd, 1935.

ROUND *the* WORLD *of* WIRELESS

Two Victorian Plays

A VICTORIAN double bill will be broadcast to National listeners on February 26th, and in the Regional programme on February 27th. This will consist of two successful plays which were staged about fifty years ago. The first, "The Lottery Ticket," is a farce, and the second, "The Siege of Lucknow," a melodrama. Both are being adapted and presented by M. Willson Disher. In the radio version the presentation will give listeners the impression that the broadcast is being relayed from an imaginary theatre, "The Theatre Royal, Memory Lane."

"The Mystery of the Temple"

AN interesting play bearing this title which will be broadcast in the Regional programme on February 21st and Nationally on February 22nd, is an authentic historical play based upon the great mystery of the fate of the Dauphin, who was the son of Marie Antoinette and Louis XVI, both of whom were guillotined during the French Revolution. The Dauphin was the heir to the throne of France and great mystery surrounds his death. Some people say he died in the Temple, but there is evidence to show that although a little boy did die there it was not the Dauphin, who was smuggled out of prison and another boy put in his place. The mystery has never really been cleared up, but in this play, which has been specially written for broadcasting by Norman Edwards, the author has offered a reasonable solution based upon authentic historical memoirs.

B.B.C. Symphony Orchestra

THE concert to be given in Birmingham Town Hall, on February 27th, when Dr. Adrian Boult conducts the B.B.C. Symphony Orchestra of a hundred and nineteen players, is being broadcast on the National wavelength. The Symphony chosen is Brahms' No. 4. Ravel's "Bolero" is to be given in response to general request, in view of the fact that its brilliance can only be brought out by a very large orchestra.

The Melbourne Male Voice Choir

THIS well-known choir, which has won over forty prizes at festivals, including three first prizes at Leicester, is to have its first microphone appearance on February 28th in the Midland programme. The Choir was formed in 1922. The present conductor has had thirty years' experience of conducting male voice choirs.

"At the Langleys"

THE second of the topical series, "At the Langleys," written by a panel of local journalists, will be given for Midland listeners on March 1st. And on the following day, March 2nd, the Regional Revellers, presented by Mason and Armes, give one of their entertaining programmes.

Variety Programme from Huddersfield.

AN excerpt from the variety bill will be relayed to Northern listeners from the Palace Theatre, Huddersfield, on February 27th. The bill includes Herbert Cave and Lilian Denton (vocal duettists), Reg Radcliffe (xylophone), Jack Herbert and Cyril Halton (cross-talk comedians), and Gladys Clark (whistling vocalist).

"West Country Gazette"

THE fifth issue of "West Country Gazette," the popular erratic periodical, will be given for Western listeners on February 27th. One of the novelties in this issue will be the Music Notes, which will take the rather unusual form of an interlude by some Bristol street musicians. These men have been chosen, not so much for their musical abilities as for their interesting personalities, and they are in each case the real itinerant musician who thinks nothing of travelling to Brighton in summer to play his instrument at the Races.

"The Farming Year"

THE first of a new series of programmes, entitled "The Farming Year," will be given on March 2nd for listeners in the West. It is not to be imagined, however, that this programme is for farmers only, but for all listeners who are interested in country life, particularly perhaps those whose fate it is to live in towns and large cities. "The Farming Year" will attempt to build up a picture of the farmers' interests and activity at different seasons of the year. This first programme will deal with the actual time when spring is in the air and lambs are beginning to skip upon the meadows.

"Workaday World"

THE fifth talk in the series called "Workaday World" will be broadcast to listeners in the West on February 26th, when R. H. S. Crossman will discuss with H. A. Marquand some of the problems raised by A. J. Bowron in the previous talk. This talk is one of a series of twelve about the problems confronting industry in Wales and the south west of England. They will discuss generally the relevance of Socialist theories to modern industrial economic problems.

"On the Road"

LISTENERS will remember the talk given by Philip Allingham in the "Rolling Stones" series, and will consequently look forward to a further talk entitled "On the Road," to be broadcast by this speaker on February 28th in the National programme. In this talk Mr. Allingham will describe Appleby Show, which is really a horse show. In this he will give a description of the tribes of gypsies who gather round the place, and will illustrate his talk with good examples of Romany language, and queer phrases and words.

Concert from Belfast

THE last concert of the season will be relayed to Northern Ireland listeners from Wellington Hall, Belfast, on March 2. The soloists will be Mabel Ritchie (soprano) and Albert Sammons (violin).

ROUND the WORLD of WIRELESS (Continued)

To Complicate Identification?

THE policy adopted by the Continental stations of broadcasting for the benefit of their neighbours is not simplifying the task of identification by British listeners. Bucarest now transmits talks in the Magyar language, destined to its Hungarian minorities; and Radio-Trieste, which already broadcasts in Slav and Greek for inhabitants on the other side of the Adriatic, has also added Magyar to its list of languages. Talks in this tongue are given by the Italian station between G.M.T. 18.30 and 18.45 almost daily.

THE KING'S RECORD

The King's voice cut more than seven miles of wax when records of his Empire Speech were made at "His Master's Voice" studios.

French State Disappoints Listeners

NOTWITHSTANDING its many promises to construct a 120-kilowatt station at Rennes-Thourie for operation during 1935, it is now reported in Paris that, far from proceeding with the building, the site has not yet been definitely acquired. It is hardly likely that this super-power transmitter will be launched on the ether before 1937.

Loud-speakers in Trams

FOLLOWING the example set by Paris in the underground electric railway, the Prague authorities have equipped the local tramway cars with microphone and loud-speaker in order to permit the conductor to warn inside passengers of approaching stopping-places.

Interesting Statistics

ON January 1st, 1935, Great Britain possessed 6,780,570 listeners, Germany 6,142,921, and Denmark 568,175. The increase for the preceding year was respectively 13.6 per cent., 21.6 per cent., and 6.2 per cent. It is interesting to note, however, that although Germany has secured a greater number of licensed listeners, only 9.43 per cent. of the population possess wireless receivers. In this respect Denmark still tops the bill with 16.23 per cent., followed by Great Britain with 14.66 per cent.

INTERESTING and TOPICAL PARAGRAPHS

Marseilles-Realtor to test in April

THE first of the French State high-power transmitters (120 kilowatts) now in course of construction in the immediate neighbourhood of Marseilles, is rapidly nearing completion. It will carry out its tests from April to June and will be opened officially in August. The wavelength allotted to this station is 400.5 metres (749 kc/s.).

New Wavelengths for Aerodromes

IN view of the development of both home and foreign commercial aircraft services, the Signals Department of the British Air Ministry has obtained the extra channel of 363 kilocycles (827 metres), borrowed temporarily from the aircraft beacon band. This will enable arrangements to be made for using ultimately 363 kilocycles for Continental traffic whilst reserving 348 kilocycles (862 metres) for the home airplanes.

Stand by for New Interval Signals

SO far the French State has left the selection of interval signals to the care of the individual studios, and few of them have found practical means for making their stations known to listeners. A scheme is under discussion for providing official signals to all transmitters in the PTT network, and it is expected that they will consist of a series of musical chords representing excerpts of folk songs popular in each district.

Radio-Bretagne

UNDER this call you will now hear Rennes PTT on 288.5 metres (1,040 kc/s.). Several different names have been used recently, including Radio PTT Ouest, but it has now been decided that as the studios are to be installed at Rennes, Nantes, and Angers, Radio-Bretagne will cover all without arousing local jealousy.

Proposed Dutch Radio Reorganisation

A NEW Bill will shortly be presented to the Dutch Parliament to permit the State control of the broadcasting system in that country. It is likely that a new company will be formed to take over the transmitters; in this the State will be interested to the extent of 60 per cent. of the capital. It is to be called *Nozema* (Nederlandsche Omroep Zender Maatschappij), and will include on its board directors of the four Associations (A.V.R.O., V.A.R.A., N.C.R.V., and K.R.O.) at present responsible for the programmes.

New York's Lady Announcer

THE National Broadcasting Company of America has engaged the well-known actress, Elsie Janis, as radio announcer at the WEAF studio, New York.

Boosting Up Another Swiss Station

FOLLOWING improvements made to the Beromünster transmitter, by which it now ranks as a 100 kilowatter, the Sottens station is to be taken in hand with a view to doubling its power. The work will be carried out in August. A report from Geneva states that Sottens will again be increased to 100 kilowatts later in the year.

Alteration in Wavelength

AS it has been found impossible to synchronise the broadcasts of the new 16 kilowatter at Torun (Poland) with those of Cracow on the same channel, namely, 304 metres (986 kc/s.), the latter station has moved to 293.5 metres (1,022 kc/s.), which, although not allotted to Poland, is only used by a small Spanish transmitter.

They Learn Something to Their Advantage

EVERY week, in the Swedish broadcasts, a bulletin is transmitted in which the State seeks missing heirs. Thanks to this feature, in forty-nine cases of unsettled legacies seventeen persons have learnt something to their advantage.

Radio *versus* Telephone

STATISTICS recently published in Berlin show that during recent years broadcasting has made so many recruits that at the end of 1934 there were in the entire country three times more licensed radio listeners than telephone subscribers.

SOLVE THIS!

Problem No. 127

Out of curiosity Jackson decided to make up a one-valve receiver with all home-made parts. He accordingly made the condensers, coils, grid leak and condenser and H.F. choke and tried out the circuit. He found, however, that oscillation was taking place even with the reaction condenser at zero, and in an endeavour to find the cause he disconnected the leads to the reaction condenser, but the receiver still oscillated. What was the reason? Three books will be awarded for the first three correct solutions opened. Envelopes should be marked Problem No. 127 and must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Entries must be received by the first post Monday.

Solution to Problem No. 126

When Samuels connected the two leads from his speaker to the pick-up terminals he joined the lead carrying H.T. supply to the terminal joined to the grid of the input valve, and consequently the application of a large positive potential to the grid prevented the valve from functioning. The first three correct solutions opened in respect of Problem No. 125 were from the undermentioned readers, and books are being forwarded to them: H. W. Forrest, 16, Primrose Croft, Hall Green, Birmingham; A. Joyce, 31, Ramsgate Road, Margate; E. J. White, 118, Beech Hill Lane, Wigan, Lancs.

IMPORTANT NEW SERIES

TELEVISION FOR ALL—2

What H.D. Television Reception Involves

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

THE proposal to start during the latter part of this year a high-definition television service appears to have caused a measure of misunderstanding among certain readers, especially in so far as it applies to the receiving end. This is unfortunate, and it is the purpose of this article to show briefly what is involved.

First of all, it can be stated with every degree of emphasis that the new high-definition television service is to be entirely distinct and separate from the existing broadcasting service now provided by the B.B.C. and Continental stations. The present service of aural broadcasts is a form of entertainment designed to appeal wholly to the ear. Also, the signals are radiated on the medium and long wave-bands, which all existing (and future) broadcast radio sets are capable of receiving. If, therefore, any reader is building or contemplates making any set featured in this journal, or alternatively desires to purchase a commercially-made set, the advent of H.D. television should in no way alter those plans.

The Position Defined

The contemplated television service will in no way require the scrapping of present or anticipated broadcast receivers. The aural radio programme service will continue as at present, and even extend its scope by improving the stations and making every effort to provide freedom from sideband interference.

When the proposed high-definition television service becomes available through the medium of the first station which is to be built in London, it will provide an entirely separate and distinct form of entertainment requiring a dual set (it must receive both vision and sound signals) and working on the ultra-short wave-lengths. This set will be characterised by a design completely different from broadcast receivers, and furthermore, requires vision equipment so that the pictures can be seen and heard in the home, as and when the "signals are on the air." Whereas the present sound programmes are designed to meet the case of "blind" listening and do not require any concentrated effort (that is, one can eat or work with a pleasant musical background) with the new television service one must, of necessity, bring the senses of sight and hearing into sympathetic concentration on to the programme which is provided to obtain the maximum value from it.

New Transmitting Medium

It is to be hoped that these few preceding remarks will clarify the minds of all readers who were unable to appreciate to the full what was meant by the findings of the recent Television Committee. Now let us see how the advent of television is going to open up an entirely new vista and provide a new constructional and interesting pastime to supplement that already given by the present "practical wireless."

The first point to consider is that of the medium used for propagating the signals from transmitter to "looker." With the proposed television definition of 240 lines, having twenty-five images per second and a picture ratio of approximately four horizontal to three vertical, the frequency involved in the resultant signal extends from zero to well over two million cycles. If any attempt was made to radiate this from, say, the London National station, which at present transmits the low-definition or thirty-line television service, it would mean that a sideband extending from about 200 to 500 metres would be required. Every other station working between these two wavelengths would, therefore have to close down, which is, of course, ridiculous to contemplate.

This situation had to be faced, however, and in consequence it gave birth to an entirely new technique, namely ultra-short-wave transmission and reception; that is, working below 10 metres. Now although these waves had been employed previously for sound messages, nothing had been done to ensure the embracing of a sideband approaching that just quoted.

Here, then, is the first departure from broadcast working involved by high-definition television reception. It will necessitate the assimilation of new ideas concerning the operation of sets, coupled with the amplification of signals with megacycle frequencies, yet eschewing any form of amplitude or phase distortion. This, at first sight, appears an almost impossible task when it is remembered that our present radio sets are considered "high fidelity" ones when they do not "cut off" at 10,000 cycles. It is, however, proposed to go into this matter very thoroughly at some future date, and so prepare the way for all those readers who intend to avail themselves of the new service.

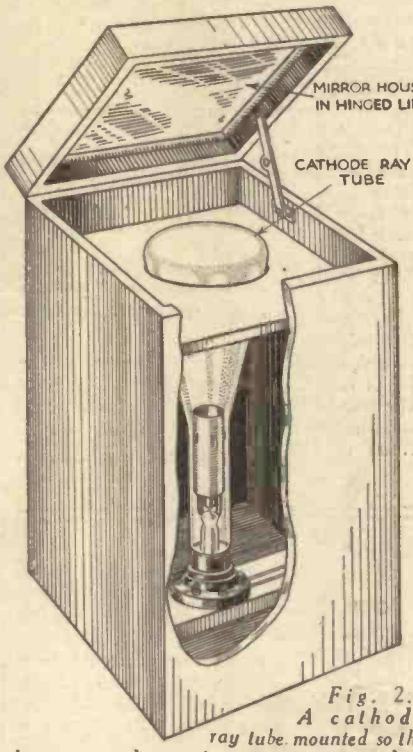


Fig. 2.—A cathode-ray tube mounted so that the image can be seen in a mirror accommodated in the hinged lid.

Fig. 3.—Employing a large cathode-ray tube mounted vertically so that the television images can be watched as mirror reflections, this modern instrument is ideal for home entertainment.

Two Sets Required.

Since these very low wavelengths correspond to extremely high frequencies it is possible to have two stations on quite neighbouring wavelengths. This is a great advantage when it is borne in mind that two separate radio transmitters are required for the radiation of both the vision and sound signals. As an example, it can be mentioned that with one experimental service, the vision is radiated on a wavelength of 7.0 metres, while the accompanying sound is sent out on a wavelength of 8.5 metres.

Two quite separate sets are required in order to take full advantage of the service and for convenience these will be housed in the same cabinet. An example of the Baird Co's. commercial form of this arrangement is shown in Fig. 1, two sets of controls being available for the separate receivers. Once the scheme of things has been mastered the sets will be found quite simple to operate.

The aerial is of the "dipole" type (half a wavelength in height), and consists of a straight stiff wire which for preference should be mounted vertically on a mast on the roof of the house. If this is impossible, or inconvenient, quite strong signals will be secured if the dipole is positioned on the side of the house, or even in the room. In the case of the last named, experiments must be made on site to determine the best position for optimum results.

(820)

The Vision Side

Both the receivers should derive the whole of their power from the mains and, of course, associated with the vision set is the equipment which makes the signals visible to the eye. At present the only suitable device for really satisfactory high-definition television images is the cathode-ray tube. This is used in the receiver, shown in Fig. 1, being supported in a horizontal position in the top compartment so that the pictures can be built up on the front fluorescent screen. The set shown has an actual image portrayed on the screen, the size being 8ins. wide by 6ins. high, while the colour is almost black and white.

The picture on tubes of this nature (specially developed for television purposes) is sufficiently brilliant to be seen in any ordinary room with normal lighting, although obviously the effect is improved by dimming the illumination. A control is available for varying picture contrast to suit individual taste, while another adjusts the average brilliance.

In Fig. 3 is illustrated another form of the same type of set, giving a 12in. by 9in. picture with the cathode-ray tube mounted vertically, while the two sets for sound and vision are housed in the one cabinet.

Another Method

In some cases, especially when the cathode-ray tube is of a much larger size to give an increase in image area dimensions, it is found more convenient to mount the cathode-ray tube in a vertical position. The scheme is shown by the cut-out pictorial diagram of Fig. 2. The electrode system is near the base of the cabinet, while the belled out screen end of the glass bulb is held in a frame at the top. When not in use the cabinet lid is closed, but for reception purposes the hinged lid is raised 45 degrees so that a view of the top of the tube can be seen in a mirror held in the lid recess by anyone seated in front of the apparatus.

Fig. 1.—A Baird compound vision and sound receiver employing a cathode-ray tube.

When the set is tuned in, the image formed on the screen is seen as a reflection in the mirror.

Auxiliary Equipment.

So far we have dealt with the transmitting medium, the dual sets and the cathode-ray tube, but a reference must now be made to what can be regarded as auxiliary equipment. In passing, however, bear in mind that since the sound transmitted suffers no artificial frequency cut off, such as of necessity is imposed on broadcast transmissions, it is possible to obtain quite undistorted reproduction provided that the loud-speaker used is capable of responding to the high frequencies involved.

Reverting now to the cathode-ray tube, it must be remembered that an electrical device is required in order to make the end of the electron beam striking the fluorescent screen scan across its area in a manner identical to that being undertaken by electrical or mechanical methods at the transmitting end. This equipment is known as a double time base.

Essentially, it is an electrical circuit which produces a progressively-increasing electrostatic or electromagnetic field under the influence of which the electrons (negatively charged particles) move, say, from right to left. This gives a visible trace as a horizontal line on the tube's screen, and at the end of this scan the circuit is "triggered" so that the field collapses and the beam flies back to the other side. This process is repeated and continues all the time reception is being undertaken, the triggering effect being controlled to take place at the correct instant by the incoming high frequency synchronising impulse.

At the same time as this left to right scan is working, a second triggered circuit causes the beam to move from the top to the bottom of the scanned area and at a predetermined moment flies back to the initial position to start all over again. This is the low frequency scan which depends on the picture repetition frequency (25 in the proposed service) while the high frequency is controlled by the degree of definition in the picture (6,000 in the proposed service). Finally, we have the power packs to supply the requisite accelerating and focusing voltages to the appropriate tube electrodes. Here we are concerned with relatively high voltages but infinitesimal currents, so the word "power" is rather of a misnomer. In any case, the whole of the equipment once installed needs no further adjustments.

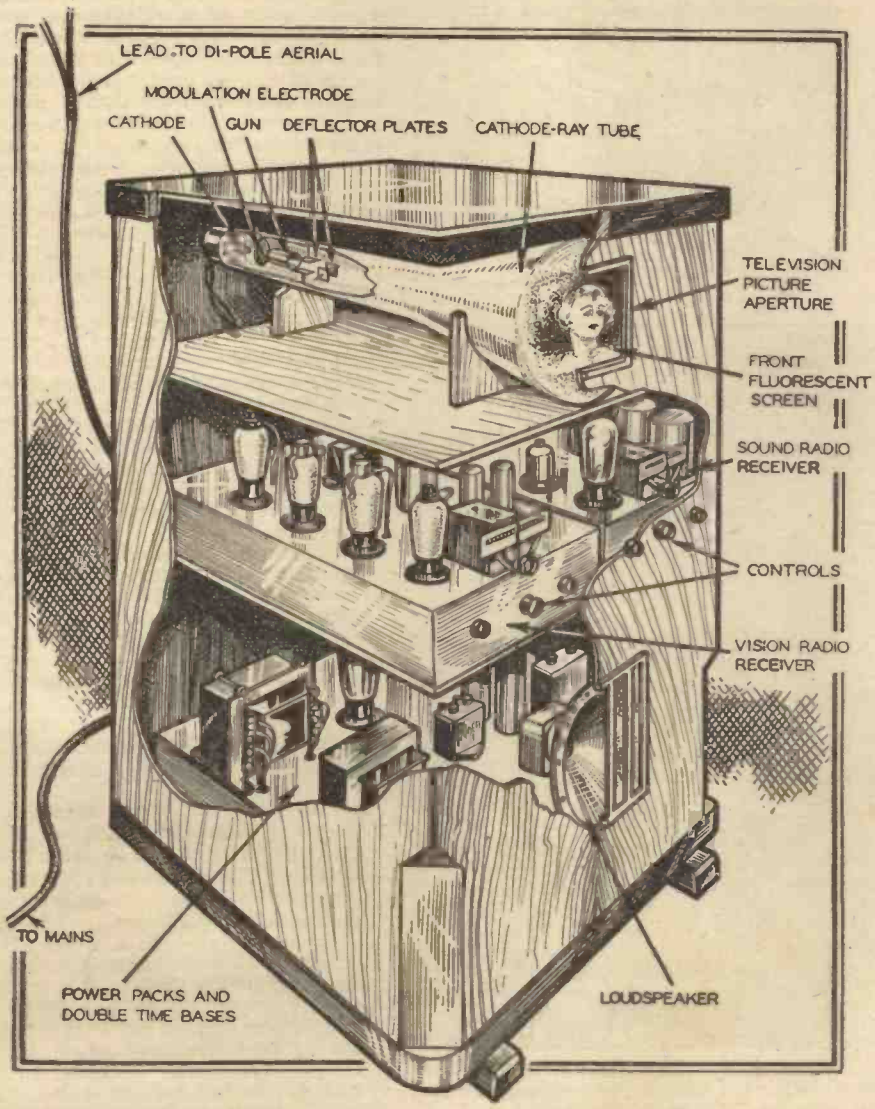


Fig. 4.—A pictorial sketch of a complete cathode-ray tube receiver, showing the internal construction.

IMPROVING THE PORTABLE

Some Useful Refinements and Methods of Adapting a Portable Receiver so as to Increase Its Range of Usefulness. By W. J. DELANEY

THOUSANDS of listeners rely, for their broadcast entertainment, upon the portable type of receiver. The reason for this is to be found in the fact that it functions satisfactorily without an external aerial or earth, and that it may be transported easily from room to room. Transportability is the main feature underlying the design of this type of receiver, and consequently the usual aerial and earth have to be discarded in its design. As probably every listener knows, the signals are picked up by a winding of wire arranged inside the portable cabinet, and in addition

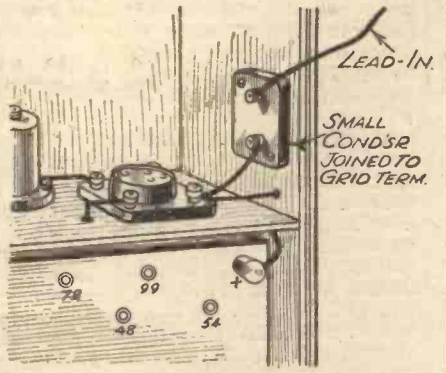


Fig. 1.—An external aerial may be added to the portable by connecting a low-capacity condenser to the first grid terminal. A pre-set condenser will prove a useful substitute for the fixed condenser shown in the sketch.

to its function as a "frame" aerial, this also has to act as the first tuned circuit. It cannot, therefore, in any form of modification be disposed of without connecting a coil in its place.

