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Radio in Aviation

The use of radio in aircraft has now reached a high stage of perfection, but there are many difficulties which have to be overcome, not only in transmission, but in reception. Apart from the design of the actual apparatus there is the important question of the aerial, which must be protected against ice formation and interference from the electrical system of the engine, and, in time of war, must be given some protection from stray shots. For telephony the mike must be masked so that it will not pick up engine noises, and, in time of war, must be protected against ice formation. For telephony the mike must be masked so that it will not pick up engine noises, and, in time of war, must be protected against ice formation.

Outside Broadcasts

Many difficulties in the way of efficient outside broadcasts may be smoothed away if experiments at present being carried out by the B.B.C. prove effective. It is proposed to use a very small knapsack transmitter for the use of the commentator, the range being just sufficient to enable the receiver aboard may be able to hear the message and thereby proceed to effect a rescue which would otherwise be delayed.

Blood Transfusion

The Belfast Blood Transfusion Service is anxious to increase the number of voluntary blood donors in Belfast and district with a view to providing an adequate supply of tested and graded blood donors to be of use in a national emergency. The work of the Blood Transfusion Service and their requirements in the way of voluntary donors will be explained in a talk to be broadcast from the Northern Ireland station on April 27th.

SOS Rebroadcasts

In future all telegraphic and telephonic distress calls received by the B.B.C. will be transmitted to the authorities from ships are to be rebroadcast during the normal programmes, even if this may mean an interruption of the normal broadcasts. This suggestion has been made as it is thought that small vessels which have only a broadcast signals to be picked up by an O.B. van placed in a suitable position, and the signals may then be retransmitted from the van to be up by the B.B.C. for the usual relay.

Sponsored Programmes

It is announced by the Minister of Posts and Telegraphs in Dublin that as a result of the sponsored programmes broadcast from Radio-Eireann the State will collect £35,000 from "advertising and other receipts."

Television in America

At the Golden Gate Exposition in San Francisco the authorities are arranging for television demonstrations whereby visitors will be able to see themselves on the screen, on similar lines to the demonstrations held at Radiolympia last year. This will be in addition to standard demonstrations of new television receivers. It is also announced that the television transmitter on the top of the Empire State Building is being rebuilt and will probably be working by the end of the month.

St. George's Day

On April 23rd the North Regional will have a considerable band in the broadcast which will be Britain's greeting to the New York World Fair. D. G. Brando, feature programme producer for North Regional, is arranging and will produce "Calling New York," which, besides being on the National and Empire wavelengths, will also be broadcast in the United States. At the close of this programme Lord Halifax is to speak.

Jam On It—Second Helping

Some weeks ago the B.B.C. broadcast a special "Jam Session" from New York in which see swing players took part. The B.B.C. will repeat the broadcast on May 6th (Regional), this programme being a recorded version of the broadcast. The records were made in New York and have been sent over to Broadcasting House.

Royal Academy Banquet

The speech of the President of the Royal Academy and the reply by the chief guest at the R.A. banquet have been broadcast yearly by the B.B.C. with only three exceptions since 1925. This yearly tradition will be observed on April 27th, when the President, Sir Edwin Lutyens, is to be heard by listeners in the National tradition will be observed on April 27th, when the President, Sir Edwin Lutyens, is to be heard by listeners in the National programme. It is anticipated that the guest of honour will be a member of the Royal Family.

Old-time Dance Music

The late night dance music on April 26th will be broadcast from the Palais de Dance, Nottingham. It will be a special "Old-time Numbers" programme, with Billy Murrin and his Commanders to play old-time numbers.

Variety from Bristol

In the series entitled "Theatres of Variety," which, besides being on the National and Empire wavelengths, will also be broadcast in the United States. At the close of this programme Lord Halifax is to speak.

On Other Pages

An Experimental All-wave Tuner

Short-wave Section

On Your Wavelength

Readers' Wrinkles

A Review of Communications

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Another Meeting of European Broadcasters

It is reported that a further session of the D.I.U. (Union Internationale de Radio-Diffusion) will take place at St. Moritz, Switzerland, during the period June 14th to 24th next.

France's New National Station

PARIS radio journals state that the initial tests of "France-National," the 500-kilowatt transmitter now under course of erection at Allonnia, will take place between May 16th to 30th.

Germany's Radio Channels

WITH the absorption of Austria, the Sudetenland, Bohemia, and Moravia, the German Reich has added a number of radio channels to its broad-casting network both on the medium and short wavebands. At present, Germany dispenses, for the purpose of propaganda, of twenty exclusive wave-lengths and seven channels shared with other transmitters. The former Czech station Moravska-Ostrava is now relaying the Breslau programme daily.

A 2,000-year-old Battery?

FOLLOWING recent excavations made in the neighbourhood of Baghdad (Iraq) curious-shaped hollow copper cylinders have been discovered amongst fragments of pottery, dating back to 2500 or 3000 years before the Christian era. When brought to light it was found that the inner surfaces of these tubes were coated with a species of bitumen. The tubes were sealed with a stopper through the middle of which could be seen a small iron bar. The entire construction of the alleged instrument recalls the primitive voltaic battery, and it is therefore considered a probability that electricity was known to the ancients.

General Listening Barometer

THE first stage of one of the most ambitious schemes hitherto undertaken by the B.B.C.'s Listener Research Section has just come to an end. Known as the "General Listening Barometer," the present scheme has tackled the problem of supplying broadcasting with a "box office" return.