Frame-Aerial Limitations

There are two main limitations to the small frame aerial. Firstly, it will only "pick up" fairly powerful signals; and secondly, it will only respond to signals which are coming from a certain direction. The first-mentioned limitation renders it necessary to employ a larger number of valves for a given range than would be required if an external aerial were used, whilst the second point renders it necessary to turn the receiver about in order to hear various stations. Bearing these two points in mind, how can the user of a portable obtain better results? Firstly, he can make use of a normal external aerial and/or earth; secondly, he can adopt some indicating device to enable him to ascertain the correct direction in which to turn the receiver for a given station; and, thirdly, he can modify the internal arrangement of the parts or circuit in order to bring an old receiver up to date.

Using an External Aerial

Dealing with these points in the order given, the first obvious improvement is to make use of an external aerial of orthodox design in order to increase the range of the receiver. The aerial should be erected with all the care that would be expended over the erection of an aerial for a normal receiver, and the usual attention should be paid to insulation, etc. To attach the lead-in to the receiver, there are two alternative methods, and these are illustrated in Figs. 1 and 2. In the first method, a small condenser having a value up to .0003 mfd. is joined to the grid terminal of the first valve-holder, and the lead-in is attached to the remaining terminal of the condenser. If a pre-set type of condenser is used, it may be adjusted to provide the required degree of selectivity, and thus it should be mounted so that it may be adjusted without removing the back or other part of the receiver.

The second method is to use a loose-coupled winding, consisting of four or five turns of wire, wound round the cabinet immediately over the internal winding, with terminals attached to a small piece of insulating material and joined to the ends of this winding. The aerial should be joined to one of these terminals, and the earth to the remaining terminal. If the first method is employed, the earth should be joined to the negative (—) terminal on the L.T. accumulator.

Loss of Directional Property

The attachment of an external aerial will remove the directional property of the self-contained aerial, and thus it will not be necessary to turn the receiver about for different stations. It was mentioned

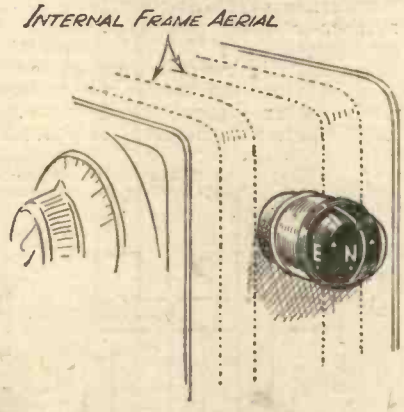


Fig. 3.—To assist in accurately orientating the portable, a compass is invaluable. In this illustration the novel suction-grip Heayberd accessory is shown in position over the internal aerial indicated by the broken lines.

in the opening paragraphs that one of the limitations of the portable is the small amount of energy which is picked up, and to overcome this the circuit employed generally makes use of a large amount of H.F. amplification, and it becomes unnecessary to adopt sharply-tuned or selective circuits, owing to the directional property of the aerial. Therefore, the use of the external aerial may very probably introduce trouble owing to the flat tuning of the various circuits, and a certain amount of care will be necessary in choosing the size of the aerial, and of the coupling condenser or winding. Owing to the intricacy of design of the average portable, it is unwise to attempt to modify the H.F. side of the circuit.

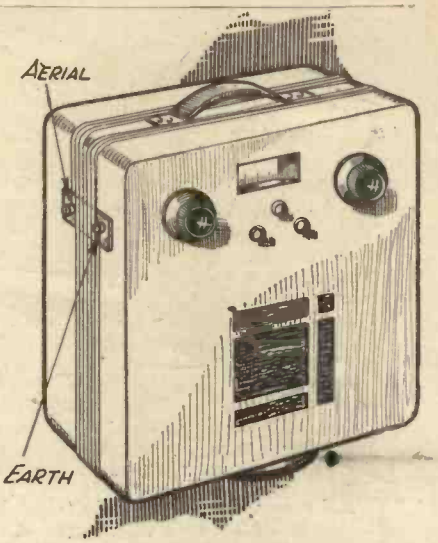


Fig. 2.—An alternative method of adding an external aerial is to wind a few turns of wire round the framework of the portable and to provide two terminals on an insulated block for aerial and earth.

A Useful Direction Finder

When the portable is used in its normal condition, it is of great assistance in the location of a weak transmission if the exact direction of the station is known, so that the whole of the operator's attention may be concentrated upon accurate tuning. For this purpose you require a fairly large-scale map of Europe and a small device which was recently introduced by Messrs. Heayberd for the use of motorists. This consists of a small compass fitted with a rubber suction cap, by means of which it may readily be attached to the portable cabinet. It must be affixed to the side of the cabinet across which passes the frame, and this point is indicated in Fig. 3, where a typical receiver is shown with the frame indicated by broken lines. Upon the map mark your own location as accurately as possible, and then when a desired station is required it is a simple matter to lay a rule or other straight-edge on the map and ascertain the direction in which the station lies. The portable should then be rotated until the required direction is seen behind the vertical line on the front of the compass, and you have a reasonable certainty of being able to hear the station if it is within range of the receiver.

The majority of portables are provided with a turn-table on the base, but where such a device is not fitted one can be

(Continued on page 840)

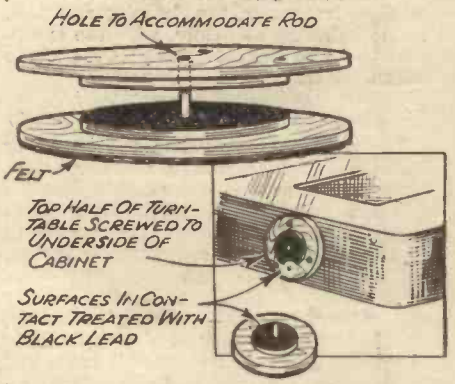
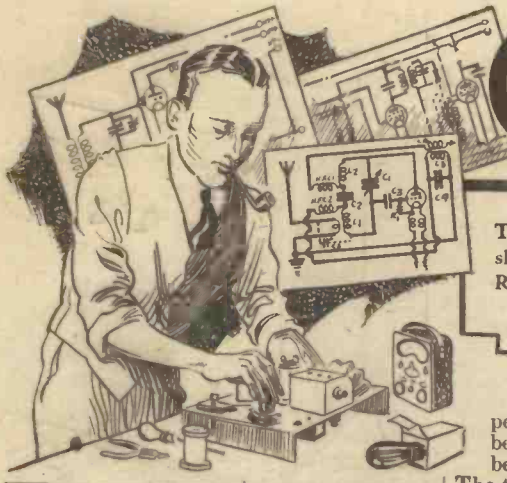


Fig. 4.—A simple but effective turntable may be constructed from four discs of plywood and a piece of dowel rod as shown here. Note the black lead to reduce friction, and the felt at the bottom to prevent damage to tables or other surfaces.



CIRCUITS AND SETS FOR ALL

The Circuit Described is for an Ultra-short-wave Converter Suitable for Reception on Wavelengths Below 12 metres.

THE recent developments in television have shown that ultra-short waves are essential for the transmission of vision programmes of the high-definition kind. It is also certain that there will shortly be television programmes transmitted on wavelengths below 10 metres, and for this reason every constructor and experimenter will naturally wish to build in advance some kind of receiver that will be suitable for use when those programmes commence. Readers will no doubt remember that the Television Committee reported that a complete sound-vision receiver would, at first, cost between £50 and £80, but the constructor will naturally be able to indulge in looking-in for a much smaller expenditure than this.

For Use with S.G. Receivers

Eventually, it will almost certainly become desirable to have two receivers, one for sound and another for vision, but in the early stages the average amateur will be quite content to receive the vision separately, if only for experimental purposes. The first question that besets him is in connection with how a reliable ultra-short-wave set can be built for a minimum of expenditure. And it is fairly obvious that the simplest method is to build an adaptor or converter for use in conjunction with the existing broadcast receiver. Of the two types of "add-on" units the converter is to be preferred. As most readers are aware, the object of a converter is to change an existing "straight" broadcast receiver into a short-wave superheterodyne, and for this to be possible the receiver must be provided with at least one stage of high-frequency amplification. The H.F. amplifier then functions at intermediate frequency, the detector and L.F. stages behaving as before, with the exception that the detector really becomes the second detector.

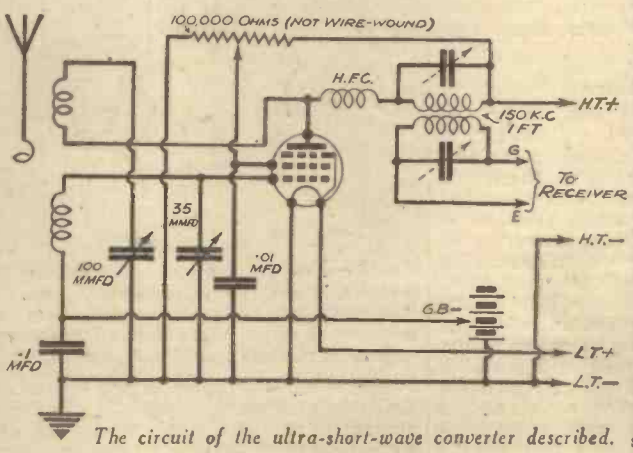
Simple Frequency Changing

The single valve used in the converter functions as a frequency changer or, in other words, as a combined first detector and oscillator. On the broadcast bands it is generally necessary to employ a pentagrid or similar valve for frequency changing, but on short waves an ordinary triode, S.G., or H.F. pentode valve is perfectly satisfactory. A simple, though effective, circuit for a converter of the type under discussion is reproduced on this page, and it will be seen that the arrangement differs only slightly from that employed for an ordinary short-wave converter. The main difference is that the aerial coupling coil is "open-ended"; that is, it is not connected at its lower end.

The valve actually used is an H.F. pentode, and it operates on the anode-bend system, this generally proving better on the very short wavelengths. The tuning and reaction circuits are pretty much as usual, but the condensers used in these circuits are naturally of very low value, that used for tuning having a maximum capacity of 35 m.mfds., and the reaction condenser having a capacity of 100 m.mfds. Both of these condensers may be Eddystone "Microdensers," although for experimental purposes it is quite permissible to use a pair of good neutrodyne condensers. The difficulty when using the latter is that the set cannot be calibrated, although it will be just as satisfactory for the reception of occasional transmissions such as are made by several amateurs on about 5 metres. The condensers will also be perfectly satisfactory for the reception of a single television transmission.

150 Kc. I.F.

The anode circuit of the valve is rather different from that generally employed for a short-wave converter, since an I.F. transformer is used in place of the customary medium- and long-wave H.F. choke. The arrangement used is more satisfactory, although it does make it necessary to make a slight alteration to the wiring of the receiver when the converter is in use. As to the I.F. transformer itself, this should be tuned to a fairly high intermediate frequency, and the Colvern 150-kc. component is advised.



The circuit of the ultra-short-wave converter described.

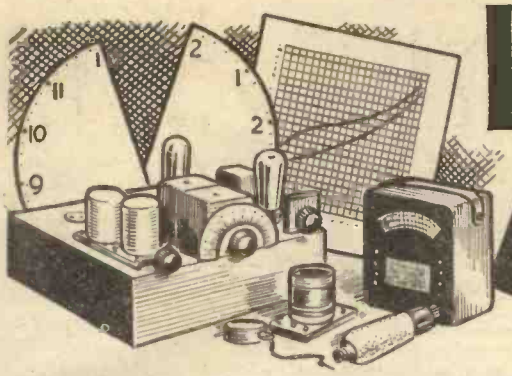
In order to connect the converter to the first (H.F.) valve of the receiver the two leads from the grid winding of the first coil should be disconnected, and the corresponding connections from the secondary winding of the I.F. transformer joined to grid and earth respectively. When the first valve is of the variable-mu type one end of the secondary will, of course, be joined to the volume-control potentiometer instead of directly to earth. It will be evident that the variable condenser normally used to tune the high-frequency valve must also be disconnected, since the secondary of the I.F. transformer is pre-tuned by means of a semi-variable condenser attached to it.

The Principal Components

Contrary to what has been the general practice in this series of articles, it is not proposed to give a complete list of the parts required, but rather to leave the choice to the constructor, who will be able to make use of many parts that happen to be on hand. A few notes are perhaps desirable, however, especially in connection with the coils. Those can be obtained as a complete set (wound with copper tubing) from Eddystone; they are supplied complete with stand, which holds them well clear of the baseboard or chassis, in two interchangeable types. One set is for wavelengths between approximately 4.5 and 6.5 metres, and the other is for wavelengths between about 8 and 11 metres. Alternatively, an experimental coil can be made by winding 16-gauge tinned copper wire on a 1in. paxolin tube. About four turns will be required for the grid winding, and three for reaction, whilst the aerial coupler should consist of a single turn. Each of the three windings should be separated from its neighbour by about ⅛in., and the turns must be made quite rigid by keeping the wire as taut as possible while winding. In winding, the individual turns should be kept about ⅛in. apart.

The valve-holder should be of the special low-loss short-wave type, and should preferably be mounted on supports such as are supplied by many firms for the purpose. Two fixed condensers are required, and both of these should be non-inductive and of good make. The H.F. choke must be of suitable type for under-10-metre working and can, if desired, be made by winding 25 turns of 24-gauge d.c.c. wire on a ¼in. diameter paxolin tube; the turns should be spaced by winding a length of stout linen thread on the former along with the wire.

It is scarcely necessary to point out that when the converter is in use the tuning circuits of the receiver must be adjusted to the same wavelength as that to which the I.F. transformer is tuned—2,000 metres—but the optimum tuning position can easily be found by trial. In many respects it might be better to employ an intermediate frequency of 450 kc. or so, but this is impracticable, because the average broadcast receiver will not tune to 450 kc. (approx. 700 metres).



HALF-HOUR EXPERIMENTS

By FRANK PRESTON

A Number of Interesting Experiments in Connection with Tone Control are Described in this Eleventh Article of the Series

IN the first article of this series the question of tone control was touched upon, and methods of applying tone control to the loud-speaker were explained and illustrated. As was pointed out in that article, the idea of controlling or correcting the tone between the output terminals of the receiver and the speaker is not the best, although it is frequently most convenient. It is actually far more satisfactory to apply the control at an earlier stage in the set, since it then has a more pronounced effect, and the losses introduced are not so great. The latter

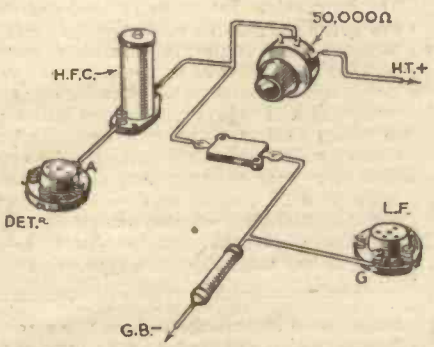


Fig. 1.—A simple, though not very good system of tone control. The anode-coupling resistance is variable, so that the anode load may be changed.

point may not be quite clear until it is pointed out that when tone control is applied in the output circuit of the receiver a portion of the amplified signal current is wasted. On the other hand, if correction or control comes before the L.F. amplifier, only the "useful" portion of the signal energy is amplified.

Pre-L.F. Tone Control

There is still another point, which is that a smaller change in the circuit characteristics is required in the pre-L.F. stages to bring about any particular change in the tone of reproduction. It follows from this that if a considerable amount of correction is required, it can only be obtained by dealing with the circuits prior to the L.F. amplifier.

It is not always realised, although it is perfectly true, that the pitch, or tone, of loud-speaker reproduction can be modified by altering the constants in practically any one of the receiver stages. That is, by making changes in the high-frequency, detector, or low-frequency circuits. As an example of this, just try the effect of disconnecting the earth lead and using a short length of wire for an aerial. This will considerably sharpen the tuning of the aerial circuit and—provided that the reduced "damping" does not cause the set to fall into oscillation—it will be noticed that reproduction becomes much lower pitched. The reason for this is that, as the tuning is sharpened, there is a certain amount of attenuation of the higher frequencies, or in other words, that the side-bands are "cut."

In the Detector Circuit

There are various methods of modifying the tone by altering the detector circuit, and one of the simplest is by changing the impedance of the anode circuit. Thus, if resistance-capacity coupling is used between the detector and the following L.F. valve a certain measure of tone control can be effected by using a variable resistance in place of the fixed one connected in the anode circuit; the idea is illustrated in Fig. 1. The value of the resistance for use with the average detector valve should be about 50,000 ohms, or appreciably higher than the optimum load (approximately twice the A.C. impedance of the valve). As the value of the resistance is varied from maximum to minimum, it will be noticed that reproduction gradually becomes higher pitched. This is by no means a satisfactory method

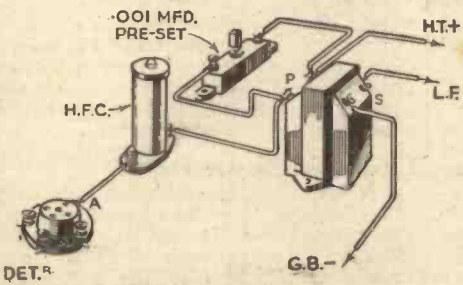


Fig. 2.—Another simple method of tone control applied to the detector anode circuit.

of tone control in other than superhet circuits, because the alteration in the resistance affects the control of reaction.

A simpler and more effective arrangement, and also one that may be applied whether resistance capacity or transformer coupling is employed, is that shown in Fig. 2. Here a .001-mfd. pre-set condenser is wired in parallel with the anode-circuit "load" (resistance, choke, or transformer primary). As the capacity of this condenser is increased the pitch of reproduction will be lowered; the reason for this is that the condenser will allow the higher frequencies to "leak away," although the lower notes will not be affected. A better method, due to the fact that the control is more easily manipulated, is to replace the pre-set condenser by a fixed one of about .005 mfd., and to include a 50,000-ohm variable resistance in series with this. The function of the two components in series is just the same as that of the pre-set condenser, except that a wider variation is possible. The condenser acts as a resistance to high-frequency currents, the resistance being lower to higher frequencies. Actually, the resistance—"impedance" is a more correct word—of a .005-mfd. condenser to frequencies of 6,000 cycles per second (equivalent to the first harmonic of the top note of the clarinet) is 5,000 ohms, whilst its resistance to frequencies of 150 cycles (about

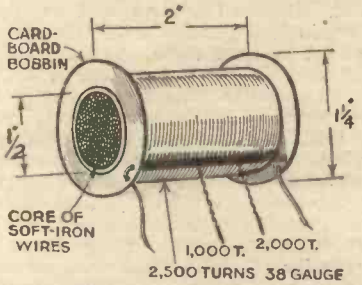


Fig. 4.—Showing how the T.C. choke shown in Fig. 3 can easily be made.

the average male-speaking voice) is about 200,000 ohms.

Raising the Pitch

It will be seen from what has been written that it is a very simple matter to *lower* the tone of reproduction, but it is rather a different matter when one wishes to *raise* the pitch. Nevertheless, this is possible by making use of the opposite effects to those produced by a condenser. It has been stated that the impedance of a condenser is inversely proportional to the frequency, and it should be added that the impedance of a choke coil is proportional to frequency. This was pointed out in the previous article on tone control to which reference has been made above, and it might be added that the impedance of a 2-henry iron-cored

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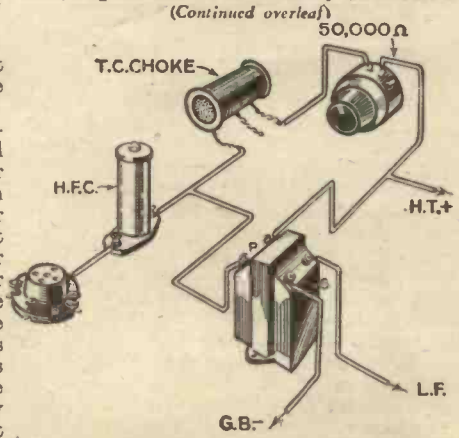


Fig. 3.—By using an iron-cored choke connected as shown here, the pitch of reproduction can be raised.

(Continued from previous page)

choke to frequencies of 6,000 cycles per second is approximately 70,000 ohms, whilst the impedance of the same choke to frequencies of 150 cycles is 1,800 ohms—negligible by comparison. A tone-control choke for use in the position shown in Fig. 3 can be made exactly as was described in the first article of this series, but by using a total of 2,500 turns, with tappings after the 1,000th and 2,000th turns. To save readers the trouble of looking up their back numbers constructional details are shown in Fig. 4.

"Two-way" Control

So as to combine the two opposite methods of tone control described, it is only necessary to use the choke and fixed condenser in conjunction with a 100,000 ohm potentiometer connected as shown in Fig. 5. This is, as a matter of fact, the method that is employed in connection with certain tone-control transformers on the market, and it serves to give a continuous variation from low to high pitch. The system can be adapted equally well, whether the inter-valve coupling component consists of a resistance or the primary winding of a transformer, and it is just as effective if a transformer is resistance fed. It should also be added that if pick-up terminals are included in the grid circuit of the detector valve, the control will also be operative on gramophone reproduction.

In order to obtain the exactly correct degree of control for any particular receiver, it will be desirable to try alternative tappings on the choke, and also to experiment with condensers of different capacity.

An entirely different method of lowering the pitch of reproduction is to connect a variable condenser having a maximum capacity of about .0005 mfd. between the grid of the first L.F. valve and earth. This arrangement is particularly good when a pentode is used in the L.F. stage, since this type of valve always tends to give emphasis to the higher frequencies. For this reason it is frequently unnecessary to have a "two-way" tone control because the average between high- and low-pitched reproduction is obtained with the vanes of the variable condenser partly meshed. In consequence, the condenser serves to raise or lower the pitch as desired.

Using a Separate Valve for Tone Correction

It occasionally happens, when an extremely selective tuning arrangement is employed, that an insufficient degree of correction cannot be obtained by employing one of the methods described, without introducing too great a loss in signal strength. (It should be made quite clear that all normal methods of tone control function due to the fact that they reduce the degree of amplification at one end of the audio range, and not because they increase amplification at the other end. Thus, when the pitch is lowered, it is because the higher frequencies are reduced in intensity, and *vice versa*.) When this is the case, it is generally desirable to employ an additional valve especially for the purpose of tone correction, and this is often done in connection with the line amplifiers used by the B.B.C. when relaying programmes. The connections for such an additional valve are given in Fig. 6, where it will be seen that an L.F. coupling condenser of only .0003 mfd. is used, and this is shunted by a 1-megohm variable resistance. It will be seen that a .1 mfd. condenser is also wired in series between the anode of the tone-control valve and the following L.F. valve, but this merely acts as a "stopper" between H.T.+ and H.T.—. Values are not assigned to the anode-coupling resistance and L.F. grid leak, but these are the same as are normally employed.

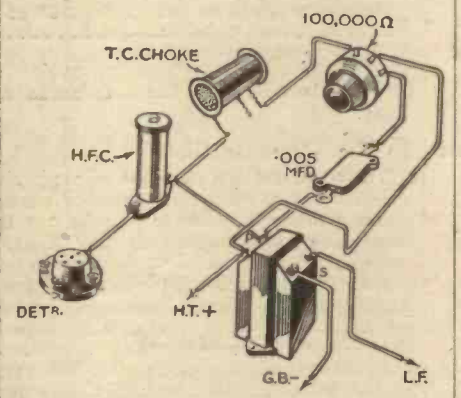


Fig. 5.—The connections for a "two-way" tone control used in the detector anode circuit.