Since December, 1938, over 4,000 representative British listeners in every walk of life have completed a total of nearly 70,000 log sheets, covering something like 5,000 programmes, each log sheet showing what broadcasts each log keeper listened to.

The results have, of course, still to be fully analysed, but the success of the scheme may be gauged from the fact that the proportion of log-keepers returning forms has never fallen below 90 per cent. The B.B.C. is most grateful to these 4,000 log-keepers for their voluntary co-operation in this scheme.

Some Spark Gap

THE apparatus which provides the ten million volt discharge which is used to herald the transmissions from Schenectady (N.Y.) will be on view in the Steinmetz Hall during the World's Fair at New York. This spark generator of one million volts is capable of throwing a ten million volt flash over a gap of thirty feet; this takes place within barely fifteen seconds of the moment the lever is pulled to set the machine in operation.

Dramatic Publicity for Car Radio

A car radio receiver, hitherto regarded primarily by its owner as a pleasurable and entertaining possession, has been given a new dimension by this year's racing journeys, has suddenly manifested its value in an altogether unexpected direction. Mr. Cecil Puttock, of Tankerton, Kent, recently heard an S.O.S for himself on the car radio asking him to go to the Hospital for Sick Children, Great Ormond Street, W.C., where his daughter, Shirley, was dangerously ill. He hurried there, and saw her before she underwent an operation.

INTERESTING and TOPICAL NEWS and NOTES

Torquay Municipal Orchestra

THE Torquay Municipal Orchestra, led by Harold F. Potts and conducted by Ernest W. Goss, will broadcast a concert from the Pavilion, Torquay, on April 24th. The solo artist will be Olive Goff (soprano).

Variety from Hanley

VARIETY on April 25th will be broadcast from the Theatre Royal, Hanley, from which there have been a number of broadcasts in the last three years. Regional as well as Midland listeners will hear the programme.

Seaside Bands Broadcast

Northern listeners will hear, on April 27th, music played by two seaside orchestras, one on the West coast, and the other on the East. Norman Newman and his band will be heard from the Tower Ballroom at Blackpool; and, later in the evening, Reginald Neale and his Orchestra will broadcast from the Spa at Scarborough.

SOLVETHIS!

PROBLEM No. 344

Wheeler made a three-valve battery receiver employing H.F. detector and output stages. When tested out, there appeared a marked instability, and he found it impossible to receive a station. He disconnected the aerial and began various tests to try to cure the trouble. He eventually found that by connecting a 2 mf. fixed condenser between the anode of the H.F. valve and earth the instability ceased, but when he rejoined the aerial he could not obtain any signals. Why was this? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to: The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes Ltd., 4-6 Moreton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 344 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, April 10th, 1939.

Solution to Problem No. 343

When Allen joined the other side of the pick-up lead to the decoupling condenser, he protected it on the H.T. side and thus prevented the valve from functioning by applying a positive bias to the grid. He should have connected the pick-up lead to the output rather than decoupling condenser.

The following three readers successfully solved Problem No. 342 and books have accordingly been forwarded to them: J.C. Payne, "Crabella," Lionel B. Scherger, Somerset; F. C. B. Leake, Shoreditch, N.1; F. T. Conner, 31, Windlesham Street, Lower Ear, nr. Wigan, Lancs.
AN EXPERIMENTAL ALL-WAVE TUNER

An Effective Though Simple Tuner Built from a Number of Separate, Small, Home-made Coils

By "The Experimenters"

THERE are plenty of all-wave tuners on the market, but most of them are fairly expensive, and many are not easily adaptable to individual requirements. Quite apart from that, the real constructor gains far more pleasure from making his own components than from buying them ready for use. It should be made clear right away that there are definite limitations to the home construction of a tuner of this type, although these are seldom of a serious nature unless a series of tuners is required for use in a receiver with a gang-tuning condenser. In that case, the accuracy of matching necessary cannot very well be guaranteed by the methods which are generally available to the amateur.

Nevertheless, the form of construction which is to be described lends itself to convenient experimental adjustment of the individual coils so that it is possible, for instance, to match two sets of coils for use in a "straight" circuit without very great difficulty.

Separate Coils

The main feature of the tuner is that it is composed of a number (any number can be used) of separate coils, each of which is designed and arranged to cover a certain waveband. Thus there is no need to compromise nor to have the technical disadvantage of dead-end losses or losses due to damping by nearby earthed windings.

Fig. 1 shows the general scheme, which is to place a set of coils on an aluminium chassis, built from a sheet of about 0.01 in. gauge aluminium measuring 6 in. by 6 in., and a few square separating screens. It is not suggested that this layout gives complete screening, but it does allow the coils to be screened sufficiently well for most purposes. If two tuners were to be used they could be placed so that the vertical sides of the screens face each other, the coils being arranged so that those for corresponding wavebands were at right angles to each other. Thus, if the long-wave coil of one tuner were upright, that in the other tuner would be horizontal.

Fig. 1. The general form of construction described. An aluminium chassis is used, and individual coils are fitted on small metal "bridges" as shown in inset.