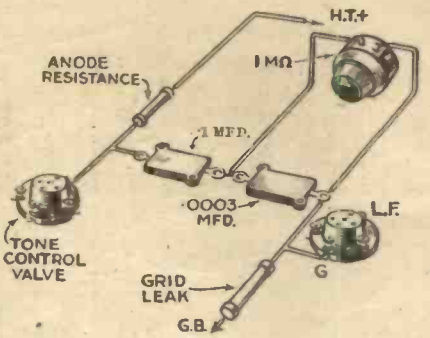


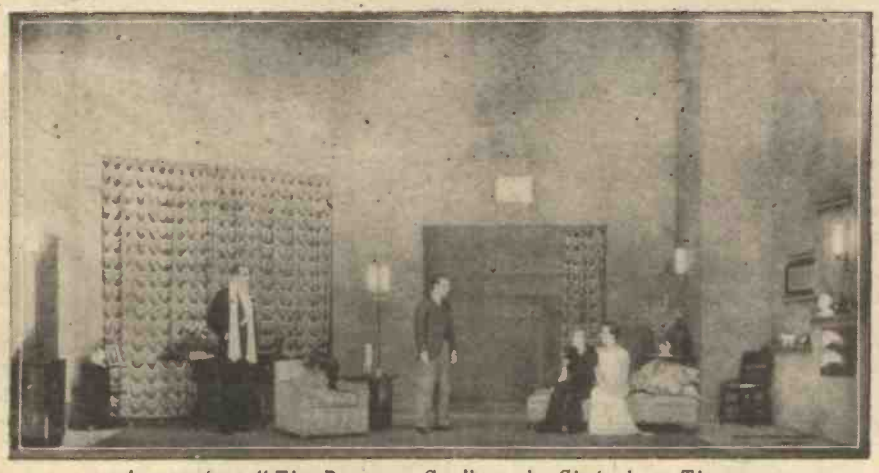
Fig. 6.—A method of using a special valve for tone control when extremely sharply-tuned tuning circuits are employed.

RANDOM JOTTINGS

"The Dominant Sex"

THE illustration below shows the all-electric house in "The Dominant Sex," a play by Michael Egan, at the Shaftesbury Theatre, a scene from which was recently broadcast by the B.B.C. Michael Egan has been a writer on electrical and wireless subjects for many years, and is the author of "The Complete Wireless," "The All-Electric Home," etc.

"The Dominant Sex" has been hailed as the most brilliant comedy of recent years. The central character is a young farmer whose ambition it is to own a modern all-electric farm while his wife's ambition is to own an all-electric house. For a first play by a new playwright, "The Dominant Sex" has scored a phenomenal success. Within a week of its production at the Shaftesbury the foreign rights were sold for the whole of Central Europe, Norway, Sweden, Denmark, and Holland. A tour has already left for Australia, and the company are rehearsing the play on board ship.



A scene from "The Dominant Sex" at the Shaftesbury Theatre.

Exide Manchester Dance

AN Exide dance and cabaret will be held at the Manchester Limited Restaurant, Cross Street, Manchester, on Monday, March 4th, from 8 p.m. to 2 a.m. Prominent members of the motor and radio trade in and around Manchester will attend, and it is expected that four to five hundred people will be present.

An attractive cabaret has been arranged, and will include the famous dancers, Dawnya and Petrov. A few tickets are available at 3s. 6d. each, and may be obtained from Exide Batteries, 18/22, Bridge Street, Manchester.

B.B.C. Orchestra to Visit Brussels

ON March 12th a musical event of great importance and significance occurs in the musical history of the B.B.C. The B.B.C. Orchestra will pay its first Continental visit to Brussels for a concert under the baton of Dr. Boult at le Palais des Beaux-Arts. It is safe to claim that broadcasts by the B.B.C. Orchestra are as familiar to musical listeners of the near Continental countries as to the British audience. The unmusical Englishman is an old joke on the Continent, and the visit of the largest orchestra in the world from Great Britain should add considerably to the prestige of British music abroad. There is a further point, that this visit is possibly the forerunner of future Continental tours by the B.B.C. Symphony Orchestra. Great interest in the visit is already evident in Brussels. Especially is this so because the concert-going habit of the public is very strong in Belgium, which receives visits from some of the most famous orchestras of the world, including the Berlin Philharmonic, the New York Philharmonic, the Gewandhaus de Leipzig, L'Orchestre du Conservatoire de Paris, and the Concertgebouw of Amsterdam. It is the first time that a British orchestra of such standing has performed on the Continent.

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PLANNING THE OUTPUT STAGE—1

In this Article the Author Describes the Working Conditions of Various Output Valves Used in All-mains and Battery-operated Sets.

WHILE no single feature can be considered the limiting factor in designing a home-constructed receiver, or in selecting a commercially-made set, it is significant that it is possible to design half a dozen or more sets on identical lines, the only difference between them being in the choice of the last valve.

The three main factors governing the selection of any particular type of output stage are first, volume; second, quality; and third, economy. These three, however, are intimately inter-connected and must, therefore, be considered both individually and in conjunction. Perhaps the best way of tackling the problem would be to consider first what we must understand by volume, quality, and economy; then the characteristics of the different types of output valve available; and, finally, how to make the best choice to meet individual requirements.

The Lissen New Process H.T. battery.

The Question of Volume

Obviously, a loud-speaker is a power-operated instrument, and the volume of sound produced will depend partly upon the amount of audio-frequency power fed to it by the output valve, and partly upon the sensitivity of the speaker, *i.e.*, the efficiency with which it converts the electrical energy into sound energy.

With a given speaker, therefore, volume is dependent upon the power output of the receiver—electrical power at audio-frequency delivered by the last valve. Electrical power, as most listeners know, is measured in watts, and as a general guide it may be mentioned that an output of about 50 milliwatts or 1/20th of a watt, fed to a speaker of average sensitivity, will produce the minimum volume of sound for comfortable listening in a small room.

In addition, it must be understood that 50 milliwatts must represent the audio-frequency output during the quietest part of a programme, and the output stage must be able to deliver at least three or four times this amount of power during loud passages of music. It would therefore appear that a valve capable of giving about 150 milliwatts output is the smallest which would be satisfactory for a receiver used in a small room, and that a substantially greater output is necessary for really good volume.

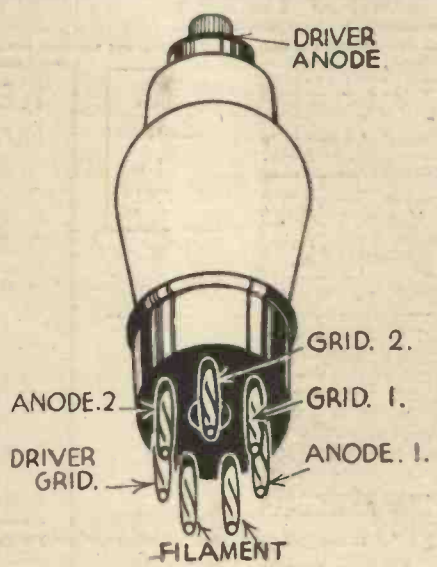
As a matter of fact, 150 milliwatts is approximately the amount of power which the smallest type of battery output valve will give with reasonably good quality. It will be shown later that a valve capable of a maximum undistorted output of about 3 watts is none too large for normal listening where good quality is required, although the power drawn from the set during the bulk of the programme time may not average more than from ¼ to ½ a watt.

Quality

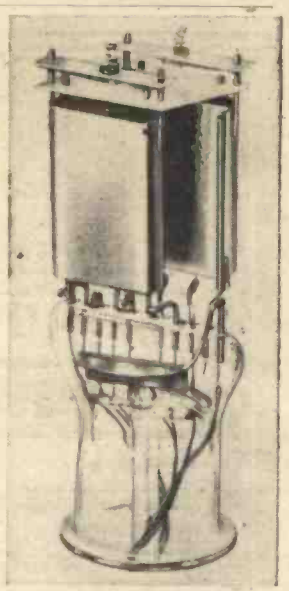
A given output valve, correctly biased, and fed with a signal of the maximum strength it is designed to handle, and feeding an external circuit of "optimum" impedance, will deliver a definite amount of power free from serious distortion. If a stronger signal is applied distortion will be introduced. Now the audio-frequency signal (or what is known as the depth of modulation of the radio-frequency carrier wave) varies throughout every programme in accordance with the nature and varying degree of loudness of the items broadcast. Thus, there are soft passages and loud passages in every piece of music, and modulation depth follows these changes.

It is obvious, therefore, that for reasonably undistorted reproduction the output valve must not only be capable of giving an amount of power corresponding to the desirable volume level of the softest portions of the programme, but it must also be capable of producing the augmented output corresponding to the loudest portions of the programme without introducing serious distortion. Experience shows that for reasonable quality the maximum output rating of a valve should be at least five times the output required at average modulation.

Allowing for the fact that occasionally, such as for dancing, volume may be required to be considerably in excess of normal, a maximum output rating of 3 watts is a suitable figure for reasonably good reproduction, while up to twice that amount will permit of really excellent quality.



This sketch shows the connections for a driver and Class B valve.



Showing the interior construction of a Class B valve.

Economy

The power utilised for operating the loud-speaker is derived, *via* the output valve, from the high-tension supply. The maximum theoretical efficiency of a normal or Class "A" output valve, when fully loaded and working under optimum conditions, is 50 per cent., which means that a valve capable of giving 3 watts undistorted output must draw at least 6 watts from the high-tension supply. In practice, for reasonably undistorted output, the efficiency under actual working conditions is much less, 25 per cent. being a good average figure for A.C. mains valves, and a still lower value for battery valves.

In the case of mains operation, current is comparatively cheap, and an output valve having a dissipation of 8 or 12 watts, corresponding to an undistorted output of from 2½ to 3½ watts, is not an extravagance from the current consumption point of view. A 4 or 5 valve mains set using such an output valve will consume, altogether, only about as much current as a single 60-watt lamp.

But with a battery set things are different. Power obtained from high-tension batteries is expensive, and the total high-tension drain must, therefore, be kept as small as possible. It is not really an economical proposition to allocate more than 1 or 1½ watts for the dissipation of the output valve if dry high-tension batteries are used, and this means a maximum undistorted output of the order of 150 to 300 milliwatts.

As already pointed out, a considerably greater maximum output is required for enjoyable listening, and ways and means have been made available for obtaining a reasonably large undistorted output. One way, of course, is to use a battery eliminator in place of dry high-tension batteries. As an alternative to this, Class "B" or Q.P.P. output may be employed, both of which are devices whereby the necessary large maximum output is obtainable without undue extravagance in high-tension current. This brings us immediately to the question of the various types of output valve available.

Types of Output Valve

Output valves may be divided into two distinct classes—the so-called Class "A" valves, which include both triode and

(Continued on page 837)

On Your Wavelength

by Thermion

Radio and "The Other Side"

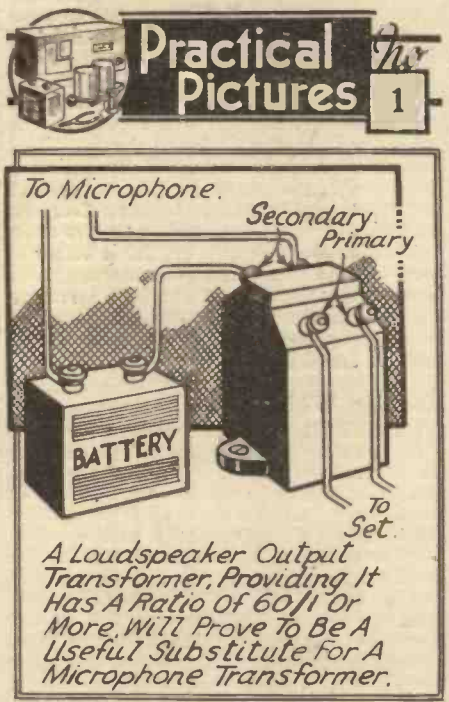
APROPOS my recent note about spiritualism, I am glad to have received so many letters in support of my views. As was to be expected on so controversial a subject, there were one or two dissentients and (I hate to have to say it) they seemed to me to have been inspired letters, for I notice that one of the letters I received was also reproduced in another journal which a reader sent to me. Now I always like to receive letters of criticism from readers who may disagree with my views (I cannot always be right), but I do not like inspired letters. One particular reader says that because of my paragraph he had cancelled his order. Our correspondence columns prove that this journal has never been afraid to publish criticisms and other points of view, and if the continuation of this particular reader's purchase of the paper depends upon every article being designed to agree with his points of view then I must bow to the inevitable and lose a reader. I cannot undertake to express opinions with which every reader will agree. No paper has ever done so. I doubt very much whether this particular letter was received from a regular reader. It was rather an artificial display of righteous indignation which some people adopt to disarm too shrewd a criticism. I do not like radio and spiritualism linked. More, I preserve a perfectly open mind on the genuineness of so-called spirit mediums. But I am as yet among the ranks of the unconvinced. As such, I am entitled to my point of view. I have always been a fearless journalist and shall remain so, notwithstanding inspired letters from followers of the spiritualist cult. In my opinion radio has nothing whatever to do with spirits, and it is also my opinion (notwithstanding some easily-faked spirit photographs and séances, with comic electrical apparatus intended to snare the unwary and ignorant) that a large amount of so-called spiritualism is tripe and onions! Spiritualists will, of course, pity my ignorance as much as I sometimes pity theirs!

Another Critic

I WROTE a paragraph on page 750 of our issue dated February 9th entitled "Cheaper Batteries." A Nottingham correspondent takes me to task regarding this. He says that H.T. batteries costing 22s. 6d. will not give 25 m.a. for three months and that I know that they will not! My dear reader, I know nothing of the sort. When I pay 22s. 6d. for an H.T. battery I *expect* to get 25 m.a. from it for a considerable period, and *do*! This correspondent also takes me to task for my paragraph in the same column of the same issue dealing with cheaper home construction. He says, "This is utter tosh. Can Thermion give me for £8 10s. something equal to a receiver costing £16 10s.? Can he give me A.C./D.C. similar to a commercial receiver costing £5 10s.? No, sir, the manufacturers do not give us the same transformers that cost 25s. for 6s. 6d., because their tools cost has been more than covered, but an entirely different type of transformer." The answer to the first part of the last sentence is yes, and this journal has done it many times. I would much rather have a sound hand-made job than a lot of skeletonised clutter, attractively and beguilingly camouflaged in a cellulose-sprayed cabinet of the veneered variety—2s. 6d. down and the balance at 5s. a month.

Insanity Capitalised

NOW and again I receive requests from readers who are anxious to enter the radio profession, in the belief that fortunes are to be made. There is still bags of room for live, trained people with initiative, enterprise, and technical knowledge, for the time has come when those who gate-crashed into the industry in the early days, knowing nothing of the subject, are being replaced by trained technicians. All the same, I sometimes muse on the fact that people who do the insanest things can make fortunes. Take crooners. Take them as far away from me as possible. All they have to do is to sing to themselves, substitute boo, boo, boo for the words and



chime in the rhyming words at the end of each line. Thus:—

"Boo, boo, boo, true.
Boo, boo, boo, boo, you.
Boo, boo, boo, love,
Boo, boo, boo, boo, above.
Boo, boo, boo, boo, shine,
Boo, boo, boo, boo, mine."

Add boo, boo, boos *ad lib* and to taste. Whilst hundreds of dance band crooners can make fortunes out of this sort of thing I wonder that anyone wishes to enter the radio industry.

A Television Exhibition

I LEARN that a Burton reader has constructed a portable television and telephotography apparatus which he has mounted on a hand truck. He has planned a walking tour of Burton, Ashby, Swadlingcote, and Donnisthorpe, commencing next Easter, and spending a day at each of the places visited. He will exhibit two television sets, one for battery or mains working to be added to present-day valve receiving sets, whilst the second is a four-valve all-mains complete short-wave television and sound receiver. Mr. Fred Edwards is the reader concerned and his address is Fairhaven, Castle Gresley. Perhaps local readers would like to get into touch with him.

Austrian Honour for Marchese Marconi

MARCHESE MARCONI has been awarded the Wilhelm Exner Medal given annually by the Austrian Association of Commerce and Industry to "persons who by their scientific work have given special increase to industrial production." The Wilhelm Exner Medal is recognised as one of the major Austrian scientific distinctions, and this is the first time that it has been awarded to a non-German-speaking scientist.

Founded in 1839, the Austrian Association of Commerce and Industry is principally concerned with furthering the application of scientific advances to industry and trade, and the medal and accompanying diploma, which is the Society's award of honour, was instituted in memory of Dr. Wilhelm Exner, a pioneer of applied science in Austria.

High- or Low-Definition Television

REGARDING the Report of the Television Committee, a well-known member of the television industry recently stated that he was entirely in agreement with the Report in all except one respect; he considered that some provision should have been made to supply the provinces with a low-definition service until the proposed relay stations had been erected. In this respect I heartily agree, and repeat the remarks I made a few weeks ago that I should like to see a continuance of low-definition transmissions, at least for a short time, after the proposed new service comes into being. I fully realise that the images obtained by the older system cannot be compared with those by high definition, but I do think that it would be better to allow those hundreds (there may be thousands) of lookers-in who have bought or built disc and mirror-drum receivers to obtain value from them.

However, it may not yet be too late to suggest to the B.B.C. that they do not forsake the pioneers.

American Relays

AT the time of penning these notes the first of the proposed Saturday afternoon relays of American programmes has not been given, but I am looking forward to sampling it on Saturday, February 16th. The proposal is that an American relay will take place at 4.45 p.m. in this country (11.45 a.m. in New York) of a short and varied programme. The relay will be known as "Five Hours Back," and the reception in this country will be carried out by the B.B.C. receiving station at Tatsfield. Reception will take place on the short waves, and this is probably the first

(Continued overleaf)

(Continued from previous page)

time that reliance has been placed entirely on a short-wave wireless link for relays of this type. From the technical point of view, therefore, the idea offers considerable scope, and the B.B.C. point out that the tests are more in the nature of experiments at the moment, and special programmes are not to be prepared by the National Broadcasting Co. of America, whose programmes are to be re-broadcast. I shall look forward to the transmissions, partly because they will enable me to compare my own humble short-waver with that employed by the B.B.C. engineers.

Light "Television"

I READ that some interesting experiments are being carried out in America with a view to transmitting speech on a beam of light. The experiments are being made on a new U.P. streamlined train, and it appears that the idea is that a narrowly-focused beam of light is directed on to a lens assembly at the receiving end. The light beam is modulated by sound waves at the transmitting end, the light modulations being changed back again into sound at the receiver. I do not know whether the system has any practical possibilities, but it is doubtless extremely interesting from the scientific point of view. It seems as though it *might* provide a means of private wireless communication, but it could obviously be operated only over comparatively short distances and between two fixed points.

Aerials for Short Waves

ARE special aerials necessary for short-wave reception? This is a question that I have been asked times without number during the last few weeks. Personally, I do not consider that they are: it may in some instances be found that somewhat better reception can be obtained by using some special aerial, but for most requirements I find that an ordinary outside aerial, about 50ft. long, including lead-in, is perfectly satisfactory for reception on every wavelength down to 5 or 6 metres. When such an aerial is employed it is obviously necessary to include a very small variable condenser in series with the aerial lead, and this can suitably be adjusted for any particular waveband. It should be found that "dead-spots" can be prevented by choosing the correct series capacity. I have generally found it a good plan to employ a good air-dielectric condenser with a maximum capacity of about .0001 mfd. and fitted with some kind of scale. The latter might be made quite roughly from paper so that it can be "calibrated" for various wavelength ranges. That is, after finding the best setting for any particular range, a mark can be made on the scale to indicate that range.

Of course, for "hot-stuff" reception, and where there is sufficient space available, there is no reason why one of the many special aerials should not prove more satisfactory than a standard broadcast one.

Test Equipment

IT often surprises me to find what a poor stock of test equipment is held by the average experimenter to-day. Twelve years or so ago one could not lay any claim to the title of experimenter unless in possession of at least a couple of voltmeters, one or two milliammeters, and an ammeter, but to-day I suppose there is not one in every score of amateurs who can boast more than a simple milliammeter. Why this should be I am not quite sure, but perhaps it is because modern components are so perfectly satisfactory that it is seldom necessary to test them or to have to measure their characteristics. Nevertheless, I am convinced that every constructor would enjoy his hobby more fully if he were equipped, at least, with a reliable multi-purpose meter suitable for reading current from, say, 5 milliamps. up to 5 amps. in stages, and voltages from 2 to 200. There are many such meters available, and at very low prices, whilst the experimenter can make one for himself if he prefers, by using a reliable milliammeter as a basis.

Notes from the Test Bench

WE receive numerous queries from readers having a domestic 100-volt D.C. supply who wish to increase the voltage to 120 or 150 for efficient operation of modern valves. A motor generator could be used for converting the D.C. to A.C., of course, but these machines are expensive. The additional 20 to 50 volts may very easily be provided by means of a dry H.T. battery or an H.T. accumulator. The negative D.C. main should be connected to the receiver H.T.— terminal in the usual manner, and the D.C. positive main should be joined *via* the smoothing choke to the negative terminal of the battery, the positive terminal of the battery being then connected to receiver H.T.+. The total voltage will then be the D.C. mains voltage plus the battery voltage. If H.T. accumulators are used for this purpose, it will be a very easy matter to provide a double-pole double-throw switch and a dropping resistance, so that the battery may be charged when the receiver is not in use.

D.C. Mains Hum

WHILST on the subject of D.C. mains it might be mentioned that in some cases where excessive hum is experienced better results are obtained when the earth lead is disconnected. This type of hum is due to the existence of a difference of potential between the earth pole of the mains and the earth wire of the set. This difference may be corrected by fitting a resistance network in the mains unit so that the negative point of the receiver can be varied with respect to the negative main until the difference of potential is balanced out. This procedure is unnecessary in most cases, however, as the hum level can be sufficiently reduced, without loss of volume, by disconnecting the receiver earth as mentioned above.

Pick-up Wiring

TROUBLE is often experienced when a pick-up is connected to the detector of a radio receiver. Unless the L.F. amplifier is perfectly stable, the addition of a pick-up will cause howling or motor-boating. This may usually be eliminated by connecting a resistance across the pick-up, but in some cases it is found that screening the pick-up lead is more effective; special screened leads are available for this purpose. When screened leads are used, however, care should be taken to keep the lead from the valve grid to the radiogram switch as short as possible, otherwise the capacity between the earthed screen and the lead itself may seriously affect tuning. When a microphone is used in place of the pick-up, still greater care must be taken if instability is to be avoided, and, if possible, the microphone and speaker should be placed in separate rooms.

A New Television Term

THE renewed interest in television has brought to the fore once more the question of a suitable name to describe either the act of watching a television image or, alternatively, the individual who performs this action. In the case of ordinary broadcasting, the terms which now appear to be employed universally are "listening-in" and "listener" respectively, but on aesthetic grounds objection seems to have been levelled at the corresponding television words of "looking-in" and "looker."

It is really very largely a question of taste, and in this connection it is worthy of note that the Television Committee, in their own report, referred to "lookers." Many regard this as a hard term which is not euphonious, but, unfortunately, the alternatives which have been suggested, including gazer, seer, visualist, teleseer, and so on, seem to be in the same category. No doubt we shall eventually standardise on some term acceptable to the majority.

Wavechange Switches

ON several occasions recently, while handling commercial receivers, my ears have been assailed by indescribable bangs and crashes when the wavechange switch has been operated. Similar trouble has on some occasions been experienced with coil assemblies intended for building into home-made sets. In some cases, the receiver has only been made to work by holding the switch in a midway position between "long" and "medium."