In Fig. 1, we show only four coils, but it will be evident that more could be added if desired, provided that rotary switches with the necessary number of contacts were used. With four or five coils the standard five-position rotary switches are suitable. One convenient type of switch is the Bulgin type S.169, in which there are actually five-way switches in one. In each case one tap is connected to a rotating arm which makes contact with each of five other tags in turn as the switch knob is rotated. Another equally satisfactory switch is the Bulgin S.169, where there are two sets of ten terminals, rotating arms cross-connecting pairs of these as shown in Fig. 2. If two tuners were used, these of two double-contact switch units would be required, and they would be operated by a single ganging spindle. It will be seen from Fig. 2 that only four of the five available switch positions are used, but it will also be clear that the fifth could be used if an additional coil were used in the unit to give five wavelength ranges.

In wiring the switches, especially when a pair of tuners is used, as must necessarily be the case when the corresponding windings are brought into circuit at each position, the first position would bring into circuit the aerial and grid windings of the lowest-wave coil in the first position and the long-wave windings in the last position.

For Intervale Tuning

In Fig. 2 a tuner is shown in use as the aerial-grid tuner for the input circuit; it should be mentioned, therefore, that the

(Continued overleaf)
AN EXPERIMENTAL ALL-WAVE TUNER

(Continued from previous page.)

grid windings could be used for tuned-antenna or tuned-grid coupling between an H.F. valve and the detector, and that the windings used for aperiodic aerial coupling could be used for reaction.

S.W. and M.W. Coils

With regard to the coils themselves, these can conveniently be made on paxolin or shellacked-cardboard tubes, 4 in. in diameter and 3 in. long. Other sizes could, of course, be used, but if the tubes were any larger the tuner would become rather unwieldy. Fig. 3 shows the general form of construction for the short- and medium-wave coils.

In the case of the short-wave coils it is suggested that the grid turns be spaced by about the diameter of the wire used for winding; the aerial or reaction winding can be wound with the turns side by side. As an example of suitable windings, a coil to tune up to about 35 metres from about 20 turns should have a grid winding consisting of 3 turns of 18-gauge enamelled wire. The second winding should consist of 6 turns of 24-gauge enamelled or d.c.c. wire. The second winding should have 15 turns of 36-gauge enamelled wire, and the other coils space them in.

In making a coil to tune up to about 60 metres, the grid winding would have 15 turns and the other one would have 12 turns. In this case the grid winding should be carried out with 22-gauge wire, 24-gauge being used for the second winding as before. The different gauge of wire is suggested so that the winding lengths would be roughly similar. For higher ranges the correct number of turns should be approximately in proportion, and the spacing between windings should remain 1 in., until 100 metres is reached; from 100 metres to 200 metres leave 1 in. spacing, and for all other coils space 1 in.

A coil for the lower broadcast band should have a grid winding consisting of 110 turns of 38-gauge enamelled wire, and the second winding should have 90 turns of the same gauge. In this case all turns should be placed side by side; this will give a winding length of about 1 in. for the grid coil.

For Long Waves

In making a long-wave coil it will be necessary to pile wind in order to accommodate the necessary number of turns on the former. This is best arranged by fitting a number of thin paxolin washers on the tube, as shown in Fig. 4. These should be made to fit tightly, and the whole former should be given a coat of shellac to secure the washers. The grid winding should have a total of 400 turns of 28-gauge enamelled wire, 150 turns of the same wire being used for the second winding. Wind the wire as neatly as possible and in even layers, placing 200 turns in each of the divisions.

General Coil Data

In the case of all coils it is important that the turns of the two windings be run in opposite directions. With the short-wave coils it is a good plan to apply a coat of thin shellac after winding to prevent the turns from slipping. Another point that is rather important if the coils are to withstand the fairly heavy-handling which they will receive during experimental work is that the length of the main rubber-covered flex for the connections should be soldered to the end of the windings, and used for anchoring the wire in the pair of holes made in the former.

This is of greatest importance when dealing with the medium- and long-wave coils, since these are made from fine-gauge wire.

Matching

One of the advantages of the form of tuner construction described is that any coil can quickly be removed for alteration. It is necessary only to disconnect the leads and pull them through the holes in the aluminium former, and then lift the coil off its mounting "bridge." At the same time, if a pair of tuners is being made, it will save a good deal of time if coils are wound in pairs, taking care to make them as nearly identical as possible. As far as the short-wave coils are concerned, this implies that care should be taken that the turns of corresponding coils are similarly spaced.

One simple method of ensuring this is to wind on two lengths of wire, one of them being left free and later unwound; its purpose is simply to give even spacing.

It need not be emphasised that it is important to make a good earth connection to the chassis-screen, for the screening would be ineffective if the connection were poor or omitted altogether.

IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, April 19th.—Visit of the B.B.C. Symphony Orchestra to Wolver
hampton: Concert in the Civic Hall.
Thursday, April 20th.—Lucky Dip, Thir
teenth edition: a weekly magazine programme.
Friday, April 21st.—The Vortex, a play by Noel Coward.
Saturday, April 22nd.—Soccer: Scottish Cup Final and Amateur Cup Final.

REGIONAL (342.1 m.)
Wednesday, April 19th.—Concert Party programme.
Thursday, April 20th.—Gipsy Love, an operetta.
Friday, April 21st.—Gentlemen, you must Smoke (No. 5), a microphone menu for men.
Saturday, April 22nd.—The Wreckers, Acts I and II, from Sadler Wells.

MIDLAND (297.2 m.)
Wednesday, April 19th.—Midland Composers Concert.—3.
Thursday, April 20th.—Ten Years and All That, 1929-1939; musical memories.