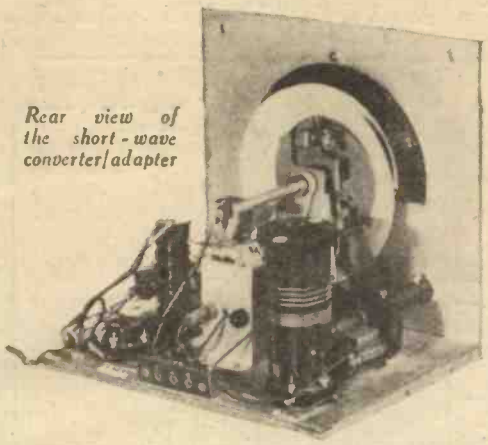
Bearing in mind the hundreds of applications for which electrical switches are used in industrial and everyday life, and the very large number and variety of efficient switches developed by electrical engineers, it is difficult to understand how there are unsatisfactory radio switches which still survive. Of course, these remarks do not in any way apply to the products sold by manufacturers of repute, but it is agreed generally that wavechange switches are a vulnerable point in a set. Realising, however, that many amateurs have constructed, out of mere scrap, switches of ingenious design, which make good and definite contact (as witness the "Wrinkles" pages in PRACTICAL AND AMATEUR WIRELESS) and stand up to continuous duty, surely it should not be beyond the capabilities of every manufacturer to achieve equally good results.

"Practical and Amateur Wireless" Helps to Make Television History

The Editor visited the House of Commons to hear Sir Kingsley Wood speak on the Television Report.

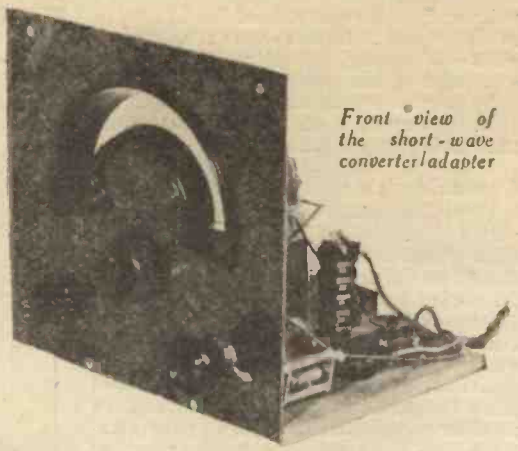
THE Editor of this journal was invited by the Postmaster-General, Sir Kingsley Wood, to the House of Commons on January 31st to hear him explain the various points of the Television Report and the recommendations made therein.

This Report was summarised in our issue dated February 9th and was further referred to in last week's issue. There is, hence, no need to make further reference to it. Readers of this paper will, of course, be aware of the important part this journal has played in the development of television. Alone of the technical Press it has regularly published a weekly article on television, and forecast the Report correct in almost every important particular a month before it was published. Thus is our belief in the new science vindicated—a belief which was held at a time when almost the entire Press of the country were pouring scorn and contumely upon Baird and television generally.



Rear view of the short-wave converter/adapter

THE "PRACTICAL and AMATEUR WIRELESS"



Front view of the short-wave converter/adapter

SHORT-WAVE CONVERTER/ADAPTER

An Efficient Dual-purpose Unit which is Simple and Cheap to Build. It Gives Remarkable Results and Enhances the Scope of any Receiver

OUR postbag definitely indicates that the publication of the Television Committee's Report has stimulated interest in short-wave reception. Until quite recently, reception of the higher frequencies was mainly confined to the experimenter, this being due to the fact that the average listener cannot afford to buy a complete receiver for short-wave reception as well as a broadcast set. The design of an all-wave set, on the other hand, presents many difficulties, as several of the components used in medium/long-wave sets are unsuitable for short-wave reception. By building a separate short-wave detector unit and coupling this to the broadcast-band receiver, satisfactory short-wave reception can be obtained at a very low cost, however.

Adapters and Converters

There are two ways of using a broadcast receiver of the usual H.F.-det.-L.F. type for short-wave reception. One of these is to substitute a short-wave detector unit for the detector stage of the receiver, and the other is to use the short-wave detector unit as a frequency changer, connecting its output lead to the aerial terminal of the set. The short-wave unit—broadcast receiver combination then becomes an efficient short-wave superheterodyne. This superheterodyne, or converter, method provides the more sensitive arrangement of the two, and also gives easier control, as the reaction condenser does not have to be operated in conjunction with the tuning condenser.

Fortunately, the difference between the two units—the adapter and the converter—is very slight, and the adapter can be used as an efficient converter if two extra components (a long-wave choke and a fixed condenser) are added. The unit described here incorporates these two components and is, therefore, suitable for addition to any receiver of the det.-L.F. or S.G.-det.-L.F. type, whether battery or all-mains operated. There is one point that we would stress in connection with the use of the unit in conjunction with an all-mains receiver, however; the mains transformer in the set must be capable of supplying the extra 1-amp. L.T. required by the unit valve when the latter is operated on the superhet. principle.

Using the Unit as an Adapter

The superhet. method of connection is advised when the set has one or more S.G. H.F. stages, and the set is capable of being tuned to the long-wave band (1,000 to 2,000 metres approximately), but if the set is not fitted with an H.F. stage the adapter method of connection must be employed, of course.

When the unit is used with an A.C. mains receiver the plug attached to the end of the 3-meg. grid leak should be inserted in the right-hand socket (viewed from the back) of the tuning condenser metal support, and in the left-hand socket when the set employs battery-type valves. It will be noted that the left-hand socket is connected to the filament + terminal of the valve-holder and the right-hand socket to E terminal; the plug merely serves the purpose of transferring the grid-leak connection from the L.T.+pin of the battery-type valve to the cathode of the indirectly-heated mains valve.

After noting that the plug is in the correct socket, the detector valve of the receiver should be removed from its socket and placed in the adapter holder—the left-hand holder when the unit is viewed from the back—and the five-pin adapter plug should be inserted in the receiver detector socket, from which the valve has been removed. If the receiver is battery operated, and is fitted with a four-pin-socket detector holder, the centre pin of the adapter plug should be removed. In the case of the battery-type receiver the leads from the filament terminals of the valve-holder on the unit should be connected the correct way round to the adaptor filament pins, otherwise slight loss of volume is to be expected. One of the short-wave coils may now be plugged into the coil holder (the right-hand holder when the unit is viewed from the back), the aerial lead transferred from the aerial terminal of the receiver to the A socket of the unit and a length of flexible lead joined between E socket of the unit and the E terminal of the set. In some cases it may be found that better results will be obtained on the short-wave bands without an external earth connection. Short-wave reception may now be obtained by switching on the receiver and operating the adaptor tuning and reaction controls. It will be necessary to keep the adapter valve on the verge of oscillation by means of the reaction control, and as the tuning is very sharp the small concentric knob should be used as this provides a very slow motion of the tuning condenser. If a long aerial is used it may be found that the adapter valve will not oscillate at all points on the tuning scale, but this trouble may be corrected by reducing the setting of the aerial-series condenser—the left-hand control when the unit is viewed from the front.

LIST OF COMPONENTS

1 Peto-Scott Plywood Baseboard 8½in. by 6½in.
1 Peto-Scott Paxolin Overlay, 8½in. by 8in.
1 Peto-Scott Aluminium Panel 8½in. by 8in.
1 Polar Type "E" Condenser, .00016 mfd.
1 Polar Double Reduction Drive with Escutcheon.
1 Polar Reaction Condenser, Type QJ.
1 B.T.S. .0001 mfd. Midget Condenser with Extension Rod.
1 Bulgin H.F. 3 Choke.
1 Bulgin H.F. 10 Choke.
2 W.B. Baseboard Valveholders.
2 Clix Insulating Sockets and 1 Clix Plug.
1 Peto-Scott Socket Strip, O., A. and E.
4 T.M.C. Hydra Condensers, two .0002 mfd.; one .00005 mfd., one .002 mfd.
1 Peto-Scott Fixed Resistance, 3 meg.
1 Bulgin 5-pin Adapter, Type A.50.
2 Peto-Scott Aluminium Brackets.
Connecting Wire, Screws, Wood Screws, and Triple Flex.
2 B.T.S. S.W. Coils, 13-52 metres.

As a Converter

When the receiver has one or more H.F. stages, the unit should be operated on the superhet principle, as previously mentioned. The same instruction as before applies to the plug attached to the grid leak, but it will now be necessary to obtain an extra valve of the H.L. type (either indirectly-heated mains type or battery type according to the nature of the supply) for use in the unit. The S.G. valve should be removed from the socket in the receiver and inserted in the plug attached to the unit, the unit plug being then inserted in the vacant holder of the set. If the receiver valve is of the seven-pin type a seven-pin adapter plug should be used—this may be obtained from the kit suppliers. When this method of connection is employed the H.T. to the unit valve is supplied from the same

point as the screening grid of the S.G. valve in the receiver. In most cases this is found quite satisfactory, but if desired the lead connected to the anode pin of the adapter plug may be connected to a socket on the H.T. battery or a terminal on the mains unit giving approximately 75 volts.

Operating as a Superhet. Converter

When the unit is used as a superhet converter the method of operation is different from that outlined for the adapter. It should be borne in mind that the unit is now being used for changing the frequency to approximately 150 kc/s, and, therefore, the unit valve must be kept oscillating the whole time. This is done by means of the reaction control (the right-hand control when the unit is viewed from the front), the receiver wave-switch being set to the long-wave position and the receiver tuning control set to approximately 2,000 metres. The O terminal of the unit should be connected to the aerial terminal of the set, and the aerial lead to A of the unit, tuning being then effected by means of the tuning condenser of the unit.

There should be no difficulty whatever experienced in the construction of this unit, as the wiring is very clearly indicated on the wiring diagram. Should any reader experience trouble, however, we shall be glad to offer our help through our Free Advice Bureau.

Ever Ready Receivers

READERS will learn with interest that Ever Ready Radio, Ltd., the firm which is so well known for batteries and accumulators of every description, is shortly to introduce a series of complete receivers for both battery and mains operation. We have not yet received the sets for test, nor have the prices been announced at the time of going to press, but the specifications are as follows:—

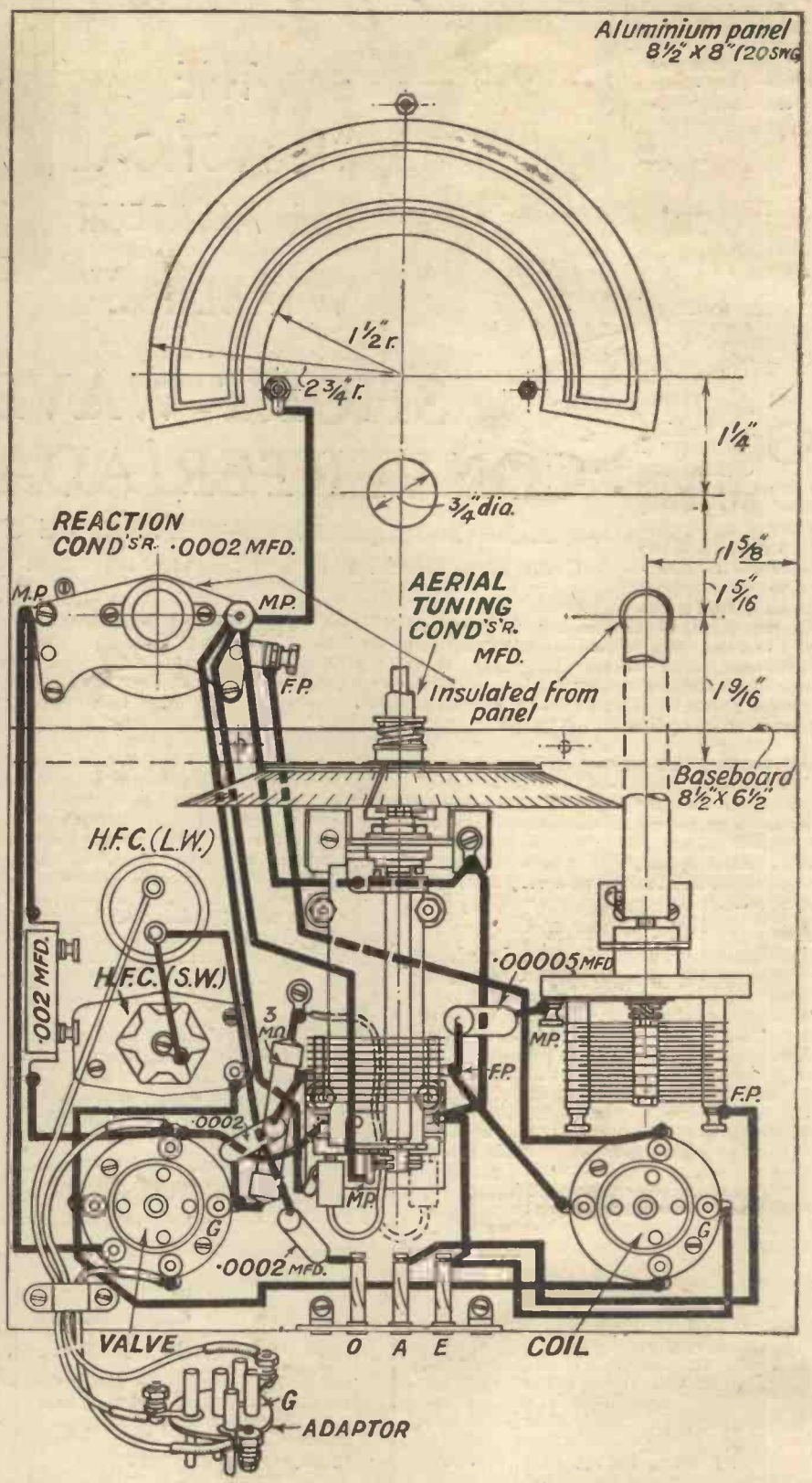
A 5-Valve band-pass superheterodyne receiver for use with outside aerial. Seven tuned circuits are incorporated. Second channel suppressors are fitted on each waveband. The following valve combination is used: variable-mu screen-grid radio-frequency amplifier (Mullard PM1 2M); octode-frequency changer (Mullard FC2); variable-mu pentode, I.F. amplifier (Mullard VP2), coupled to two metal rectifiers ("Westectors"), arranged to perform the functions of signal rectification and the generation of delayed automatic-volume control voltages. The output of the signal rectifier is transformer-coupled to the driver valve (Mullard PM2DL) which, in turn, supplies the necessary power to drive the Class "B" output stage (Mullard PM2B). The tuning scale is of the full-vision type, marked clearly in wavelengths and station names. The pointer gives particularly clear indications of tuning positions. The three controls are for tuning, volume control, and waveband changing. A permanent magnet moving-coil loud-speaker is fitted. It is very sensitive, and as a result of the careful circuit design and construction of the set, gives exceptionally good reproduction of speech and music. Provision is made for connecting an external speaker. Gramophone pick-up sockets are also fitted. The cabinet is of inlaid walnut, beautifully figured, of modern design.

Model 5002 for A.C. Mains

A 4-VALVE (including rectifier) band-pass superheterodyne receiver for use with outside aerial. Seven tuned circuits are incorporated. The following valve combination is used: triode-pentode frequency changer (Mazda AC/TP); radio-frequency pentode, I.F. amplifier (Mazda AC/VP/1) and double-diode high-slope pentode (Mazda AC2/Pen/DD) in triple-purpose output stage. This last valve functions as signal rectifier, automatic-volume control, voltage generator, and power-output amplifier—2.8 watts undistorted output. Valve rectification (Mullard IW3). The tuning scale is of the full-vision type, marked clearly in wavelengths and station names. The pointer gives particularly clear indications of tuning positions.

This receiver is supplied for use on A.C. mains, 200-250 or 100-150 volts, 25-40 or 40-100 cycles. (Four models.)

WIRING DIAGRAM of the SHORT-WAVE CONVERTER/ADAPTOR

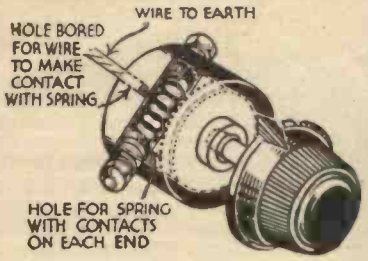


READERS' WRINKLES

THE HALF-GUINEA PAGE

A Three-point Wave-change Switch

WHILE constructing a set with two H.F. stages, I found I did not have a three-point wave-change switch, so I converted a two-point switch, as shown in the accompanying sketch.

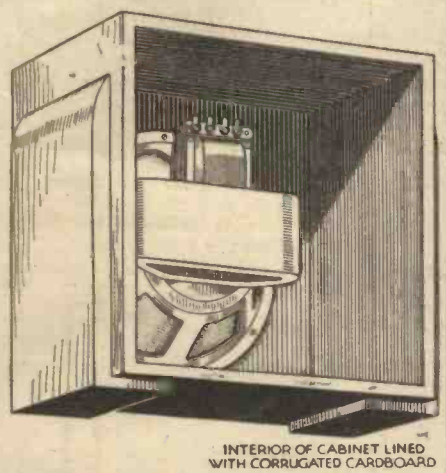


A simple three-point wave-change switch.

I soldered a flexible piece of wire to the moving spring of the switch, and connected it to earth. One terminal of the switch is connected to the wave-change tapping of one coil, and the other terminal of the switch to the wave-change tapping of the other coil.—A. SASSOON (Shepherd's Bush).

Preventing Boom in L.S. Cabinets

TO effectively prevent boom and muffled reproduction from speakers in cabinets some corrugated cardboard should be glued or tacked on the inner sides of the cabinet, as shown in the accompanying sketch. The corrugations must be placed vertically, and it will be found that reproduction is considerably improved.—W. P. AIRES (Rugby).



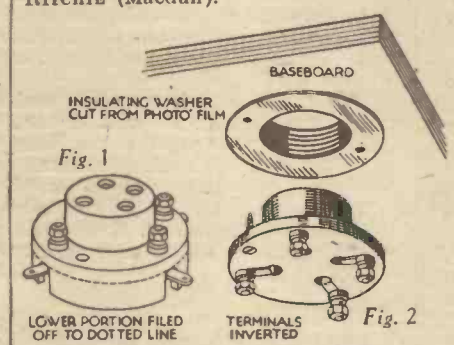
Using corrugated cardboard for preventing boom in loud-speaker cabinets.

A Useful Valve-holder Conversion

AS my local radio dealer was unable to supply me with valve-holders of the type I required, I decided to resort to the "Junk Box," which provided me with three valve-holders of the type shown in Fig. 1. The under-sides of these holders are hollow, the hollow being formed by a thin lip of bakelite; this lip is easily cut off with a saw blade, and the edges dressed with a file. The connecting terminals are inverted and an ideal, easily connected valve-holder for under baseboard wiring, as shown in Fig. 2, was the result.—F. W. RITCHIE (Macduff).

THAT DODGE OF YOURS!

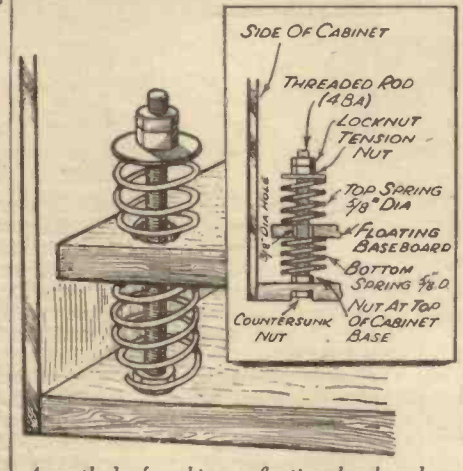
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page will pay half-a-guinea. Turn that idea of yours to account 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.



Adapting a baseboard valve-holder for chassis mounting.

A Floating Baseboard

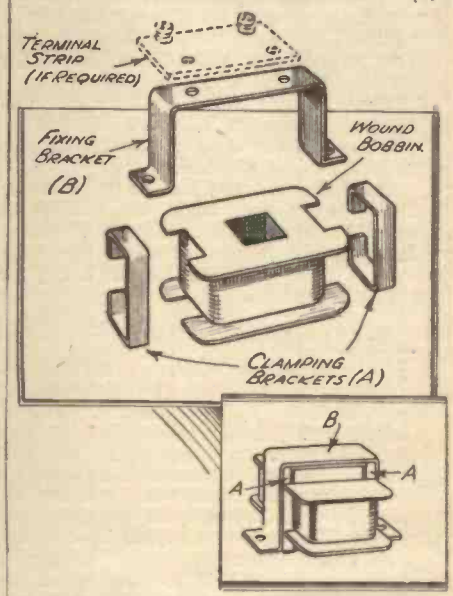
HERE is a method of making a floating baseboard (or chassis, in which case longer springs will be required) which I found improved the performance of my set. First of all I screwed the baseboard to the bottom of the cabinet with two screws. Next, I drilled four 3/16in. diameter holes, one near each corner of the baseboard, right through and into the cabinet bottom. The baseboard was then removed and its holes were enlarged to ⅜in. diameter. A short length of 4BA threaded rod was then passed through one hole in the cabinet bottom and secured in an upright position with two nuts, one on each side of the bottom of the cabinet, the bottom nut being countersunk flush with the underside of the cabinet. The other three holes in the cabinet bottom were similarly treated. Four ⅜in. diameter springs were placed centrally over each upright rod, and the baseboard was next placed in position, the 4BA rods coming centrally through the baseboard holes and not touching the baseboard. Four similar springs to the bottom springs were then placed on the top of baseboard centrally over the rods. Over each rod a large washer is slipped, then a nut, with which the tension required can be regulated. Finally, a locknut can be screwed on each rod, to keep the tension nut from working loose. The sketch shows one spring at one corner of the cabinet and baseboard.—ARTHUR TAYLOR (Knutsford).



A method of making a floating baseboard or chassis.

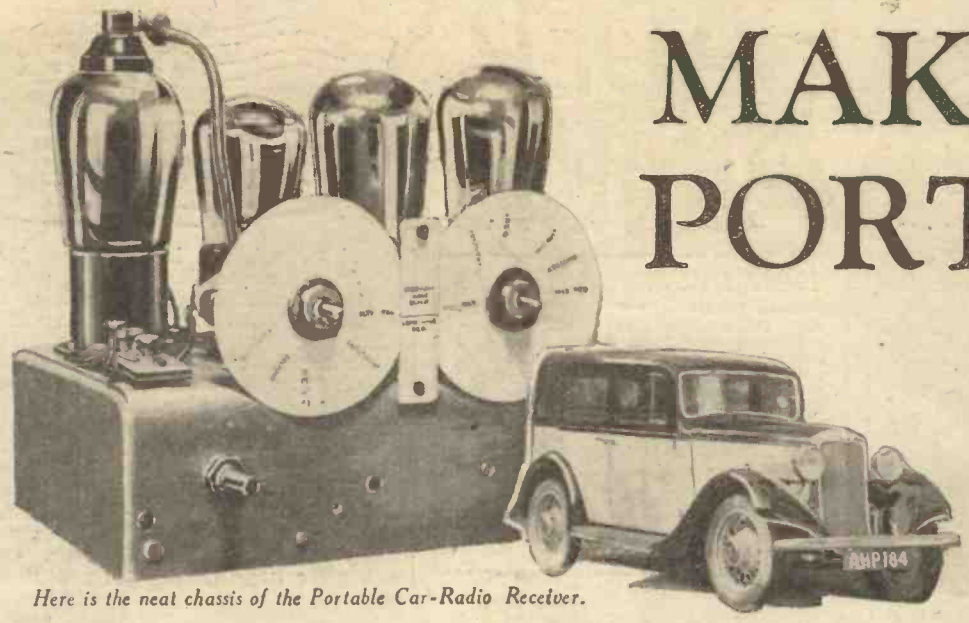
Transformer and Choke Clamping

AFTER considerable experience of transformer and choke construction, using PRACTICAL AND AMATEUR WIRELESS data, I found that the following method of clamping was very efficient and much simpler than the usual and more elaborate methods. The coil cheeks are made of extra stout fibre and are extended across the outside limbs of the core laminations. However, they do not actually touch them, but leave just enough room to insert two brass clamping brackets (A) to keep the core rigid. The brass brackets (A) are placed firmly around the laminations and held in position by the extended cheeks. Another bracket (B) is placed over the transformer and clamps the whole to the base. A terminal strip is easily arranged for by drilling the bracket (B) for two screws, thus providing for all the required connections.—WM. S. HARRISON (Aintree).