WEST OF ENGLAND (285.7 m.)
Wednesday, April 19th.—Choral and Orches
tral Concert, from the Colston Hall, Bristol.
Friday, April 21st.—For Amusement Only; competition.
Saturday, April 22nd.—Squire's Party.

WELSH (371.3 m.)
Wednesday, April 19th.—Owen or Aor: Radio news.
Thursday, April 20th.—Gwynn April: Another Ball, a radio play, by G. D.
Quinnall Evans.
Friday, April 21st.—Debra's Excitement: Country Talent—authors reading their own works.
Saturday, April 22nd.—Orchestral concert.

NORTHERN (449.1 m.)
Wednesday, April 19th.—Concert Party programme, from the Polytechnic Theatre, Burnley.
Thursday, April 20th.—Sibyllas: Instrumental programme.
Friday, April 21st.—Orchestral programme.
Saturday, April 22nd.—Spotlight on Sport: My job as a Fagin convery, by Ben Helwell.

SCOTTISH (391.1 m.)
Wednesday, April 19th.—Tunes for Every
body: orchestral programme.
Thursday, April 20th.—Aberdeen University Students present their Eve-of
Charities Day Variety.
Friday, April 21st.—La Traviata, Act I (Verdi), performed by the Royal Carl Rosa Opera Company, from the King's Theatre, Glasgow.
Saturday, April 22nd.—Scottish Dance Music: orchestral programme.

NORTHERN IRELAND (307.1 m.)
Wednesday, April 19th.—Anty's party.
Thursday, April 20th.—Chamber music. Friday, April 21st.—Concert programme.
Saturday, April 22nd.—Bond concert.
It is often stressed that short waves call for high-quality apparatus specially designed for use on the high frequencies, and accordingly many readers fail to turn their attention to short-wave listening owing to the fact that they do not possess suitable components or that funds do not permit of the purchase of them. It must be remembered, however, that really reliable parts may be made at home and will be capable of the highest performance, provided that they are employed in suitable positions and that they are made to function correctly. It is not possible to deal fully with every aspect of component making for short waves, but the following data, studied in conjunction with a standard one-valve short-wave circuit, should give some idea of the lines to be followed, and should enable many readers to take up short-wave work.

If a one-valve circuit is made, it is possible to deal with every aspect of component making in one valve. For short waves, the following data, studied in conjunction with a standard one-valve short-wave circuit, should give some idea of the lines to be followed, and should enable many readers to take up short-wave work.

Fig. 1.—A standard short-wave circuit, showing how an L.F. stage may be added.

It is often suggested that a twisted flex or similar material should be employed for a series aerial condenser. For this purpose about 18 in. or so of ordinary single flex lead (complete with rubber and the cotton covering) is attached to the aerial terminal of the receiver, and seven or eight inches of the aerial lead-in are then wrapped round this flex, twisting the two exactly as in the case of standard twisted lighting flex. It will be appreciated that the capacity is dependent upon the thickness of the insulating material which is left round the wire, in addition to the number of twists which are made, and therefore no indication as to the capacity which may be obtained can be given. In the use of the amount of twist varied until the desired effects are obtained.

Using Old Vanes

Using Old Vanes

It will be seen from the circuit that five condensers are called for: one fixed, one semi-variable, and the others variable. C1 is a semi-variable included in the aerial circuit in order to adjust the damping effect of the aerial-earth system and prevent "deadspots" and similar effects. C2 is the main tuning condenser, across which is a much smaller variable used as a fine tuning or band-spreading condenser, whilst C3 is a reaction condenser. The latter is not a critical component and any good type of condenser such as is used on broadcast apparatus may be used there. A maximum capacity of 0.003 mfd. should be suitable in most cases. C4 is the grid condenser and may be of any value from 0.001 mfd. to 0.0003 mfd.—a standard component being again perfectly suitable here. This means that there are only C1, C2, and C3 to worry about from the point of short-wave efficiency and values.

As we are using the same circuit, the condenser C5 may be built up from pieces of metal—either brass, copper, aluminum, etc.—in variable form, the corners marked X may be bolted together with a short bolt, not entering the base, and that set of plates may then be turned on the pivot formed by the bolt Y, this being locked fairly tightly to prevent movement after adjustment. Condenser C5 must have a low minimum and maximum capacity, the latter preferably not being greater than 0.0002 mfd. Again an old variable condenser may be called into use. In this case it may be remembered that each moving and fixed plate acts as a small condenser, and therefore in its maximum capacity position an ordinary variable condenser may be regarded as a number of fixed condensers in parallel. It is possible to modify the capacity by removing plates from both sections, but again it is not possible to give any exact data concerning modified capacities owing to the fact that one or more of the factors previously mentioned may be altered. By direct proportion, removal of half of the plates from each section will reduce the capacity by half, and reduction in capacity may be regarded as directly proportionate to the number of plates.

Fig. 2.—A novel method of making a low-loss self-supporting coil with 3 windings.

This means that, if the aerial lead-in and earth are both near, there is no movement.
Leaves from a Short-wave Log

Melbourne Adopts The Kookaburra
VLR3, Melbourne (previously known as the Lyndhurst transmitter), is now heard on 52.15 m. (9.65 mc/s) from G.M.T. 09.00-12.00.

Radio Romania on Short Waves

In an unusual section of the waveband, namely, 32.61 m. (9.2 mc/s), listeners report a broadcast emanating from Bucharest (Romania) with the call: Radio Romania, given out by male and female announcers. News bulletins are transmitted in various European languages from G.M.T. 21.00 onwards, the English broadcast starting at G.M.T. 21.45.

Guadeloupe Changes Its Wavelength
ATFCH, trying out various channels, now announces its frequency as 7.445 mc/s or 40.3 m., as against its former wavelength of 24.5 m. (7.058 mc/s). Transmissions are now made daily from G.M.T. 22.00-00.30. Address: Poste de Radiodiffusion PGSAA, Boite Postale, Pointe-a-Pitre.

Radio Teheran Calling
TESTS are being carried out by the 20-kilowatt Teheran (Iran) transmitter EQB, on 48.74 m. (6.155 mc/s). Other stations also being used by this transmitter are EQC, 39.99 m. (9.98 mc/s) and EQA, 33.52 m. (8.96 mc/s).

Don't be Misled

SOME confusion is caused by the fact that one may hear Italian broadcasts on two neighbouring channels, namely, 31.02 m. (9.67 mc/s), and on 31.09 m. (9.65 mc/s). These are two entirely different stations, the former being Rome (Prato Smeraldo) 12R9, and the latter LAB, Addis Ababa (Abyssinia). Wait for the call to confirm identification as both possess a woman announcer, thus complicating the puzzle.

That Illicit West African Station
THE Nazi operated "mystery" station in South West Africa, to which reference was recently made in these columns, now works daily between G.M.T. 02.00-04.00 on 42.02 m. (7.14 mc/s); 33.09 m. (9.09 mc/s) and 28.01 m. (10.71 mc/s). It has been logged by listeners on these three channels at various times.

New Venezuelan Transmitter
YVARO, Puerto Cabello (Venezuela), is a new 2-kilowatt station now operating nightly from G.M.T. 23.00 on 96.76 m. (5.02 mc/s). The call is given out every quarter of an hour, and is followed by a short military march.

Amateur transmitter, G8KZ, of London, W.10, talks to radio "hams" all over the world from his transmitting station seen in the illustration. Also in the picture: "Bobby", a big black Labrador retriever, who sometimes "talks" to dogs in far away Chile and the Dutch West Indies.
National Television Push

PROVINCIAL wireless traders, sensing that there may be big business afoot in the television market, appointed a special deputation representative of the whole country which met manufacturers in London recently, so that jointly they could hammer out some campaign to their mutual advantage. In the end a joint committee of dealers and manufacturers was set up under the title of the Television Extension Committee. Its terms of reference are that it must bring home to the authorities the need for a speed-up and the extension of television into the provinces, because of the importance of the new industry at home, its export capabilities, and because it is essential that Britain should maintain the lead which it at present enjoys over all other countries.

Provincial Service

NOW, it is nearly three years ago since the high-definition system was inaugurated in this country, and since that time the provincial fans have been insisting on a local service. It was agreed that the first station should be erected at Birmingham, as this district would serve three and a half million people and thus would increase employment, as well as sales in that district. The bargaining point seems to be that the Prime Minister is a Birmingham man. This may be flattering to the Prime Minister, but personally I do not think that this is any advantage to the country as a whole from the point of view of television.

Birmingham the First?

CERTAINLY Birmingham has no particular claim for the first television station on the score that this country is controlled by a Birmingham Prime Minister. Has he done anything yet to warrant such a signal honour? Mr. C. O. Stanley, Chairman of the R.M.A. Television Development Sub-Committee, expressed the view that as the Post Office has already ordered a television radio link to cover an extension as far as Daventry, the additional expenditure required to link up Birmingham would not be more than £70,000, which sum would cover the construction of a relay station equivalent to Alexandra Palace. So certain are the manufacturers concerning the relative merits of cable and radio links that they are prepared, if the Government will proceed with the building of a Birmingham television station without delay, to sustain the loss if it should not be a success.

I am certain that manufacturers will wish to lend all the support they can to a campaign for an immediate extension for television in the provinces. Arrangements have already been made to send deputations to see the Postmaster-General, the Board of Trade, the Department of Overseas Trade, and the Minister of Labour.

Will England Lead?

WHILST Alexandra Palace remains the only television transmitter in the country the public will regard it as experimental. The construction of a provincial television station would, it is thought, encourage the population to feel that television had progressed beyond the experimental stage.

More important, of course, is that England should retain its hold on the television industry, and not allow it to pass into the hands of Americans as it has done with the film industry. Mr. F. W. Ogilvie, the Director-General of the B.B.C., recently said at Liverpool: "We have been hard at it for two years, and we have now come to a critical landmark in television work. We have developed the resources not merely with a view to the benefit of a thirty or forty-mile radius around London, but as a nucleus of a national system. We want to take further steps to make television a national system at the earliest opportunity.

"The speed at which we can go forward depends on the result of technical experience as to the means of transmission—it is hoped these results will be known before long, although certainly not this year—and the question of finance, because the B.B.C. does not get the whole of the £10s. paid for wireless licences. "We hope that this view will prevail that the £10s. is something for services rendered and that it will enable us, when a technical problem has been solved, to make television available throughout the country."

Some months ago I asked the question, "What is holding television back?" With all this good will and effort I once again ask that question.