An efficient method of clamping transformer stampings.

MAKING A PORTABLE



Here is the neat chassis of the Portable Car-Radio Receiver.

BEFORE giving a description of this little set, brief details of the reason for its design and its adaptability to various needs will doubtless be of interest.

There are many wireless enthusiasts who are the happy possessors of motor-cycles, combinations, and small cars, and my experience of the ordinary size portable, especially when there are passengers, is that it takes up too much room in a small car, particularly when there is luggage as well.

There are two alternatives: a car radio, or a portable set of much smaller size than usual, and the latter was decided upon as best suiting my needs.

Car radio did not suit so well because there are times, when on holiday for example, when it is handy to be able to take the set indoors, or on to the beach, and even a small car cannot always be taken near the sea.

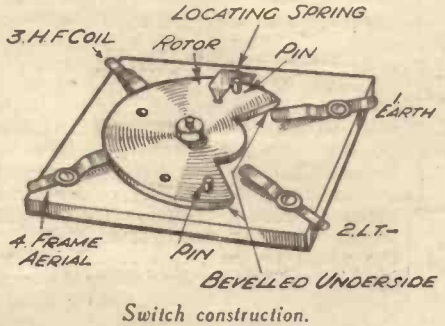
Adaptability

On the other hand, a traveller, for instance, may find it more convenient to have the set fixed to the car. The set itself is small enough (chassis 9in. by 4½in. by 2½in.) to be mounted behind the dash, the four control knobs and scale to the front, the 6in. moving-coil speaker and batteries or H.T. converter in any suitable place. The frame aerial could be dispensed with, and another little coil used; there is ample room for this to the left of the chassis if raised slightly.

In the writer's case provision for aerial and earth is made for increasing the range if desired. The set was tried with two coils at first, and results were so good that it was decided to use a frame aerial. The local station with two coils, less aerial and earth, was tuned in on the speaker, so that by using a car aerial good results should be obtained.

The circuit used is a straight and well-tried one of S.G.-det.-R.C. Trans., the parts, with two exceptions, being all standard and obtainable anywhere.

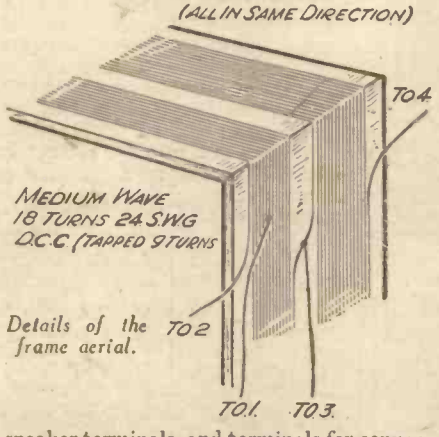
The two exceptions are the on-off and wave-change switch, which had to be flat, and the coil; both were home-made very cheaply, and doubtless a small iron-core coil could be used.



Switch construction.

The Chassis

The set is made on an aluminium chassis of the size given and carries on top four valves, two slow-motion tuning condensers,



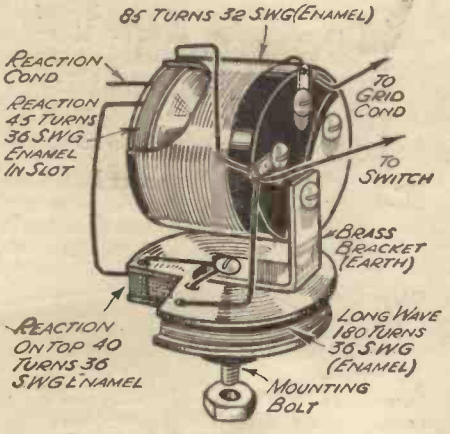
Details of the frame aerial.

speaker terminals, and terminals for connection to the frame aerial. All the other parts are mounted underneath, including the L.F. transformer, coupling condensers, grid leaks and resistances, the coil, 2 mfd. and .1 mfd. condensers, and screened H.F. choke, as well as the switch and reaction condenser.

The set, complete with its valves, is mounted in a cabinet 11½in. by 10in. by 7½in.; above it is mounted the 6in. moving-coil speaker (mine is a Lissen L.N. 5324). Behind the set and speaker is the frame aerial, and this has the batteries inside it. The H.T. is a standard 120-volt Drydex or Ever Ready, of suitable size; not being special portable type, replacements can be got anywhere. This is in the top of the case behind the speaker, and underneath it is the portable accumulator—jelly-acid type, of course.

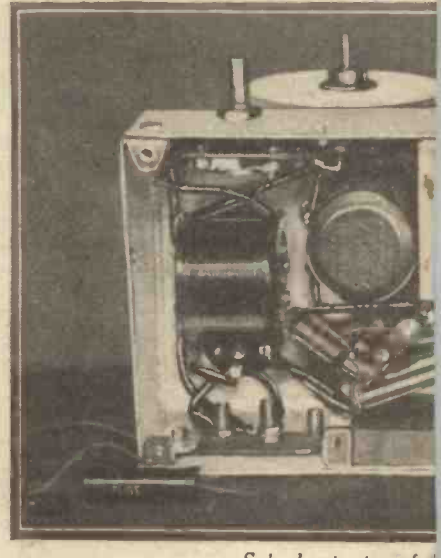
There is ample room to get at the aerial and earth terminals without removing the batteries.

So much for the general arrangement; now a few words about the coil and switch, as, apart from this set, they may interest readers. Both are suitable for use in any set.



Details of the H.F. intervalve coil.

The coil consists of two formers, the medium-wave being a solenoid, and wound on an old Mullard S.G. valve base 1¼in. long and 1¼in. diameter. An accom-



Sub-chassis view of t

CAR-RADIO

A Practical Article Dealing with the Construction of a Compact and Efficient Portable Receiver

By A. L. JACKSON

This illustration shows the complete Car-Radio Portable.

panying sketch shows details of this: The long-wave winding is on a built-up bobbin of bakelite sheet, taken from the bottom of an old transformer—cardboard would have done as well.—It is 1¼in. diameter and has ½in. centre

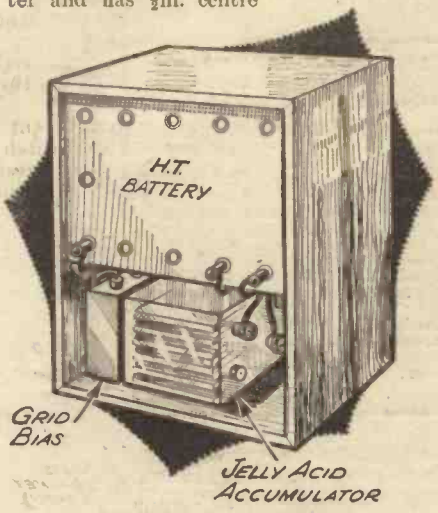
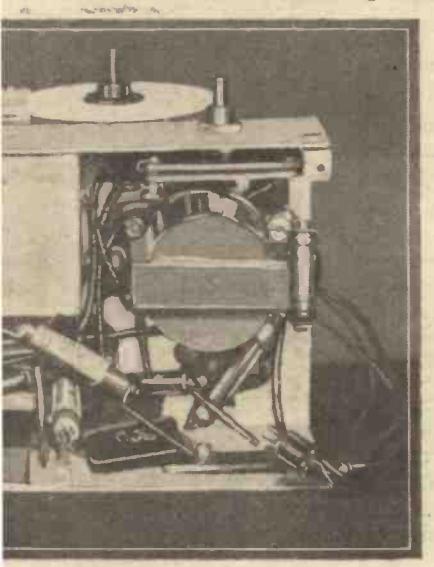


Diagram showing disposition of the H.T. Portable.

and 3/16in. slot. The medium-wave former is held at right angles to this by a brass bracket, and the screw holding the bracket is used with a distance piece for mounting on the chassis. A sketch shows the windings used, the bracket being earthed. The beginning of the long-wave winding is soldered to it, and the end of long-wave reaction also. Both reaction windings run in series, the M.W. reaction being on a built-up bobbin pushed into the open end of the valve base. The valve pins were removed and screws and soldering tags used in their place to act as terminals, one hole being used for the brass bracket.

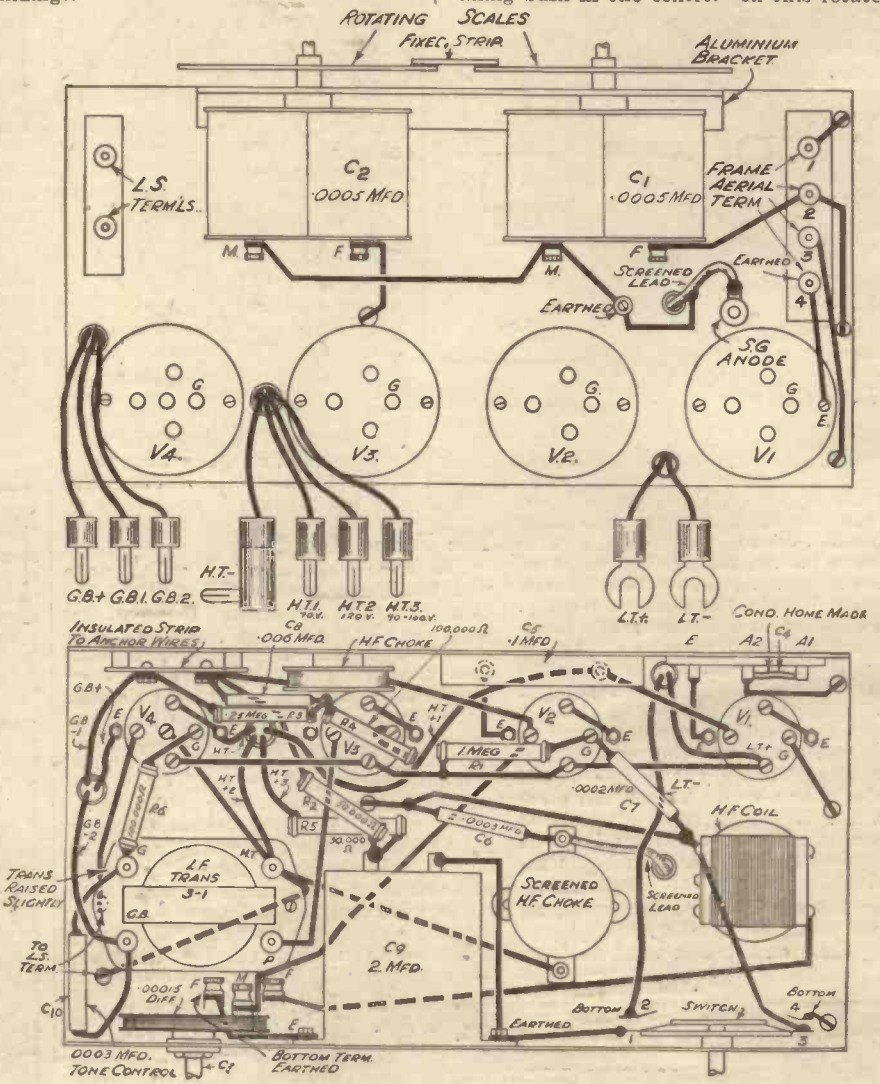


Car-Radio Portable.

Coil Screening

The coil is unscreened, but there is no reason why a screened coil should not be used instead. Alternatively, the coil shown could be screened provided that the screening were not placed less than ½in. from the windings.

The switch is illustrated on this page and is of the rotary type. It consists of a bakelite or ebonite plate with a one-hole fixing bush in the centre. In this rotates



Top and sub-chassis wiring diagrams.

a spindle with a disc on the end, a portion of this disc being cut away, the under-side of the cut-away being bevelled. As this turns it slides over and pushes down slightly the four springs, 1, 2, 3, 4, seen on page 834. The fifth spring, at the top, is for locating purposes, and the end dips down slightly. As the disc turns this spring drops into three holes in turn, thus locating the three positions; a pin each end of the rotor prevents it being turned too far.

In this set it is connected as shown. When all contacts are shorted—medium waves when 1 and 2 shorted, long waves when 3 and 4 only shorted—the set is off.

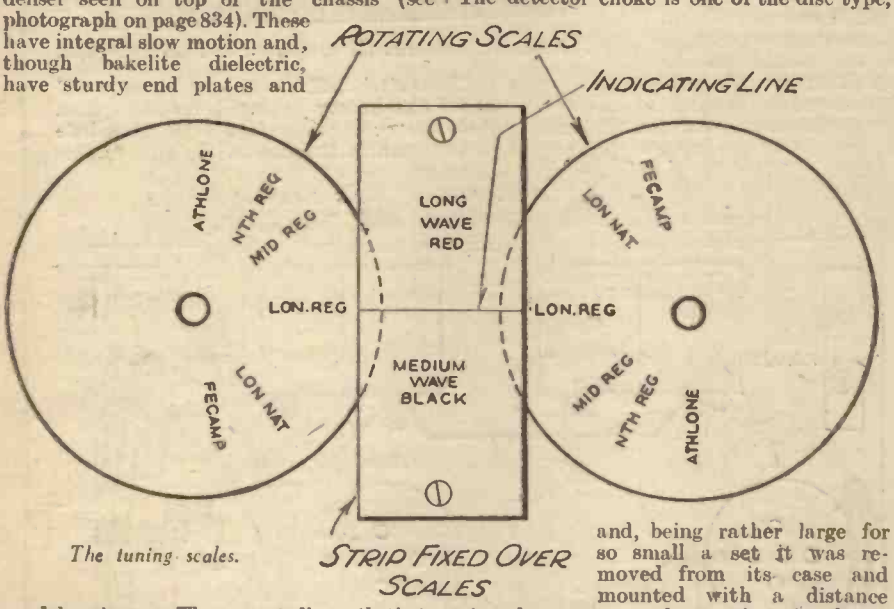
I used a square-end spindle from an old reaction condenser, otherwise there is some risk of the spindle turning without the disc. Properly adjusted, the spring should not push down much, and, being rotary, there is a self-cleaning wiping action, assuring reliability and long life.

Constructional Details

The general construction of the set can be seen from the illustrations, the condenser seen on top of the chassis (see photograph on page 834). These have integral slow motion and, though bakelite dielectric, have sturdy end plates and good bearings. They are well worth their place in the set.

They are supplied with a 2½in. dial, but these were discarded, in their place being fitted two 3in. discs of white celluloid with brass centre bushes, these being calibrated in station names. Across the top of these, where they join in the centre, is a ½in. strip of celluloid on a bracket; this has a line marked on, and the scales are turned until the station names are in line with this, the set then being tuned to that station. This has worked well in practice, and necessitates cutting one hole only in the cabinet, to view the scales. My opening is of square shape but round would do just as well. The sketch gives an idea how it works, long-wave stations in red and medium-wave in black. The uninitiated appreciate this little refinement, station logging being greatly simplified.

As the set was intended for travel, all joints wherever possible were soldered, including those on the Clix valve-holders; the resistances have wire ends and were also soldered. The small condensers are tag type of various makes; wires to these and the scr.-gr. choke were also soldered. The detector choke is one of the disc type, and, being rather large for so small a set it was removed from its case and mounted with a distance piece by a screw and nut, the wires being extended and taken to their respective points.

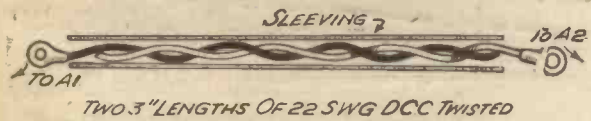


The tuning scales.

The Frame Aerial

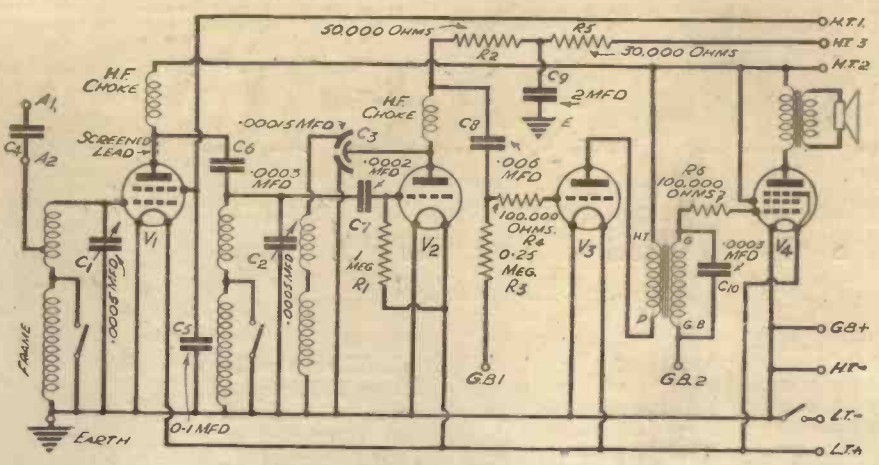
The frame aerial is just an ordinary one with medium- and long-wave windings, the long being shorted when not required, this being done by the one switch shown. The medium-wave has a tapping two-thirds from the grid end taken to aerial one; aerial two is joined to aerial one by a very small fixed condenser. This consists of two pieces of insulated wire twisted together and slipped into sleeving. The value required was found by trial on a long aerial to give the necessary selectivity.

If I were going to use this set for car radio with two coils I think that a tapping on the H.F. would be a decided asset as well as low tap on the aerial coil. Stations roll in, after dark especially, and selectivity is sufficient with the frame aerial, but may not be enough with an efficient car aerial; with an efficient outdoor aerial it is selective enough as it is, but aerial two must be used, bringing into use the very small condenser. Using this tapping, tuning is hardly affected. These observations were made in London; probably in the country aerial A1 would have to be used. It has so far not been tried in the country with an aerial.



TWO 3" LENGTHS OF 22 SWG DCC TWISTED TOGETHER – AERIAL SERIES CONDENSER –

The aerial series condenser.



Theoretical diagram of the car-radio portable.

LIST OF COMPONENTS

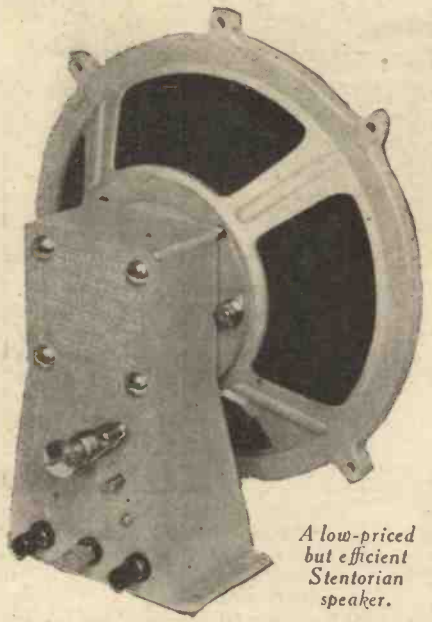
Two .0005 tuning Condensers (C1, C2).
One .00015 differential Reaction Condenser (C3).
One screened H.F. Choke, one unscreened H.F. Choke.
One 3:1 L.F. Transformer.
Six fixed Resistances: 1 meg. (R1), 50,000 ohms (R2), 30,000 ohms (R5), .25 meg. (R3), 100,000 ohms (R4), 100,000 ohms (R6). (Amplion or Erie.)
Six fixed Condensers: .1 mfd. (C5), .0003 mfd. (C6), .0002 mfd. (C7), .006 mfd. (C8), 2 mfd. (C9), .0003 mfd. (C10).
Four Valve-holders—three 4-pin, one 5-pin (Clix).
One L.S. strip, one A.E. strip (Clix).
Six Plugs, one plug with fuse incorporated, two spades.
Four Valves: S.G., Det., L.F., Pentode.
Speaker.

The designing, building, and, yes, wangling the parts in have occupied many happy hours; annoying sometimes, perhaps, but it came right in the end. You may think it is complicated, but everything can be got at easily, though the 2 mfd. may have to be unscrewed in some cases. Valves of all sorts have been tried and work well, but the S.G. wants to be metallised. As I write a military band from Munich is coming through well 14ft. away, so I must finish writing now; my fingers are itching to twiddle those knobs.

PLANNING THE OUTPUT STAGE

(*Continued from page 826*)

pentode types for battery or mains operation, and the "quiescent" types, which embrace Q.P.P. valves and Class "B" valves used mainly for battery sets. Dealing first with Class "A" valves, it must be explained that the basic principle of these valves is that the working conditions (that is, grid bias and anode voltage) are so adjusted that, when no signal is applied, the valve takes a steady H.T. current of a specified value. Thus, current is termed the "standing current" or "rest current," and its value in milliamps multiplied by the H.T. voltage gives the *dissipation* of the valve in milliwatts (not the output),



A low-priced but efficient Stentorian speaker.

and it must be remembered that this amount of high-tension power is used all the time the set is switched on, whether a signal is tuned in or not and whether the volume is loud or soft.

The application of a signal to the grid of the valve causes audio-frequency variations in the strength of the high-tension current, and it is only the amount of these variations which represents the useful output of the valve. It should be explained that these variations are not actually the output power, for they must be considered in conjunction with the characteristics of the speaker load, as will be shown later. But it is nevertheless a fact that for a given valve and speaker the the output is proportional to these.

It will be appreciated, therefore, that all Class "A" valves (that is, normal triodes and pentodes), impose a steady drain on the H.T. supply, which is from 3 to 5 times the maximum output and is irrespective of the existence or strength of the signal. It is on account of this drain (which is not of great economic moment in the case of mains sets) that Class "A" valves of big output cannot be used in sets depending upon high-tension batteries.

A quiescent output stage, on the other hand, employs valves so designed and adjusted in respect of operating conditions that when no signal is applied only a very small H.T. current flows. When a station is tuned in, the H.T. consumption increases roughly in proportion to the strength of the signal. During the great majority of programme time the actual high-tension drain is quite small and well within the capacity of a standard H.T. battery.

(*To be continued.*)

THE PRECURSOR OF WIRELESS

With the Celebration of the King's Jubilee this Year it is Interesting to Examine the Progress of the Gramophone During the Last Decade, and to See the Influence that Radio has had on its Development.

BY the time of the accession of King George V the gramophone had established itself as a popular means of entertainment in the home. The early struggles of scientists in England and Edison in America to capture the voices of artists for future reproduction had, to a great extent, been successfully accomplished. Caruso, Melba, Patti, Clara Butt, John McCormack, and other world-famous artists of the concert platform and operatic stage, were regularly making records, which introduced their voices to thousands of people, who, but for the gramophone, would never have heard them. The great comedian, Dan Leno; the well-known Victorian divine, the Rev. Canon Fleming; the famous composer, Edvard Grieg; the greatest classical player of the violin in the nineteenth century, Joseph Joachim, were some of the personalities of their day who had died and had left some of their art enshrined for posterity on gramophone records.

Early Instruments

At this period the gramophone was a somewhat ugly machine. The records, similar in external appearance to those of to-day, but slightly thicker, were revolved by clockwork, and reproduced by a needle in a sound-box, tone arm, and a horn. This horn was mounted above the cabinet and protruded into the room, and by 1911 it was beginning to be realised that the popularity of the instrument would be much increased if the machine could be built in a way more conventional to furniture. The manufacturers, therefore, instead of turning the horn upwards, began to turn it downwards, and built it into the cabinet itself. The gramophone in its new form increased in popularity immediately; it became a fine piece of furniture besides an instrument—factories were enlarged and output increased.