The Radiolympia Poster Competition

THE results of the competition held by the R.M.A. Exhibition Subcommittee for suggestions from members of the trade for the poster and slogan to be used for advertising Radiolympia, has resulted, after a large number of entries had been judged, in the decision to use part of four suggestions, and to award prizes as follows: A Marconiphone representative sent in a design and the slogan, "Let's all go to the Radio Show," and is awarded 10 guineas; while a Philips representative suggested a design with which he is also awarded 10 guineas.

An Ekco representative forwarded an idea for the creation of two Radiolympia personalities and is awarded 10 guineas; while a prize of five guineas goes to a Philips representative who gave a suggestion for a slogan.

"SEEING IN"

Pity the television fan Attempting to see in, Recording Angiol, turn deaf ears Write not his language " Sin " When to the pearly gates he comes Oh, give him speedy clearance, "Two would spoil the temper of a saint, This constant interference, His definition marred and blurred By passing motoring mugs Whose engines give a petty spark Front all their many plugs, When Mrs. Brown (who lives next door) Her Turkey carpet sweeps, The would-be-televisor he leaps, In frantic rage he leaps, When lovely Lulu, Glamour Girl, Who lives at number ten, Is busy drying her shampoo.
Then it makes him leap again.
A gouty gent across the road
Is using violet rays.
"I would give him something worse than
gout,
What televiser says,
And feel that butty butcher,
At the bottom of the street,
Who switches on so frequently
To make more sausage meat.
Or the diathermic institute,
Oh, when he thinks of that,
And " bong-pong " beauties going there
To make a clean fat!
So all day long, and everyday,
They're twinkling with their switches,
Until with homicidal rage
Poor (diathermic twitch).
With life preserver firmly grasped,
To beat their bone-thick knob?
The law says " No "—What can he do?
Put Thermion on the job!!

Listening With a Purpose

I AM glad to note that on the
subject of "Listening with a
Purpose," a conference of group
and other listeners in Northumberland,
Durham, Cumberland, and Westmor-
land will be held on Saturday,
April 29th, in the Old Assembly
Rooms, Westgate Road, Newcastle-
on-Tyne. The conference is or-
ganised by the B.B.C. and the North-
Eastern and North-Western Area
Councils for Group-Listening. It
will aim to consider how broadcasting
can and does help the serious listener.
Principal speakers will examine the
direct educational contribution of
school broadcasts and of talks designed
for discussion groups, and the broader
potentialities of music, drama, talks
and other programmes.

The Deputy Director-General of the
B.B.C., Sir Cecil G. Graves, will
take the chair; and the opening
speaker in the first session will be
Mr. H. M. Spink, Director of Education
for Northumberland; the
second session will be opened by
Sir Charles Trevelyan (H.M. Lieu-
nant-Governor for Northumberland
and a former President of the Board of
Education). The first session will be
at 2.30 p.m. and the second at 5 p.m.
Members of the conference will be
present by invitation; and interesting
discussions in which keen listeners
and keen critics will take part may be
expected.

Invitations are being sent to many
people in the Region's four northern-
most counties who are already inter-
ested in group-listening or schools
broadcasting. As the conference also
covers the generally informative uses
of regular broadcasts, however—and
though numbers will be limited—the
Newcastle Director of the B.B.C.
(Broadcasting House, 54, New Bridge
Street, Newcastle-on-Tyne) will be
pleased to hear from any listener who
has a special interest in the cultural
aspects of broadcasting, and who
would like to have an opportunity of
attending the conference.

A.R.P. Shelters at Ekco Works

I WAS interested to hear that five
acres of land at the Ekco works
have been devoted to A.R.P. shelters
and accommodation for more than
2,000 has already been provided.
The total cost so far is approximately
£3,000. The shelters have been laid
out in a series of rectangles, with
communicating corridors and at least
two means of exit from any point.

Entrance is by way of gradually
sloping ramps (gradient 1:7),
designed to obviate slipping, tripping
or crushing. Additional exits are
provided for emergency use.

The details of construction are
interesting. A form of mass-produc-
tion was used for walling the trenches.
Boarding and uprights were prepared
entirely above ground, working to a
jig, and lowered in 50-foot sections
into the trenches. Cross-struts at top
and bottom, each butting on to
opposite members, were then placed
in position, and any small gaps
behind the walls were filled with
rubble.

This proved to be a particularly
satisfactory form of construction, being
capable of swift completion and pro-
ducing galleries of regular shape and
section.

Walled, Roofed and Floor-boarded

The shelters are boarded through-
out with creosoted timber, and the
roof is of treated corrugated iron
under a mound of sandbags and earth,
5ft. 6in. deep. Floorboards are laid
on creosoted cross-bearers bedded in
dry gravel.

Drainage sumps at the base of each
entrance and exit ramp protect the
shelters from flooding. The trenches
remained clean and dry throughout
the recent spell of bad weather.

Gas locks and light locks are pro-
vided at each entrance and exit, in
the form of twin layers of blanket
material.

I wonder if any other radio firms
have made similar arrangements?

TO FIND THAT FAULT!

THE WIRELESS CONSTRUCTOR'S
ENCYCLOPEDIA

5/6 or 6/6 by post from
George Newnes, Ltd., Tower House, South-
A Condenser Testing Unit

To determine the capacity of home-built condensers, I devised a unit shown in the accompanying sketch. An "S" type crystal receiver was used as this arrangement gives sharper tuning. It is best to use as large a variable condenser for tuning as possible. The coil is wound so that the local station is received when the tuner is turned to its highest capacity. To graduate the scale, first mark the point where the local is received as zero. By

depicted, these in turn being clamped to a suitable thick plywood baseboard, by brass clamping pieces "D."

The 4 EA brass screws "A" clamped the shanks securely, and clearance holes were drilled in the shanks for the steel adjusting rod. To permit ease of adjustment with the wing nut, a brass bush "E" was slipped over the rod between the nut and the hinge shank. The jaws "J" are separate, and are shaped from some 16 S.W.G. material which was handy at the time. — W. L. Dewton (Alnwick).

A Neat Chassis Test Jig

The accompanying sketch illustrates a chassis test-jig which I have constructed for an experimental hook-up chassis that I use when compiling short-wave circuit data, whilst marking the point to which the tuner is turned, to lower the capacity, and again bring the local into tune to correspond with the condenser connected. When the dial has been calibrated in this manner, you have a useful instrument which can be used to test home-made condensers having capacities less than the maximum capacity of the tuner. — A. Bathioldomew (Kirkebby, E1.).

A Simple 'Phone Conversion

A simple method of converting aperiodic coils.

A method of centralising aperiodic coils. The advantage of this method is that no batteries are required. It is a method of making one. I took a pair of headphones and detached the headband, as shown in the accompanying sketch. I then bent the one which was to serve as an earpiece slightly inwards, and joined the two earpieces by the screw and cap which originally joined the headband and earpiece together. The length can be adjusted as in the ordinary telephone, and the actual earpieces themselves can be adjusted to the most convenient position. I have found this idea very satisfactory, and the appearance is not displeasing. The advantage of this system is that no batteries are required. — R. G. Utzen (Nottingham).
A REVIEW OF COMMUNICATIONS

A Description of Some of the More Popular American Receivers
Various English Firms. Further Details of these Receivers may be
either to the Firms or to this Office

The receiver illustrated immediately below is the new Howard Model
450-A. This is a 12-valve 6-band model with a frequency range from 65 me/s
to 540 kc/s. The valve combination is H.F. stage, mixer, oscillator, two I.F. stages,
second detector, L.F., phase inverter, push-pull output, R-meter amplifier and
heat-frequency oscillator. Electrical bandspread tuning is employed, and a novel dual
dial with special bandspread logging scale is provided. This provides a total tuning
scale length of 47 in. divided into 1,000 divisions and thus tuning is greatly simplified.
The tuning controls have flywheel balances so that rapid adjustments may be
made, and a further novel feature is the inclusion of a B.F.O. shift switch which
transfers the oscillator to each of the I.F. circuits, these being of 1,500 kc/s and 465
kc/s. The H.F. stage is in circuit on all except the 5-metre band. The coil system
is coaxially designed with the band-switch, the switch and coil assembly is
shown below.

The output of this model is 91 watts, and among the many novel features are
separate 5-metre aerial connection, relay connection for break-in work, copper-plated chassis,
and alternative output connections for 3,500 ohms and headphones. The cabinet
is finished in brushed silver and black, and measures 11 in. high by 26 in. wide and
12 in. deep, the overall weight being 56 lb.

A separate speaker to match is available, and is also shown below. The price of this
model is £31 10s.

National Radio

There are a number of interesting models in the National range, and on these pages
we illustrate two of the more popular—namely models NC-100 (below) and
NC-80X (on the right). The NC-100 is the latest product of the National
company and uses the latest metal valves, twelve in all. The tuning range is from 30
me/s to 540 kc/s, divided into five setting-ranges. On all ranges there is an
H.F. stage, mixer and separate oscillator, two I.F.'s, second detector, A.V.C., push-pull
output, B.F.O. and a visual tuning indicator of the cathode-ray type. The aerial input arrangements
permit either the doublet or single-wire type of aerial to be used, and the makers suggest
that for use below 50 metres an earth connection may be desirable. The output connections are
taken to a 4-prong socket for connection to a speaker which is supplied with the receiver. A headphone
jack is mounted on the panel and is wired so that the speaker is silenced when phones are
in use. The main tuning control operates a 3-gang condenser through a multi-
revolution type drive, and in tuning across any one-coil range the dial makes ten complete revolutions, and
since the diameter is 4 in., the scale is thus equivalent to a length of 126 in. There
are fifty divisions round the scale about 3 in. apart, and the index numbers are
changed automatically as the dial is rotated by means of an epicyclic gear, so that the calibration numbers are
numbered consecutively from 0 to 500. The operator

In the National NC-100 receiver there is a cathode-ray tuning indicator, as well as a pilot light to indicate that the set is switched on.

The Howard Model 450-A. Note the novel tuning dials with bandspread device.

The Howard coil unit and the cabinet speaker as used with the Howard receivers.

The Howard coil unit and the cabinet speaker as used with the Howard receivers.
RECEIVERS

which are Obtainable from
Obtained on Application

tuning control, varying the beat frequency over about 20 kc/s; an A.V.C. on/off switch, an audio-gain control which also opens the H.T. supply when turned to the zero position and three sets as a standby switch. An H.F. gain control modifies the bias on the three I.F. valves and also operates in the signal-meter circuit. This control, at zero setting, switches off the receiver. Phasing and selectivity controls are also provided. Connections are provided for the inclusion of a 0 to 1 mA meter for signal strength indications, a bridge circuit being used for this purpose. An important point regarding these two models is that they are designed for A.C.-D.C. use, and battery versions are available. The price of either NC-SOX or NC-S1X is £28.