First Public Address Gramophone

Audiences of a thousand or more heard, by means of the "Auxetophone," what they thought at the time was a faithful reproduction of the artists' original performances. In this instrument a small air valve replaced the mica diaphragm in the sound-box. An electric motor built into the top of the cabinet actuated bellows which pumped air past the valve at a pressure of two pounds per square inch. The sound from the record was, in non-technical language, blown out of the external horn by compressed air. This crude apparatus was probably the first form of public address equipment.

Naturally, few developments took place during the years of the Great War, with the exception of the development of the portable gramophone. This compact instrument enjoyed great popularity in the trenches, and whilst the majority of gramophone factories in England were turned over to the making of munitions, a small supply of records was pressed to provide the troops with entertainment.

By the time of the King's Accession the gramophone was being taken to all parts of the world as a means of providing entertainment. This picture was taken during Captain Scott's antarctic expedition in 1911, several hundreds of miles from civilisation.

Mark Hambourg, the famous pianist, listening in London recently to a record he made twenty-five years ago on an external-horn gramophone of the period.

The Lumière diaphragm was applied to gramophones and loud-speakers in 1924 as a means of disseminating sound in place of a horn. In this instrument the vibrations from the record were transferred to the centre of the diaphragm by a system of bell-crank levers.

Horn Recording

The method of making records did not vary much between 1909 and 1925. Artists recorded their performances in front of large horns, on the end of which sound-boxes having thin glass diaphragms were mounted. The sounds were impinged on the diaphragm, to which was attached a sapphire point, which cut a wavy line in a soft wax revolving disc. By a process of copper deposition, metal negatives were made from the wax recordings, and then hard records were formed by a thermo-plastic process.

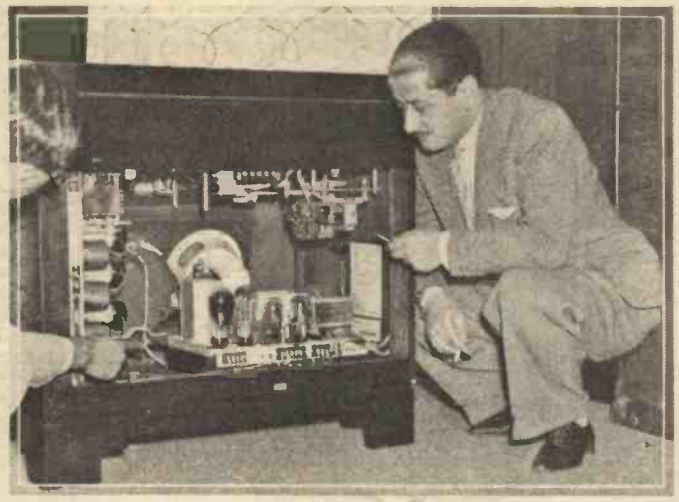
The disadvantage of this method of recording was that it was only possible to get a section of the musical scale satisfactorily on the record. Whilst fairly good representations were made of the human voice, the accompaniment and orchestral records were of inferior quality. The performers had to huddle together in front of the horns, and skeleton orchestras were used in an endeavour to obtain some degree of faithfulness in the making of orchestral records. Stroh violins with small horns mounted in front of the strings were employed in order to amplify the sounds. Satisfactory recordings of the organ were quite out of the question.

First "Hornless" Loud-speakers and Gramophones

In 1924 the first practical, truly hornless gramophone made its appearance. The "His Master's Voice" Lumière Diaphragm Model, as the instrument was called, used a large fan-shaped diaphragm as the method of distributing the sound. The needle point was connected to the centre

of the diaphragm through a system of levers.

This diaphragm was also used in the manufacture of loud-speakers, and the reproduction from both gramophones and radio sets using this method of sound distribution was a relief from the rather hollow horn quality which the public had been accustomed to up to then. But within a year such a great development took place in the art of recording that this, and all other gramophones, were at once rendered obsolete. Instead of records being made by the acoustic process, whereby artists stood in front of a horn and the power of the voice or of the instruments played was conveyed mechanically to the record, "His Master's Voice" engineers introduced the electrical system of recording. This method, which is standard at the present day, with the exception of detail improvements, enables the artists to perform in congenial surroundings and in close proximity to a microphone, similar to that used for broadcasting. Valves similar to those used in radio transmitting and receiving equipments are employed in an amplifier, and thus the performance, by means of a control, is recorded at the best degree of volume. Instead of a glass diaphragm sound-box cutting the wavy line on the wax, an electric recording device is employed, somewhat similar in appearance to a gramophone pick-up.



Geraldo, the well-known radio artist, is seen here examining one of the latest type "His Master's Voice" radio-gramophones in which more than 6,000 parts are incorporated. An instrument of this kind now costs only a few guineas more than a large horn gramophone retailed for a few years ago.

The difference between records made by this new electrical process and the old one is remarkable. A considerably wider range of musical frequencies is captured by this new method, and instruments such as the organ, and full symphony orchestras, massed choirs, etc., which it had been impossible to record by the acoustic process, can now be faithfully transferred to wax electrically. Instead of relying on the artist's human capabilities to make a loud record, the touch of a volume control ensures the best possible recording. Records made of Melba's farewell speech and performance at Covent Garden in 1926 demonstrated the flexibility of the new system, and its faithful reproduction.

Electrical Recording Starts Record Boom

After the introduction of electrical recording the progress of the gramophone was rapid. The new records could not be faithfully reproduced on the old machines—new ones were forthcoming. A few months after the first electrical records made their appearance "His Master's Voice" introduced a range of gramophones in which new sound-boxes and long horns did justice to the newly-made records. The gramophone entered on its boom years. Records sold in millions. Factories worked day and night to keep up with the demand for the new instruments. In 1927 gramophones employing the electrical principle of matched impedance, in which an unobstructed pathway for the sound waves, from the tip of the needle to the outer opening of the horn, were produced. These re-entrant models, in which, by a clever method of folding, a truly exponential horn of as much as 6½ft. in length could be fixed into an ordinary gramophone cabinet, enabled the wider frequency range which the records now possessed to be reproduced with faithfulness.

At this time there also appeared the first automatic gramophone, in which the "His Master's Voice" engineers had designed ingenious apparatus which changed the records automatically. The amplifying valves used in radio sets were now being employed for the reproduction of records in the same way as they had been used previously with the introduction of electrical recording.

Radio-gramophones

Gramophone pick-ups by which the sounds from the records were converted into small electrical impulses started to make their appearance. Many of the first models were constructed from converted telephone ear-pieces, and by 1929 a number of commercial electrical reproducing gramophones were being marketed. This was followed by building the gramophone and radio receiver into one cabinet, the low-frequency section of the radio chassis being used for the gramophone amplification. By 1930 leading radio and gramophone manufacturers had lowered the cost of radio-gramophones by using common chassis for both instruments, whilst in the following year equipments were made more ambitious by the incorporation of simple eight-record changing automatic mechanism. From 1931 the progress of the radio-gramophone has been rapid; whilst the features incorporated in the models have improved out of all recognition from the early instruments, the prices have fallen rapidly. In 1934 the first popular-priced radio-gramophone was introduced by H.M.V., in which a five-valve all mains superheterodyne radio chassis, moving coil loud-speaker and electric motor and pick-up were all combined in a handsome walnut cabinet and sold for 20 guineas. It can be said safely, that the prices of these instruments have now reached their rock-bottom level, and there is, in fact, a slight tendency for increase to take place.

In all the Jubilee years it was not until radio and the gramophone were linked together that the development of the gramophone became rapid. In 1927 a large exponential re-entrant gramophone made by H.M.V., with an electric motor, cost £100; now, for practically a similar sum it is possible to obtain a 15-valve radio-gramophone made by the same manufacturers, with a power output which is probably forty times greater than its predecessor. Besides reproducing records, it is capable of receiving practically every worth-while radio transmission, and having its discs changed automatically.

The years of the King's reign have seen vast changes in the home entertainment of the people. Even scientists with the greatest foresight could hardly have realised, in 1910, the great developments that would take place by the time His Majesty celebrated his Silver Jubilee.

Modern electrical recording equipment enables records to be made in practically any building. Members of a C. B. Cochran production are here seen recording for Columbia on the stage of a Manchester theatre.

IMPROVING THE PORTABLE

(Continued from page 821)

obtained from any good radio store, or constructed from plywood as shown in Fig. 4. Obviously, the commercial article, fitted with ball-bearings, will enable the receiver to be moved more easily, but by smearing the surfaces of the plywood with blacklead a fairly smooth movement will be obtained.

Adding a Pentode

The only circuit improvement which can be undertaken with the majority of portables is in the output arrangements, and if an ordinary L.F. or power valve is employed, the use of a pentode will enable much louder signals to be obtained on the majority of transmissions. A four-pin pentode may be plugged in in place of the present valve, with a lead from the side terminal on the valve base taken to a tapping on the H.T. battery slightly lower than the maximum value of the battery. Alternatively, a five-pin valveholder may be substituted for the present holder, and the additional terminal connected to the extra tapping as above mentioned. The higher impedance of the pentode will necessitate a different tapping on the speaker transformer if one is fitted, and if no additional tappings are provided, it will be advisable to fit a tapped pentode-output-transformer somewhere in the cabinet so that correct matching may be accomplished. The lead from the anode terminal of the output valve to the speaker should then be disconnected and joined to one terminal of the primary of the additional transformer, whilst the remaining primary terminal should be furnished with the lead from the speaker to H.T. positive. The two speaker terminals should then be joined to the appropriate secondary terminals, according to the impedance of the valve, type of speaker, etc.

CUT THIS OUT EACH WEEK

Do you know

—THAT aluminium and copper, whilst being ideal for screening H.F. currents, are useless on the L.F. side of a receiver.

—THAT a permanently-installed milliammeter on the output side of a receiver is an ideal arrangement for ensuring good quality.

—THAT great strides will be made in short-wave technique this year due to the television broadcasts.

—THAT if appearances are not too essential, a flat baffle is to be preferred to any form of cabinet.

—THAT when difficulty is experienced in cutting-out a nearby powerful station, a vertical aerial may prove of value.

—THAT the reason for the above statement is to be found in the non-directional properties of the vertical aerial.

—THAT gas pipes or water pipes in contact can give rise to noises in a receiver if they move under the influence of vibration.

By T. Onearm

THE contracting of D. Malone by Decca is considered a great "scoop."

The history of this young singer must be already well known to you. His rise to fame was meteoric. On discovery he was claimed to be the second John McCormack, who also had a most humble beginning.

Those early prophecies seemed well founded. Danny Malone has made tremendous strides since then, and is now in America, where his latest records were made, making a great name for himself.

With Malone's fellow countrymen—Jack Doyle and Richard Hayward—Decca have now secured the most popular Irish singers of the day, whose sales are world wide, for Irish songs by Irishmen are steady sellers all the world over, since the Irish have always been such ardent settlers.

They anticipate an enormous response to Danny Malone's records—especially on Decca at 1s. 6d.—and I think you will find both sides of *F*5383—"There's a Cottage by the Shannon" and "I'll Take You Home Again Kathleen"—exceedingly well sung and recorded. May I urge you to hear this record?

John Fogarty is another Irish tenor, not, perhaps, so well known in this country, but he is the outstanding Irish tenor in the States, where Irish records are, of course, in great demand. I would like you to hear both sides of this record, *Decca F*5382, "When You and I Were Young, Maggie" and "Mary of Argyle."

Boyd Neel String Orchestra

It is a notable thing to be able to purchase a recorded version of Holst's very famous "St. Paul's Suite," on two double-sided ten-inch records at 1s. 6d. each—especially as the suite is tip-top English music, and an extremely interesting work that has gained world renown. The records are *Decca F*5365-6.

The suite was written for the orchestra at St. Paul's Girls' School, Hammersmith, London, at which Holst was, for a good many years, music master.

The Boyd Neel String Orchestra, founded and conducted by Boyd Neel, has literally leapt into prominence, chiefly by reason of his broadcast concerts. The playing of the orchestra is always distinguished by good taste and intelligent interpretation.

Muriel Pollock and Lee Lawnhurst are new artists to the Brunswick list, and they have made a fine piano record on *Brunswick O*1911. The latter artist will be remembered in the combination "Fanchild and Lawnhurst," some years ago; they were big sellers. This new record should have a wide appeal to those who favour piano recordings, for it is an excellent record.

Decca-Polydor Records

The Fifth Brandenburg Concerto is the only recording of this excellent Bach Concerto with the solo clavier (or cembalo) part played upon a harpsichord and not upon a pianoforte, as is usual in concert performances nowadays. The records are *Decca Polydor LY*6101-4.

The concerto as recorded is presented as near as possible in the Bach manner, and it is an extremely fine performance.

I draw attention to the fact that the concerto occupies seven sides, the eighth side is occupied by an organ solo, played by Alfred Sittard—the "fill-up" is played first instead of last, thereby the second and third movements of the Concerto are allocated one record each.

Decca-Polydor has now published five of the six Brandenburg Concertos, all recently recorded, and all presented in practically the original Bach form. I am sure that readers will regard this enterprise as being a tremendously important achievement.

*Decca Polydor CA*8194 is the first solo record of Felicie Huni-Mihacsek, a brilliant singer who has a really big following in Great Britain, and finally, there is an excellent medley of the Paul Lincke Waltzes, played by an augmented string orchestra, conducted by the composer on *Decca Polydor PO*5112.

Chayele Grober

This artist should have appeared under the Decca notes, but I am purposely writing about her here, as hers is a specialised record, and will not be included in the usual "sets" sent out, but will be sold on demand.

She is one of the most famous Jewish singers, and has sung in nearly every big city in the world.

Her work is most dramatic, and if readers like really good Yiddish music, I would like them to hear this most interesting recording: "Drei Tochterlach" "Hashiveiniu," on *Decca Polydor F*5291.

Dance Records

Teddy Joyce, whose new band has become a great success, plays "Lost in a Fog" and "The Spring don't mean a thing to me" on *H.M.V. B*6544, and a waltz "Love for ever I adore you" and "I never slept a wink last night" on *H.M.V. B*6543.

This same band also appears in the British Homophone Company's list for this month playing "Song of the Islands" and "Farewell Blues" on *Sterno* 1533. Dance Medley records are always popular, and Billy Merrin and his Commanders present a fine pot-pourri of modern tunes full of novelties and perfect rhythm on both sides of *Sterno* 1534. This band introduce such tunes as "Oh! Muki, Muki, Oh!"—"Dreamy Serenade"—"Tiddlywinks"—"Lonely Singing Fool"—"Shadows on the Pavement"—"I love you very much, Madame"—"You were so Charming"—and "Ole Faithful." It is undoubtedly a very fine record, and one to be recommended.

SHORT-WAVE GOSSIP

ALTHOUGH much has been and is still being written with regard to the best weather conditions for the reception of short-wave stations, it will be found by experience that few listeners agree to what may be considered the best state of the atmosphere to assist them in securing DX logs. In a general way, however, you may rely on pulling in broadcasts on nights approaching full moon, and for perhaps six or seven days later. When the atmosphere is clear, and on frosty nights, you may settle down to a world tour with some hope of success, and again when the barometer is fairly high; namely, during the periods when the B.B.C. announces the approach of an anti-cyclone.

American Broadcasts

The National Broadcasting Company of America would appear to be all out to ensure good reception of its broadcasts in all parts of the world, and you would do well to make a note of the undermentioned channels which are particularly favourable ones for listening to the U.S.A. programmes:—

W3XAL, Boundbrook, 16.878 metres (17,780 kc/s), a 35-kilowatter which is on the air daily (except Fridays) between G.M.T. 13.00-19.00; on Fridays try for the alternative station W3XL on 17.33 metres (17,310 kc/s) between G.M.T. 16.00-22.00. It only works on that day. On 46.70 metres (6,425 kc/s) the transmissions of W3XL are irregular, but it is the N.B.C. control and "cue" station for nearly all stunt broadcasts. W3XAL, on 49.18 metres (6,100 kc/s) is also rated at 35 kilowatts, and, provided background is not too insistent, is a strong signal on Mondays, Wednesdays, and Saturdays, between G.M.T. 21.00 and 05.00. The calls are regularly given after the interval signal (three xylophone notes) and usually every fifteen minutes.

Codos and Rossi, the two French aviators whose departure, although not yet definitely fixed, is imminent from the Istres Aerodrome (France) in an attempt to make a non-stop flight to Brazil, have equipped their 'plane *Joseph Le Brix* with both radio transmitter and receiver. The wavelengths to be used are 900, 600, 55, 35.71 and 34 metres; the call sign is EALCC.

It is expected that PRF5, Rio de Janciro, on 31.58 metres (9,500 kc/s) will endeavour to keep in touch with them, and will broadcast several transmissions during the flight. This Brazilian station is heard almost nightly between G.M.T. 22.30 and 23.30. The interval signal is a three-note gong, and the call (phon.): *Pay air effe sinko, La Voz do Brasil.*

Apparently, amateurs in both continents will do their best to pick up the aviators' signals.

Experience has proved that transmissions from 'planes have been heard at great distances.

Broadcasts from Iceland

So far, it has always been difficult to hear the programmes broadcast by the Reykjavik (Iceland) station on the upper broadcasting band. Possibly, however, our chances of picking them up in the near future will be greatly increased, as the authorities have started to build a short-wave transmitter near the capital; its power will be 8.5 kilowatts and the wavelengths chosen are: 3TFJ, 4.52 metres (12,235 kc/s); TFK, 33.11 metres (9,060 kc/s); and TFI, 59.31 metres (5,088 kc/s).

Another mystery station has cropped up in the ether; it is a transmission on 48.78 metres (6,150 kc/s), which would appear to be of Portuguese origin. Two of my acquaintainces assure me that the call picked up is CSL. which would belong to that country. I have few details to offer, but on occasion incorporated in the call a reference has been made to *Emissora Nacional* (National broadcast), which would put both CT1GO and CT1AA out of court, and lead one to believe that it is an offshoot of the Barcarena National transmitter, especially as I understand a woman's voice is heard giving out the announcements. Personally, I have not yet logged this station, but perhaps some of you may have already done so.

I learn that the W8XK, Pittsburgh (Pa.), stations are now giving out special broadcasts every Sunday morning between G.M.T. 04.00-04.30, on 25.27 metres (11,870 kc/s) and 48.86 metres (6,140 kc/s). Their usual daily schedule on these channels is for the former from G.M.T. 21.30-03.00, and the latter until 05.30. Bear in mind that W8XK is also to be found on 13.93 metres (21,540 kc/s) between the hours of midday and 19.00 G.M.T., and on 19.72 metres (15,210 kc/s) between G.M.T. 15.00-22.15. It is one of the best stations to follow throughout the day. The interval signal is easily recognisable, as it consists of the three notes used by all studios associated with the N.B.C.

A South American station, of which broadcasts have again been received, is HJ1ABB, Barranquilla (Colombia) on 46.53 metres (6,447 kc/s); it relays, as a rule, the medium-wave transmitter HJ1ABA, in the same city, and in consequence both calls are made. It provides nightly concerts between G.M.T. 22.00-03.00 and announcements are given out in both Spanish and English.

RANDOM JOTTINGS

S O S Messages in 1934

FIGURES which have recently become available reveal that more S O S messages were broadcast last year than in 1933, and that the percentage of successful messages was higher. 889 messages were transmitted from London and provincial stations in 1934 as against 858 in 1933. This increase of 31 is all the more striking because the B.B.C. has ceased to broadcast messages for missing persons (except in cases originated by the police), and the total for 1933 includes 181 S O S messages of this class. A marked increase in the number of successful messages (56.58 per cent. for 1934 as against 44.75 per cent. for 1933) is attributed to the fact that the B.B.C. no longer broadcasts S O S messages for missing persons. A large proportion of this type of message proved to be unsuccessful.

Police Wireless in Brazil

WE understand that the police authorities of the State of Sao Paulo, Brazil, have placed an important contract with the Marconi Company for the supply of wireless equipment to be used for the establishment of a network of police wireless services throughout the State.

Communication is to be provided between the police headquarters in the capital and the principal police stations in the outer districts of Sao Paulo, and also with motor patrols, some of which will carry combined transmitting and receiving equipment for two-way working and others receivers only.

For the operation of these services there will be two powerful transmitting and receiving equipments for long-distance communication on short waves, four smaller stations for provincial police centres, and six transmitters and eighteen receivers for motor patrols, together with auxiliary equipment.

Types of Equipment

THE two main stations for long-distance working are to be fitted with Marconi short-wave telegraph-telephone transmitters of the S.8 type. The nominal rating of these transmitters on the highest frequencies is 500 watts to the aerial circuit on continuous wave telegraphy and 250 watts for interrupted continuous wave or telephony carrier. A thermostat-controlled quartz crystal oscillator is used to maintain the frequency to within one in 20,000.

Receivers for these stations will be the Marconi Type Rg. 28, covering the wave-range of 10 to 200 metres. This is an efficient four-valve instrument, with one screened grid high-frequency amplifier, detector, and two low-frequency magnifiers, operated by two controls for high-frequency tuning and one for reaction.

For the smaller fixed stations, four in number, and for the mobile patrols carrying transmitting and receiving equipment, identical apparatus has been selected. This is a portable short-wave telegraph-telephone transmitter, with valve frequency control, designed to operate at 1,000 volts 100 milliamperes high tension and 7.5 volts 6 amperes low tension, and a light-weight compact receiver. The latter incorporates one screen-grid high-frequency amplifier, one detector with reaction coupling, and one low-frequency magnifier, with two high-frequency tuning circuits.

New Station for Delhi

WORK on the manufacture of the equipment for the new 20-kilowatt broadcasting station at Delhi has begun at the Marconi Works, Chelmsford. The transmitter will be of advanced design, incorporating the most modern developments of broadcasting technique, and with its unmodulated aerial energy of 20 kilowatts it will be several times more powerful than any broadcasting station previously erected in India.

Part of the new Ferranti factory referred to on this page. This is the Valve Section.

New Ferranti Factory

EMPLOYMENT for at least 3,000 people will shortly be found at the new Ferranti radio factory at Moston now nearing completion. It is situated about a mile from the present works, and will be devoted exclusively to the manufacture of radio. The new factory has a floor space of 260,000 sq. ft., and is well under way.

TELEVISION NOTES AND NEWS

WITH discussion mainly directed, it is understood, on the choice of a suitable site for the first London television transmitting station, the Advisory Committee on Television, just formed to co-operate with the B.B.C. in establishing a public television service, held its first meeting at the General Post Office. Members present were Lord Selsdon, Sir Frank Smith, Colonel Angwin, and Messrs. Noel Ashbridge, J. Varley Roberts, and F. W. Phillips.

* * * * *

THE amount of money available for television service will necessarily be small until the scheme has gathered way, and it is thought that in all probability the existing Baird transmitting station at the Crystal Palace, which is already fully equipped, may be made use of temporarily. Failing this, a site for an entirely new station may be selected on suitably high ground near Hampstead.

* * * * *

MANCHESTER enthusiasts are more than a little disgruntled to think that London is to enjoy high-definition television before their own thickly-populated area. Radio dealers particularly consider that the fact that their London cousins will be able to think to-day what they will be thinking to-morrow is a distinct handicap, and have lost no time in framing resolutions much to that effect.

* * * * *

THE Edison Bell firm, following two years of earnest endeavour, have perfected a high-definition television receiver giving pictures of remarkable clarity and being suitable for both the Baird and the E.M.I. transmissions. Less than £25 will be the price of a vision receiver alone, and in the case of a complete sound and vision receiver incorporated in one cabinet the price will still be less than £40.

* * * * *

A DIRECTOR of a well-known radio firm (Mervyn) considers that some provision should be made to supply the Provinces with a low-definition service until their new high-definition stations are ready. "At least," he says, "the equipment now at Broadcasting House could be transferred to North Regional." For the present Mervyn will continue to market 30-line apparatus, introducing a high-definition receiver at the psychological moment.

* * * * *

SINCE going to press with last week's issue, we learn from the Westinghouse, Saxby Signal Co., Ltd., that they have modified the design of the Westector for use in high-voltage television circuits. We also learn that a new American cold valve of the glass envelope type is in course of manufacture, and we shall publish an article on it in next week's issue.

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.

"GOLTONE" RADIO PRODUCTS

RUNNING to no fewer than fifty-eight large and well-illustrated pages, the new "Goltone" catalogue of radio components will be found abundantly useful to all wireless enthusiasts. About 300 items are enumerated in the index, which gives some idea of the comprehensive range covered. Practically all the lines listed are made in England, the few that are not being clearly designated foreign. Devices for the suppression of man-made static have been given much space, notably patent air-spaced metal-screened down-leads as recommended by the Post Office authorities and installed by both the B.B.C. and Home and Dominion Governments. The list includes a wide range of chokes, iron-cored tuning coils, and general electrical accessories and compouents for the radio-set manufacturer, as well as for various specified kits.

ELECTRICAL INSTRUMENTS

THE well-illustrated catalogue published by James McMillan and Co. covers an extensive range of electrical instruments all combining best British materials and labour. The instruments listed are of three types. The moving-coil type is suitable for use on direct and rectified current, and is guaranteed to conform to the requirements of the British Engineering Standards Association Specification No. 89, 1929, for first-grade instruments. The moving-iron-rectifier type is for use on both direct current and alternating current of standard supply frequencies. The polarised-moving-iron type with magnetic control may be used on direct current or can be calibrated for use ou rectified current if specially ordered. All the instruments listed are calibrated individually against standard instruments, and are fitted with satin-finish metal scales. The radio instruments listed are neat in appearance and inexpensive, a four-range voltmeter and milliammeter, for instance, costing but 8s. 9d.

BOOK RECEIVED

GUIDE TO THE SUPERHET.

"THE SUPERHETERODYNE RECEIVER," by Alfred T. Witts, A.M.I.E.E. (Sir Isaac Pitman and Sons, Ltd., 3s. 6d. net) is a comprehensive work for which many wireless students, both highly proficient and otherwise, have been waiting. Until its appearance there had been a dearth of information on the subject in compact form, and one was forced to spend considerable time in obtaining, piece by piece, any required information. Until three years ago the superheterodyne was regarded in this country as an "academic" type of receiver, and not as a practical means of obtaining selective radio reception of high fidelity. In this respect it has now amply proved its worth, and no wireless student can nowadays afford to neglect the further possibilities it offers. Admittedly, much of our debt of gratitude to the superhet. exists because of the insistent demands which it has made upon the skill and patience of radio designers. It was, for instance, largely because of its development that some kind of automatic volume control became a necessity, but that necessity having made itself evident, solutions of the problem were not long forthcoming. An interesting chapter in the book under review devotes itself to considerations of automatic volume control. In short, this up-to-date book gives all the information necessary for a complete understanding not only of the superheterodyne receiver, but also of the developments in modern research that largely owe their being to this exploitation of a most efficient, reliable, and increasingly popular principle. An array of admirably clear diagrams accompanies the text.

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.

SLADE RADIO

AN illustrated photographic lecture was given by Mr. Geoffrey G. Hoare, at a meeting of the Slade Radio Society recently held at the Priory Rooms, Birmingham. The meeting was exceptionally well attended, there being about 130 members and friends present.

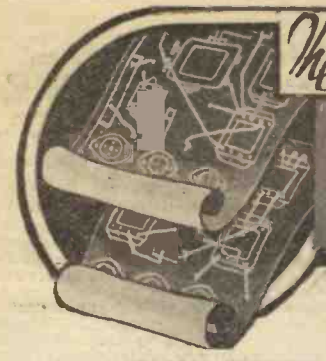
Mr. Hoare, who was, he pointed out, lecturing through the courtesy of Dr. Spencer, F.R.P.S., of London, proceeded to present to the audience a selection of unique and clever slides.

The lecture covered a wide range, dealing with the various forms of ray photography now in use, examples of spark, aerial, and trick photographs, etc., and a section dealing with the use of the camera to detect many types of forgery.

After a short interval, Mr. Hoare continued his lecture by showing a number of slides, produced by means of Mr. Pontings' controllable distortograph. This is an ingenious instrument, which, by deliberately upsetting the balance of opposing faults in a lens system, produces distorted photographs.

At a meeting of this society on Thursday, February 7th, the programme consisted of a debate "Is Car Radio Worth While?" It was commenced by a member reading newspaper extracts. This was followed by quite a number of speakers, who seemed generally to consider that car radio was not worth while and, in fact, some most amazing things were raised against its adoption. As time went on, however, other members who had had experience of car radio presented the opposite angle, with the result that when a vote was

(*Continued on page 847*)



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

These blueprints are full-size. Copies of appropriate issues of "Practical Wireless," "Amateur Wireless" and of "Wireless Magazine" containing descriptions of these sets can in most cases be obtained at 4d. and 1s. 3d. each, respectively, post paid. Index letters "P.W." refer to "Practical Wireless" 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.

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A.C. Twin	22.4.33	PW18
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A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	4.3.33	PW22
Double-Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
Class B Detector Two-Valver	17.6.33	PW24A
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	4.11.33	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	10.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Prima Mains Three	5.4.34	PW35D
Master Midget Two	12.5.34	PW35E
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	27.10.34	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Half-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	31.3.34	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	Out of print	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.

B.B.C. One-valver	Out of print	AW344
B.B.C. Special One-valver	Out of print	AW387
Twenty-station Loud-speaker One-valver (Class B)	Out of print	AW449

Two-valvers: Blueprints, 1s. each.

Melody Ranger Two (D, Trans)	Out of print	AW388
Full-volume Two (SG, Det, Pen)	17.6.33	AW392
Iron-core Two (D, Trans)	Out of print	AW395
Iron-core Two (D, QPP)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D. Trans)	Out of print	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	Out of print	AW338A
Lucerne Minor (D. Pen)	Out of print	AW426
Family Two (D. Trans)	*Apr.* '32	WM278

Three-valvers: Blueprints, 1s. each.

£8 Radiogram (D, RC, Trans)	Out of print	AW343
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D. Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D. Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans. Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	Out of print	AW422
Cossor Melody Maker with Lucerne Coils	Out of print	AW423
P.W.H. Mascot with Lucerne Coils (Det, R.C., Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	Out of print	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)	9.6.34	AW437
All-Britain Three (HF Pen,D,Pen)	Out of print	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	*Feb.* '32	WM271
Multi-Mag Three (D. 2 Trans)	*June* '32	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.-B. Three (D, LF, Class B)	Out of print	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)	*Feb.* '34	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

Four-valvers: Blueprints, 1s. 6d. each.

65/- Four (SG, D, RC, Trans)	Out of print	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	Out of print	AW421
Crusaders' A.V.C. 4 (2 H.F, D, QP21)	18.8.34	AW445
(Pentode and Class-B outputs for above; blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	*Feb.* '32	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	*Nov.* '32	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)	*Feb.* '34	WM350

Five-valvers: Blueprints, 1s. 6d. each.

Super-quality Five (2 HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (SG, D, LF, Class B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C.Two(D, Trans)A.C.	*June* '32	WM286
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM333
Six-guinea AC/DC Three (HF, Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers: Blueprints, 1s. 6d. each.

A.C. Melody Ranger (SG, DC, RC. Trans) A.C.	Out of print	AW380
AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	*Apr.* '32	WM270
All Metal Four (2SG, D, Pen) A.C.	*July* '33	WM329

SUPER-HETS.

Battery Sets: Blueprints, 1s. 6d. each.

1934 Century Super	9.12.33	AW413
Super Senior	*Oct.* '31	WM256
1932 Super 60	*Jan.* '32	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets: Blueprints, 1s. 6d. each.

1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	*Feb.* '32	WM272
Seventy-seven Super, A.C.	*Dec.* '32	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.

General-purpose Portable (SG, D R.C, Trans)	Out of print	AW351
Midget Class-B Portable (SG, D, LF, Class-B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM297
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM362
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM363

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	Out of print	AW329
S.W. One-valver for America	Out of print	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D. Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D. R.C, Trans)	Out of print	AW355
Experimenter's 5-metre Set (D. Trans. Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19,'35	AW463
Short-wave Adapter	*Dec.* 1.'34	AW456
Superhet. Converter	*Dec.* 1.'34	AW457

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Super-hets: Blueprints, 1s. 6d. each.

Quartz-crystal Super	*Oct.* '34	WM372

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368

Three-valvers: Blueprints, 1s. each.

Emigrator (S.G, D, Pen), A.C.	*Feb.* '34	WM352

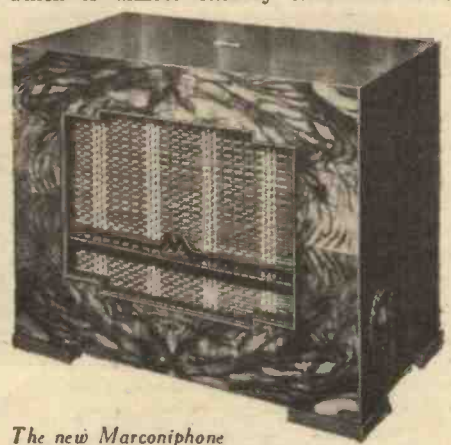
Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5.'35	AW462

FACTS & FIGURES

A New Marconiphone Loud-speaker

THE attractive cabinet-model loud-speaker illustrated on this page is the type "195" which has just been released by the Marconiphone Co., Ltd. It is referred to by the makers as a "multi-functional" speaker, mainly due to the fact that it incorporates a built-in volume control and also an automatic tone-compensating device. Other noteworthy features include the fitting of a non-directional metal-and-paper elliptical cone which is almost entirely free from resonances, and a highly sensitive permanent-magnet moving-coil unit.



The new Marconiphone Model "195" Multi-functional M.C. speaker.

This speaker is particularly intended for use as an extension in conjunction with such receivers as the Marconiphone Models 292, 289, and 296, although it can, of course, be used with many other high-grade receivers with eminently satisfactory results.

The impedance of the speech coil is 9 to 10 ohms at 800 cycles, and no input transformer is fitted since the speaker is intended for use chiefly as an extension from receivers in which an output transformer is already provided. The maximum speech input of the "195" is 6 watts, but we found that excellent reproduction was obtainable when the input was as low as 1 watt. An idea of the high sensitivity of the speaker can be gained when it is pointed out that the flux density of the magnetic circuit reaches a figure of 8,000 lines per sq. cm.

The speaker is definitely of the high-grade type, and the price is 8 guineas (cash), or (on H.P.) 16s. 9d. deposit and twelve monthly payments of 14s. When supplied with certain Marconiphone receivers the speaker can be obtained for an initial payment of 21s., and eighteen monthly payments of 9s. 6d.

Eddystone Ultra-short-wave Components

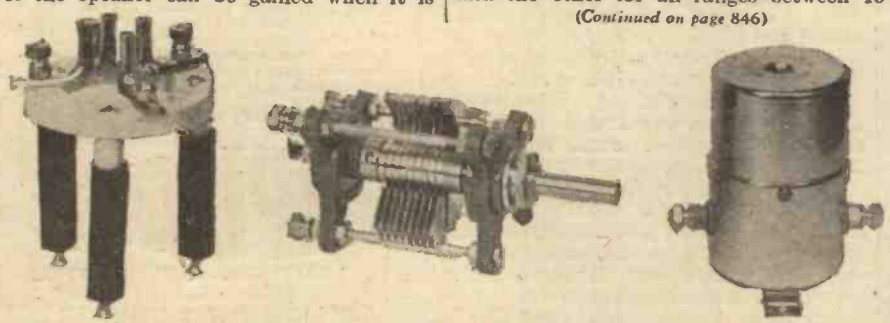
THREE interesting Eddystone components are shown in the accompanying illustration, these being a low-loss short-wave valve-holder (with stand-off insulators), a 100 m.mfd. "scientific" variable tuning condenser, and a screened all-wave choke. It is scarcely necessary to say that all of these components show extremely fine workmanship as well as mechanical and electrical efficiency, since the makers are so well known to all short-wave enthusiasts.

The valve-holder is built up on a ring of special no-loss insulating material, and is equally suitable for short or ultra-short wavelengths. It is of a type that will be in great demand for receivers intended for use in connection with future high-definition television programmes and the price is 1s. 5d. in four-pin type, or 1s. 8d. with five pins, the insulating pillars costing 7d. extra in each case.

The tuning condenser is an extremely fine piece of work; the fixed vanes are all soldered together to ensure perfect contact; the spider end plates are made from "D.L.-9" (a special low-loss material); connection to the spindle is made by means of a braided copper lead and the centre spindle is spring loaded to ensure smooth and steady movement. This component is available in four alternative capacities—35, 60, 100 and 160 m.mfd., the prices ranging from 6s. to 7s. 6d. The "Scientific" condenser is one that we can confidently recommend to every short-wave experimenter and constructor.

The screened choke illustrated is supplied in two types, one of which is for use on wavelengths between 10 and 200 metres, and the other for all ranges between 13

(*Continued on page 846*)



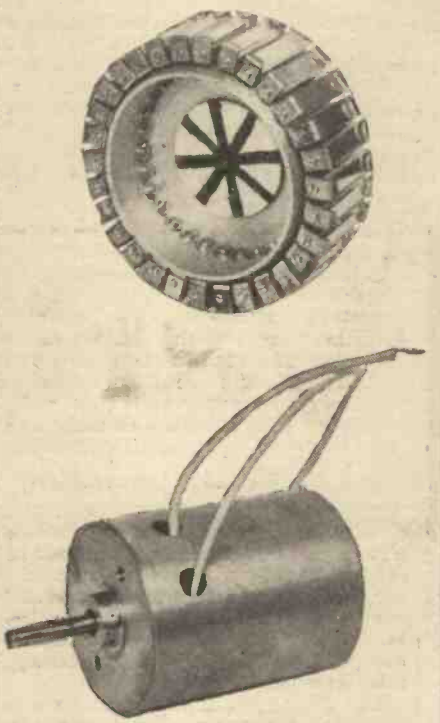
A group of Eddystone ultra-short-wave components, including a low-loss valve-holder, a tuning condenser, and a screened choke.

(*Continued from page* 845)

and 2,000 metres. The prices are 3s. 9d. and 5s. respectively. In both cases the windings are of very low self capacity and are arranged in sections on a hollow steatite tube. The screening case is made from pure copper, and is of ample diameter to avoid undue capacity between the windings and earth. On test it was found that both chokes were entirely free from resonance peaks over the complete ranges of wavelengths covered.

Mervyn Television Equipment

WE have recently received from The Mervyn Sound and Television Co., Ltd., a new mirror drum of extremely fine and accurate construction and which



Two television components by the Mervyn Sound and Television Co., Ltd. Above, a Duo-Sphere mirror drum and, below, a new Mervyn enclosed universal television motor.

has an external diameter of only 3½in. This drum is known as the Duo-Sphere, and has been patented. It is designed for use in connection with 30-line scanning, and is thus fitted with the necessary thirty mirrors which are all scientifically balanced and adjusted ready for immediate use on transmissions employing a 3 to 7 picture-size ratio. The drum can be supplied for use in either transmitter or receiver, the price being £3 10s.

Illustrated below the Mervyn mirror drum is a new Mervyn universal television motor, styled the BM4. As can be seen, this is a totally-enclosed unit, thus being practically dust proof. It is provided with self-aligning and self-oiling bearings, whilst there are rectangular brushes which are automatically applied to the commutator at the same tension.

This motor can be fed from either D.C. or A.C., through a suitable potential divider and it is so economical that when driving a 16in. disc the consumption is only about 95 milliamps. The price is 25s., which represents excellent value for so fine a unit. A similar motor can also be supplied for battery operation, the price in that case being 27s. 6d.

RADIO CLUBS AND SOCIETIES

(*Continued from page* 843)

taken an overwhelming majority were in favour of car radio.—Hon. Secretary, Chas. Game, 40, West Drive, Heathfield Park, Handsworth.

CROYDON WIRELESS AND PHYSICAL SOCIETY

AT the last meeting of this society, held at 5, Altyre Road, East Croydon, Mr. C. J. Hayward delivered a lecture on "Instruments used in the Navigation of Aircraft," accompanying his remarks by reference to actual instruments used in aerial navigation.

The lecturer explained that the advance in design of navigating instruments, and the fact that they were now used in conjunction with wireless telephony or telegraphy, had resulted in a very high standard of efficiency of navigation being obtained and had contributed largely to increased safety, particularly when flying at night or in conditions of poor visibility.

Reference was made to the fact that the introduction of certain instruments employing the gyroscope system of control had made it possible to fly in bad weather for long periods with comparative ease, and that, further, these instruments had done much to relieve the strain on the pilot, who in the early days had to rely almost solely on the compass for his direction. The functioning of the instruments which indicate the air speed and altitude was explained in detail. Visitors are heartily welcomed at any of the meetings, and particulars as to membership, etc., may be obtained from the Hon. Sec., Mr. H. T. P. Gee, Staple House, 51 and 52, Chancery Lane, London, W.C.2.

SOCIETY OF WIRELESS PIONEERS

THIS society announces the appointment of Mr. R. W. Stewart, 8, East View Terrace, Seaton Carew, West Hartlepool, Co. Durham, as hon. director of the Durham and Yorks area. A chapter is in process of being formed, and it is requested that all pioneers in short-wave work will communicate with Mr. Stewart, enclosing a stamp for reply. The Society of Wireless Pioneers also announces its own monthly journal under the editorship of the well-known American writer, Alice R. Bourke, of W0DXX, for many years reporter of a Chicago newspaper. The society will always be pleased to hear from all pioneers who began in or prior to 1924; the official Q.R.A.s are H. B. Shields, 39, Hardman Lane, Fallsworth, Lancs.; R. W. Stewart, 8, East View Terrace, Seaton Carew, W. Hartlepool; and R. L. Rawles, Blackwater, Isle of Wight.

THE CROYDON RADIO SOCIETY

MR. RIVERS-MOORE, President, lectured to the Croydon Radio Society on Tuesday, February 5th, in St. Peter's Hall, South Croydon. His topic was "From the Days of the Coherer," and his experience in pioneer radio resulted in a fascinating talk. Indeed, his audience were taken back to before 1900, and even before Marconi experiments were proceeding. Wireless for lighthouses was one of the first very useful applications of the then new science, and among the first signals ever sent were romantic ones between a lighthouse keeper's daughter and the postmaster's son on the mainland. At length came the coherer, and eventually the Fleming valve. The evening concluded with a demonstration of his redesigned quality receiver, incorporating a "tweeter" speaker. On Tuesday, February 19th, Mr. Mordaunt, of Purley Radio, Ltd., is demonstrating his new wide-range quality receiver, and as some very interesting results are expected, PRACTICAL AND AMATEUR WIRELESS readers are invited to attend, and will be welcomed. Fixture cards till the end of the session are available. —Hon. Secretary, E. L. Cumbers, Maycourt, Campden Road, South Croydon.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THIS organisation is holding its Annual Dinner and Dance on Saturday, March 9th, at Maison Lyons, Shaftesbury Avenue, W.1. It will be attended by the Senior American Consul, broadcasting authorities, radio manufacturers, etc. The tickets are 6s. 6d. each, evening dress optional, and ladies are invited. We would like to see many short-wave enthusiasts on this occasion, and an early application should be made for tickets.—A. E. Bear, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

SMETHWICK WIRELESS SOCIETY

AT a recent meeting of this society an interesting lecture, illustrated by lantern slides, was given by Mr. G. L. Deal, of the Mullard Wireless Service Co., Ltd. The subject was "The New Season's Valves and their Uses."

Commencing with a short history of the valve the lecturer described the evolution of the S.G. valve and H.F. pentode. The introduction of automatic volume control was mentioned as one of the causes for the revival of diode detection, whilst the need of set manufacturers for a compact chassis was stated to be the prime reason for the introduction of the modern multiple valve. Different varieties of these were dealt with and their circuit diagrams explained. New members will be welcomed at meetings of this society, particulars of which will be gladly supplied on application to the Hon Secretary, Mr. E. Fisher, M.A., 33, Freeth St., Oldbury, nr. Birmingham.

PRACTICAL 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).

Two H.F. Stage Receiver

SIR,—I have been a reader of your excellent journal since No. 1, and I add my support for a 2 H.F. stages receiver. I would like to see a design published incorporating 2 H.F. pentodes, power grid detector, and triode output (3-4 watts), using a 4-gang permeability tuner, with A.V.C. and visual tuning.—G. BENNETT (Holloway).

"A Splendid Gift"

SIR,—I wish to thank you for your splendid gift, the "Television and Short-Wave Handbook." I am looking forward to many happy evenings reading it through. I should very much like to see a design for a three-valve short-wave set included in your "cheap sets and quality" campaign. Wishing PRACTICAL AND AMATEUR WIRELESS even greater triumphs.—JEFFERSON H. LIGHT (Plymouth).

"Good Practical Radio Knowledge"

SIR,—Although a reader since number one of PRACTICAL WIRELESS, this is my first letter, so I feel it my duty to apologise for the delay in expressing my appreciation for the really good practical radio knowledge you have imparted to us each week through the pages of PRACTICAL WIRELESS.

Three of us here in "digs" each have our separate order for PRACTICAL AND AMATEUR WIRELESS, each cutting out and keeping articles which are likely to prove useful for future reference; three book shelves each have a copy of "Television and Short-Wave Handbook."

All being "Hams" we welcome the joining up of *Amateur Wireless*. I thought PRACTICAL WIRELESS was too good to be improved, but it seems each week you set a standard one step above the last, as H. W. (Cardiff) puts it, "A marvel of modern journalism."

Again, I heartily agree with H. W. (Cardiff) in his suggestion to make greater use of formulæ and numerical examples, in fact I will be so "unpractical" as to ask if we might have a "solve this" problem on the same lines in addition to the practical one we have each week. I suppose this is really side-stepping from the original idea of PRACTICAL WIRELESS, but now we have the addition of *Amateur Wireless* I am sure there is every excuse, and I feel sure most readers after a time will appreciate the help of a few figures to the practical side of radio.—H. G. SAUNDERS (Senglea, Malta).

Something Really New

SIR,—What about an A.C. *one* valver for local stations? Let's have it.—ROBERT T. SIMMS (Parkstone).

"A Real Quality Set"

SIR,—I would like to add my plea to other correspondents desiring a real quality set, something much bigger than you have hitherto attempted. My own idea of a super-set is a four- or five-valver employing 2 V.M.H.F., 1 DD/Pen. with A.V.C., with either a push-pull stage or an output valve such as the Cossor PT41B as the last valve. This valve to be run on its maximum anode voltage of 400. In nearly every case, when you have published a set, you have regarded the question of price as of primary importance, and I am sure there must be hundreds of your readers who, like myself, would welcome a set on the foregoing lines with quality the first consideration and the price absolutely the last.—F. DUNCAN (Newcastle-on-Tyne).

(*The general consensus of opinion does not support this point of view.*—ED.)

Another Quality Receiver

SIR,—Lately you have produced an astounding range of receivers at an equally astounding price. Now couldn't we have a quality set? I suggest a 2 H.F. tuning unit with iron-core coils and 3-gang condenser, etc., and alternative L.F. amplifiers of 2½, 6 and 12 watts output to go with it. The 6- and 12-watt models at any rate could have a very efficient frequency response. This would cater for all tastes.—P. B. EARLE (Rugby).

An All-mains Short-waver for Overseas

SIR,—As a reader of PRACTICAL WIRELESS and an enthusiast in the Tropics, where good components are essential and only short-wave sets, suitable for 14 to 100 metres, are of any use, I agree with your correspondent, L. Buckley, of Waziristan, India. What would interest us is a circuit to suit A.C. mains, 230v., and capable of good reception over a distance of about 9,000 miles.

I might state that a set with keen tuning is required, as the Empire stations, French, Dutch, and German stations are all very close together around 19 metres and 25 metres, and at times there is great difficulty in separating them. I have admired Mr. F. J. Camm's £5 Superhet: Three, but its range is unsuitable here.—T. DUNCAN (Kuala Lumpur, Federated Malay States).

A.V.C.: That L.S. Switch

SIR,—I was very pleased to read Thermion's outspoken and common-sense protest against makers of wireless sets forcing upon the public that stupid device A.V.C. It means that because some foreign stations fade, all foreign stations must therefore be so cut down that none (or very few) can be listened to with any pleasure.

Another thing, if makers must incorporate a speaker in every set they turn out, they might at least put in a switch to switch off such speaker, and enable one to switch on another independent one. As far as I know Ferranti's are the only firm to do this.—C. W. HODGSON (Liverpool).

High-tension Unit

SIR,—Replying to your invitation for suggestions, I should be glad if you could publish in the near future a constructional article on a good High-Tension Unit to run from a 6-volt car battery. I have been in conversation with several readers who would welcome an article of this description.—A. H. OLIVER (Hitchin).

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

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

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.

Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

What is a Time Base?

"I should like a simple explanation of the apparatus known as a time base which is used in a television set. Could I fit one to my home-made mirror-drum set?"—C. F. (Basingstoke).

The time base is only used with a cathode-ray tube. The electron stream in this device is directed through a small hole towards the fluorescent end of the tube, and on its way passes between two sets of parallel plates. One set is at right angles to the other set. These plates are connected to some apparatus which applies a potential to the plates and thereby deflects the electron stream. To obtain the correct picture, according to the particular transmission, the electron stream must be deflected in such a manner that it passes across the end of the tube at a definite speed from one side to the other, and at the same time must gradually travel from top to bottom so as to form a complete rectangle of light. The speed of this movement is governed by the potentials applied to the plates, and the apparatus which controls these potentials is known as the time base.

Improvised Push-Pull

"I have amongst my 'spares' two L.F. transformers and two ordinary L.F. chokes. I believe it would be possible to use these to construct a push-pull circuit, but am uncertain regarding the correct disposition of the parts. Could you please tell me whether my assumption is correct, and the most efficient method of carrying out the scheme?"—J. St. V. P. (Dover).

It would be possible to use the parts, but the results would not, of course, be as good as those obtained with correctly-designed components. Connect the primary of each transformer in series, and do the same with the secondaries. Connect the anode of the L.F. valve to one of the remaining primary terminals, and join the other primary terminal to H.T. positive. The junction of the two secondaries should be connected to G.B., whilst the remaining secondary terminals should be joined to the grids of the output valves, either direct or through stabilising resistances. The two chokes may be joined in series, with the junction taken to H.T. positive and the outside or remaining terminals to the two anodes. The speaker should be fed through 2 mfd. fixed condensers from the two anodes.

Hum and Earthing

"I have a home-made receiver in which three L.F. stages are employed, and the set works from the A.C. mains. It worked well until a short time ago, when hum became rather more pronounced. I searched carefully for the cause and noticed the following peculiarity. The first two L.F. valves are metallised. Whilst trying the valves to make certain that they were firm in the holders, I found that when I just touched the second valve the hum stopped and volume came up slightly. It was not looseness, as I proved by careful examination, but the improvement was only obtained while I held the valve. Can you state the reason for this, and the cure?"—A. W. (Bolton).

The most likely cause is the failure of the condenser used as a by-pass across the biasing resistance for that particular valve. The metallised coating is joined to cathode, and the cathode is earthed through the resistance and condenser in shunt. The absence of a condenser would lead to hum and probably poor response of bass notes. The capacity introduced by your body to earth, and thus from the cathode, would reduce the hum and improve results. On the other hand, the condenser may be in order but of too small a value, and the increase due to your body proves the necessity for an increase in capacity. Generally speaking, electrolytics of large capacity should be used on the L.F. side.

Arcing Switches

"Just recently a peculiar trouble has arisen in my house. When two of the upstairs electric switches are switched into the 'on' position I hear a long sizzling noise in my speaker. It stops after a short time, and only occurs sometimes. Can I cure this, or are the switches broken or in need of replacement?"

The switches have weakened through use and it is necessary to close the two sockets into which the knife-arm fits. The noise is caused by arcing across the two points, and this will cause pitting of the metal, and if not corrected will in time cause the metal to break, and the switch will then require renewing. If you examine the switch you will see the small double socket into which the arm is pressed when the switch is put into the on position, and in the dark you will see the arcing (simply screen the switch with a book or some similar device). Switch off at the main and carefully close the contact until a clean rubbing movement is obtained. If you are in any doubt regarding the problem of tampering with the switches, call in the services of a qualified electrician.

H.F. versus Superhet

"I am desirous of choosing a circuit for a home broadcast receiver. The number of valves is immaterial, and cost is also of no consequence. I want superb results from the point of view of high quality on a large number of stations. I think my needs would be served by a superhet or a straight receiver employing two or more H.F. stages. Which of these would you advise me to adopt?"—L. O. P. (Grimsby).

For superb quality the H.F. receiver would be chosen in preference to the superhet, as the high degree of selectivity of the latter type of circuit must lead to high-note cutting. Tone correctors could be incorporated, but even so the result would not equal the output from a straight H.F. type of receiver. On the other hand, some skill is required to build up such a receiver without introducing instability, and the choice of intervalve couplings must also be governed by the types of valves, the layout, and other things. If you feel capable of carrying out this selection, build a receiver with two H.F. stages employing modern H.F. pentodes, but if you feel unequal to making the circuit design, then obtain standard parts and construct a superhet on standard lines.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

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

OFFER the Following Manufacturers' Surplus New 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 for Illustrated catalogue, post free.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves and Magnavox Super 66 energised speaker, £12/10/0.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, condensers, resistances, and diagram, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps with 4v. 2-4 amps. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps., with 4v. 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9; 250 milliamps, 30 hys., 20/-.

ALL Premier Mains Transformers have engraved panels, terminal connections, all low-tension windings centre tapped, tapped and screened primaries 200/250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps, 4 volts, 2-3 amps, 4 volts 3-4 amps., 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps, 4 volts 2-3 amps, 4 volts 3-4 amps., 12/6.

PREMIER combined HT8 and HT9 transformer rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, either type, 18/6.

PREMIER HT10 transformer rectified output 200 volts, 100 milliamps, 4 volts 1-2 amps, 4 volts 3-5 amps, 10/-, or with Westinghouse Rectifier, 19/6.

PREMIER HT11 transformer 500 volts 120 milliamps rectified output, 4 volts 2 amps, 4 volts 2 amps, 4 volts 3-5 amps, 22/6 with; Westinghouse Rectifier, 42/6.

SPECIAL offer Western Electric mains transformers input 200/250 volts, output 350-0-350 volts, 120 milliamps screened primary 4 volts 1-2 amps, 4 volts 2-3 amps, 4 volts 3-5 amps, 9/6. Input 100/250 volts, 300-0-300 volts 60 milliamps 4 volts 1-2 amps, 4 volts 2-3 amps, 6/6. Input 200/250 volts screen primary output 500-0-500 volts 150 milliamps 4 volts 3-5 amps, 4 volts 2-3 amps, 4 volts 2-3 amps, 4 volts 1 amp, 4 volts, 1 amp, 19/6.

MAINS transformer with Westinghouse Rectifier output 150 volts, 30 milliamps and 4 volts, 2 amps LT., 15/- the pair.

USA. 3-gang condenser with trimmers, 3/11; a really solid job.

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

B.T.H. Truspeed Induction Type (A.C. Only), Electric Gramophone Motors, 100-250v., 30/- complete. D.C. model Truspeed, 100/250v., 42/6.

COLLARO Gramo. Unit, consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-; without volume control, 46/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire-Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CENTRALAB Potentiometers, 400 ohms, 1/-; 50,000, 100,000, ½ meg., any value, 2/-; 200 ohms, wire-wound, 1/-.

RELIABLE Canned Coils with Circuit accurately matched, dual range, iron cored, 2/11.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 144, 2,500 ohms, 12/6; D.C. 152 magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 16/6; 9in. cone, 22/6.

SPECIAL offer .00015 brass short-wave tuning condensers with slow-motion and complete dial, 3/9. Short-wave chokes 10-200 metres, 9d.

DUBILIER electrolytic condensers, 12 microfarads, 20 volts 6d., 8 plus 4 microfarads 500 volts 4/-, 50 mf. 50 volts, 1/9.

AMERICAN G.E.C. auto-transformers 450 watts, one side 110 volts, other 90/240 volts in 5 volt steps, 30/-.

(Continued at top of column three)

(Continued from foot of column one)

BRITISH Radiophone fully screened 3-gang .0005 top trimmers with complete, slow-motion drive, 7/6.

MAINS transformer input, 200/250 volts, 6 volts 1 amp, 4/6. 10 volts .5 amp., 4/6.

SPECIAL OFFER. Kolster-Brandes (shop-soiled) Receivers, 2-valve Battery Pup, with self-contained Speaker, Valves and Batteries, 27/6.

POLAR Star Manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmers; unscreened, 5/-.

RELIABLE Intervalve Transformers, 2/-; multi-ratio output transformers, 2/6; Microphone transformers, 50-1 and 100-1, 2/6; 1-1 or 2-1 Output Transformers, 2/6.

UTILITY 3-gang Condensers. 0.0005, fully screened, with trimmers, ball bearing straight-or superhet, 6/9, complete; with disc drive, 7/11; the best 3-gang available.

T.C.C. Condensers, 4mf. 450v. working, 4/-; 4mf. 750v. working, 6/-.

VARLEY Constant Square Peak Coils, bandpass type B.P.7 brand new, in maker's cartons, with instructions and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.S., band-pass, complete with instruction, in original cartons, 2/6.

PREMIER British-made Meters, moving iron, flush mounting, accurate, 0-10, 0-15, 0-50 m.a., 0-100, 0-250 ma., 0-1, 0-5 amps.; all at 6/-.

WESTERN Electric Condensers, 250v. working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 400v. working, 1 mf., 1/-; 2 mf., 1/6.

WIRE-WOUND Potentiometers, 1,000, 2,500, 50,000, 500,000, 2/- each; 1,000 ohm, semi-variable, carry 150 m.a., 2/-.

A LARGE Selection of Pedestal, Table and Radio-gram cabinets, by best manufacturers at a fraction of original cost. Send for list.

THE following Lines 6d. each, or 5/- per dozen.—Chassis valve holders 5-, 6-, or 7-pin, screened screen-grid leads, any value 1-watt wire resistances, wire end condensers 0.0001 to 0.5, 3 amp. mainswitches, Cyldon double capacitors.

SUPER-MOVING Coil Speakers, handle 10 watts, energised directly from A.C. mains, manufactured by world-famous radio and gramophone company, 40/-.

T.C.C. Electrolytic condensers, 8 mfd. 440v. working, 3/-; 4 mf. 440v. working, 3/-; 15 mf. 50v. working 1/-; 50 mfd. 12v. working, 1/-; 15 mf. 100v. working, 1/3; 6 mf. 50v. working, 6d.; 2 mf. 100v. working, 6d.

CONDENSER Blocks, H.M.V. 400v. working, 4+2+1+1+1+.5, 3/9; 2+2+1+1+1+.5, 3/-; Dubilier 300v. working, 4+4+2+.1, 3/-; Phillips 6+4+2+1+1, 4/6.

VALVES. See our displayed advertisement in Feb. 16th issue.

GRAMPIAN Permanent Magnet 9 inch Moving Coil Speakers, handles 4 watts. Universal Transformers, 18/6. Ditto Energised, handles 5 watts, 2,500 ohms, 21/-.

10,000 12,000, 15,000 ohm wire-wound potentiometers with mains switch, 1/6.

SCOTT Aerial and Anode Coils. Dual Range with Circuit, 2/6 per pair.

SPECIAL OFFER. Guaranteed U.S.A. Electrolytics. 4 mf. 1/9, 8 mf. 1/9, 12 mf. 1/9, all 550v. Peak Working.

DARIO directly-heated 1 watt, 200v. Mains Power Valves, 2/6.

BLUE SPOT 45 P.M. Speaker, multi-ratio transformer, handles 4 watts, listed 45/-, at 25/-, or in handsome walnut cabinet, 35/-. Blue Spot 99 P.M. Speaker, multi-ratio transformer, handles 5 watts, listed 59/6, at 31/-.

BLUE SPOT Energised Speakers 2,500 ohms type 29D.C., Power and Pentode Transformer, 9/11.

SUPER Moving-Coil Speaker by world-famous radio and gramophone company, 300v. 30 m.a. field (10,000 ohms), 25/-.

PREMIER SUPPLY STORES

(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest Station: Clapham North, Underground.

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

MAGNAVOX speakers, complete with hum-bucking coil, output transformers, etc. DC152 (9in. cone), 22/6. DC154 (7in. cone), 16/-. All with 2,500 or 6,500 ohms fields.

WESTINGHOUSE rectifiers, HT8, 9/6. HT9, 10/-. HT10, LT5, LT4, 10/9. Regentone transformers for HT8 or HT9, with 4v. 4amp. LT winding, 7/-. Eliminators, first-class make. Outputs 150v. 25ma, 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 8mfds or 4mfds, 500v working, 50mfds, 50v, 200 mfds, 10v, 3/3. 50mfds, 15v, and 15mfds, 100v, 2/3. 50mfds, 12v, 2/-. TCC type "M" condensers, any value up to .001 mfds, 6d. Erie resistances. 1 watt type, 7d., 2 watt, 1/2, 3 watt, 1/9. Send for comprehensive list.

WARD, 45, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

SURPLUS VALVES.—All brand new; battery types, 2-volt, HF.2, LF.2, LP.2, 1/9. Super power, PP.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt, 1 amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full wave rectifiers, 3/6; postage paid, cash with order, or C.O.D. over 10/-. Clarion Valves, Dept. 2, 885, Tyburn Road, Erdlington, Birmingham.

WOBURN RADIO OFFER FOLLOWING Surplus and Bankrupt Stock :—
ALL orders over 7/6, C.O.D. Charges free. To save delay send orders without money.
KIT A.—Cadmium plated chassis (ex-Murphy), with new type fully-screened Radiophone 2-gang condenser, curved dial with bronze escutcheon, and four chassis valveholders, 12/6.
KIT B.—As above, and including two iron-cored canned coils, 16/6.
KIT C.—As Kit A, but with Radiophone 3-gang condenser, 14/6.
RADIOPHONE semi-screened midget condensers, with side trimmers .0005. 2-gang, 5/- ; 3-gang, 7/6 ; 4-gang, 8/11.
DUBILIER dry electrolytic condensers : 8 mfd., 500v., 3/- ; 4 mfd., 500v., 3/- ; T.C.C. 8 mfd., 500v., 3/- ; 4 mfd., 500v., 3/-. British Insulated Cables, 8 mfd., 550v., 2/10 ; 50 mfd., 50v., 200 mfd., 15v., 2/10 ; 2,000 mfd., 12v., 8/6. T.C.C. 6 mfd., 50v., 15 mfd., 100v., 25 mfd., 25v., 50 mfd., 12 v., 1/3.
LUCERNE iron-cored canned coils, boxed with circuits, 2/6. Dario transformers 3 : 1, 2/-. Microphone transformers, 2/3. Western Electric mikes, 2/3.
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G.P.O. Relays, few only at 9/6. Tubular condensers, .01, .1 and .02, 6d. ; .25, 9d. Chassis valveholders, 4/5 pin, 1/3 half-dozen.
FORMO 1 mfd., 1000v. test, 1/- ; 2 mfd., 1/3 ; 4 mfd., 750v. test, 2/3. Toggles, 6d. Sistoflex, 7yds. 6d. Screened flex, 3d. yd. H.F. chokes, 10d. Binocular chokes, 1/3. S.W. chokes, 1/-.
ROTHERMEL P.M. speakers, 7½in. cone, power or pentode transformer, listed at 39/6, 17/6. Rothermel Midget P.M., 5in. cone, 12/6. Magnavox speakers, with humbuckers, D.C.152, 9in. cone, 22/6 ; D.C.154, 7in. cone, 16/- ; 2,500 or 6,500 ohm fields. Marconi model 25 pick-ups, 21/-.
READY RADIO mica reaction condensers, .00075, 1/3. Astra differentials, .00015, 1/4. Claude Lyons humdingers, 30 ohms, 1/4. Baseboard rheostats, 30 ohms, 1/-. Edison potentiometers, 400 ohms, 1/3 ; 200 ohms, 1/3. Pye S.W. valveholders, 4d.
CROMWELL cabinets, horizontal type, speaker at side, length 23ins., 6/-. Twin-speaker type, 7/6. All Walnut finish. Carriage extra. Speaker silk, 6d. piece.
CHOKES : 40h., 40 m.a. and 30h. 30 m.a., 4/-. Few Regentone Hedgehog type chokes suitable for eliminators, very efficient, 3/-.
BURGOYNE Class B three, horizontal cabinet, clock tuning, listed £6/10/0. Including Drydex batteries and accumulator, £3/10/0 (Carriage forward).
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QUOTATIONS for all kits and components.
WRITE for Trade List enclosing heading and stamp.
WOBURN RADIO CO., 9, Sandland Street, W.C.1. (Nearest Station, Holborn Und., first turning on right up Red Lion Street). Holborn 7289.

WEEDON P.L.R. Co., SPEAKER and REWINDING SERVICE. Mains transformers, etc. Cones, Coils and Centres fitted all M/C speakers, 5/-. Receiver repairs, including American and Midgets. Trade invited.—Dept. C, 80, Lonsdale Avenue, London, E.6. Maryland 1782.

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MAINS Transformers, chokes, etc.. to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

HALL-MARK THREE Superhet Three, ST600 Guaranteed First Specified Kits—Lowest Prices —Easiest Terms—Lists Free—Melfo-rad, Queen's Place, Hove. (Trade supplied.)

L. ORMOND SPARKS, late Technical Staff AMATEUR WIRELESS and WIRELESS MAGAZINE, will attend to all your Technical and Constructional troubles. Postal Queries 1/- each question. Blueprint alterations, 2/6. Diagrams 1/- per valve. Enclose stamped envelope. Detailed replies. Prompt Service.—54, Blythe Hill Lane, Catford, S.E.6.

½-PRICE CLEARANCE OF CAMCO PORTABLE CABINETS AT 20/-

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BATTERY SETS

G. Marconi

THE problem of frequency changing has worried most of us, particularly when dealing with the short waves. It is admitted that electronic methods of coupling are best, but no single valve is entirely satisfactory. An interesting method of employing Marconi X21, 2-volt heptode, has been evolved, and details will be sent to those who are working in this field.

WRITE TO THE VALVE DEPARTMENT, MARCONIPHONE COMPANY LIMITED, 210 TOTTENHAM COURT ROAD, LONDON, W.1, MENTIONING THIS PAPER.

MARCONI VALVES

THE CHOICE OF THE EXPERTS

VAUXHALL.—Magnavox permanent magnet Speakers universal for Class B, power, pentode or push-pull ; 7in. cone, 16/6 ; 10in. cone, 22/-.
VAUXHALL.—Magnavox energised types, 2,500 or 6,500 : 10in. cone, 22/- ; 7in. cone, 15/3. All brand new complete with humbucking coils, state power or pentode. Other speakers. Send for particulars.
VAUXHALL.—Practical Wireless Universal superhet chassis, completely built as specified with valves and Magnavox or Rola speaker, carriage paid, £8/15/0.
VAUXHALL.—Radiophone radio-paks R.F. superhets complete with volume control, escutcheon, new Lucerne station named dial, 34/-.
VAUXHALL.—Radiophone Intermediate frequency transformers, centre tapped primary. Secondary on bases with terminals, 5/6.
VAUXHALL.—Radiophone three gang condensers, piano type superhet. or straight fully screened, 8/6 ; two gang, 6/6.
VAUXHALL.—Benjamin. Class B transformers 1-1¼ to 1. Terminals fixing, 6/6 boxed.
VAUXHALL.—Radiophone volume controls, all values from 5,000 to 500,000 with switch, 3/6.
VAUXHALL.—Westinghouse rectifiers set, manufacturers surplus skeleton type H.T.8, 9/6 ; H.T.9-10, 10/-.
VAUXHALL.—Westinghouse Westectors, W.4, W.X.6, 5/9. Regentone transformers with terminals and H.T.8, 17/6.
VAUXHALL.—Rothermel Piezo electric pick-ups, 30/- ; Marconi K25, 21/- ; B.T.H. senior, 29/- ; Minor, 16/6. Sealed cartons.
VAUXHALL.—Gramophone motors : Collaro 32 model, 32/6. Universal model for 110, D.C. 200/250 AC/DC, 47/6.
VAUXHALL.—B.T.H. Truspeed AC. 30/- ; B.T.H. Universal model 110 D.C. 200/250 AC/DC., 47/6.
VAUXHALL.—Utility dials and drives complete with escutcheon, state black or brown, 5/-.
VAUXHALL.—Dubilier condensers, 4 or 8 M.F.D. dry electrolytic, 500.V working, 3/- ; 50 MFD.50.V. working, 1/8 ; 50 MFD.15V., 1/6.
VAUXHALL.—Dubilier or Radiophone tubular condensers non-inductive .1, 9d. ; .05, 6d. ; .002, .0002, and .0005, 4d. 1 mfd. Mainsbridge, 1/3 ; 2 mfd, 2/- ; T.C.C. .002 mica, 2,000v. test, 10d. ; .01, 1/-.
VAUXHALL.—Dubilier all values, 1 watt. resistances, 7d. ; Clix valveholders with terminals 5 pin, 7d. ; 7 pin, 9d. ; Continental 7 pin, 9d. ; W.B., 4/5 pin, 4½d. Post paid, 2/6, or over or C.O.D.
VAUXHALL. Bulgin L.F. Choke 20 henries at 50 m.a., 6/6. Mains resistances for Universal valves, 2/11.
VAUXHALL valve as specified for P.W. Universal A.C., D.C. Superset 40/- set of four.
VAUXHALL-UTILITIES, 163a Strand, London, W.C.2, over Denny's the Booksellers. Temple Bar 9338. Send postcard for new lists free.

TRANSFORMER and Choke Stampings, instrument and Resistance wires, spools and insulation. Lists Free.—Lumen Electric Co., 9, Scarisbrick Ave., Litherland, Liverpool 21.

"SWIFT SERVICE."
GENUINE BARGAINS.

SEND 3d. in stamps for our **AMAZING** new bargain list, containing details of all components, loudspeakers, kits and sets, eliminators, television, Short waves, All-wave Receivers, Car Radio, etc. Only genuine articles are listed.
DON'T DELAY. SEND IMMEDIATELY and take advantage of our astounding offers.
HALL-MARK III. KIT, 30/-.
HALL-MARK IV., Battery Model, **72/6.**
B.T.S. specified **HALL-MARK III** coils, 7/6 per set. Postage 3d.
ALL standard components and accessories supplied.
SATISFACTION GUARANTEED.
THE SWIFT SERVICE & SUPPLY CO. (PA5), 3, Featherstone Buildings, High Holborn, London, W.C.1. 'Phone : Holborn 1336.

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