Hammarlund

In the Hammarlund range a new model is the HQ-120, seen at the top of this page. It is a 12-valve model covering from 30 mc/s to 550 kc/s and has a new crystal filter circuit. This has six ranges of selectivity from broad to “single signal” and it is now possible to use the crystal whilst receiving good quality musical broadcasts. There are three stages of I.F. and a special H.F. circuit with an aerial compensator enabling various types of aerial to be used. A novelty in this model is the provision of a valve-voltmeter circuit for the main tuning dial, and these are balanced with a signal strength meter which indicates the amplitude of the received carrier. It is arbitrarily calibrated in E units and also in decibels. A novel additional feature in this receiver is the inclusion of a modulation monitor for the purpose of judging quality of I.F. equipment in a ‘phone transmitter. The I.F. stage of this receiver is from 32 mc/s to 500 kc/s and the intermediate frequency is 455 kc/s. A special gate is provided, with a separate phasing control, and a combined control gives various degrees of selectivity, A.V.C., on and off and stand-by switching. There are the usual H.F. and L.F. gain controls, a tone control and a pitch control, with a socket for “phone connection. The L.F. used is 455 kc/s, and the I.F. transformers are of the iron-core type. The total weight of this model is 9 lb., and the price is £33 10s. A suitable speaker for the receiver may be obtained for £4.

RME-69 and RME-70

In the RME-69, which is a 9-valve receiver, including rectifier, there is an H.F. stage of special design. The range of this receiver is from 32 mc/s to 550 kc/s and the intermediate frequency is 455 kc/s. The price of either RME-69 or RME-70 is £12 10s.

Skyrider

In the Hallicrafter range of receivers, which include the Sky Buddy, Sky Chief and Sky Challenger, there is now a new model, the Skyrider 23, illustrated at the foot of this page. This has 11 valves, including the rectifier, arranged as H.F., mixer and oscillator, two I.F.’s, second detector and first I.F., A.V.C., amplifier, power output, B.F.O., and noise limiter. The range covered is from 32 mc/s to 540 kc/s divided into eight wavebands—four for general use and four for relay controlling the amateur bands. These latter bands are spread out over the major portion of the 330 degree scale. To one side of this dial is a new signal meter, calibrated in both S units and decibels, and this is balanced on the other side of the tuning dial by a frequency range indicator. Both these dials are indirectly illuminated. A crystal gate is provided, with a separate phasing control, and a combined control gives various degrees of selectivity, A.V.C., on and off and stand-by switching. There are the usual H.F. and L.F. gain controls, a tone control and a pitch control, with a socket for “phone connection. The L.F. used is 455 kc/s, and the I.F. transformers are of the iron-core type. The total weight of this model is 9 lb., and the price is £33 10s. A suitable speaker for the receiver may be obtained for £4.
Today radio plays an important part in aerial navigation, and due to the fact that space is limited, and that specialised apparatus is called for, there are many interesting points in design which prove of interest to the radio student. At the Institution of Electrical Engineers recently a paper was read by N. F. S. Heath, which gave a very good insight into these problems, and the following details are reprinted in view of their interest.

Aerials

In the early days of radio-communication in aviation, aerials were relatively simple and it was possible to pay out a considerable length of wire, suitably weighted at its end, and ensure that the effective height was a relatively high proportion of the available length. Wire, usually made of copper, but sometimes of bronze and similar alloys, and nowadays frequently made of stainless steel, was let out by means of a reel fitted in the fuselage at a convenient distance from the operator's hand. Lengths of 200 to 300 ft. were commonly employed and were terminated by lead weights of the order of 1 lb. for ordinary aircraft and of 2 to 3 lb. for flying boats, with substantially increased wire diameter. (The latter has been discontinued and the normal size is now fitted.) It was a reasonably easy matter to pay out the aerial or to reel it in. For this purpose the reel was designed to be operated by means of a handle which could be in one of three states: Locked for use, free on a ratchet for winding in, and free but with adjustable braking action for control during paying out. This class of winch is still in use and is fitted with a clamp, usually spring-loaded, whereby the wire can be held securely, thus providing a good contact, an essential point during reception.

The types of weight used for the terminal bob varied in different countries and included solid weights secured on a spring, fitted weights to increase downward pull on the aerial, distributed weights to reduce a snatching action which would otherwise be referred to later. The aerial wire was originally let through the floor of the fuselage through a fairlead of insulating material, the wire being in the wound-in position being flush with its lower end. The form taken by the aerial on an aeroplane in flight is shown in Fig. 3, from which it will be seen that the effect of a wire as the length is reduced. The general shape of the curved portion is the same for all lengths and depends upon the diameter and smoothness of the wire, its weight, and the drag and weight of the terminal bob. Thus shorter aerials have a greater effective-height factor than long aerials.

The movement of this class of weight is not entirely satisfactory in flight and occasionally sways dangerously in the vertical plane. At any rate, the author's experience of this has been disappointing and it is thought that at high aircraft speeds the device is a positive danger in all but perfectly level and smooth flying.

A type of aerial which appears to have met with some success in America and in Germany is the finned stream-lined weight, sometimes known as a "fish." The idea is that the weight shall fly under the stabilising influence of the fins. It has also been proposed to give the horizontal fins such a shape as to cause a downward pressure in flight, thus adding to the effective weight of the bob without increasing its drag. It is found, however, that this class of weight is not entirely satisfactory in flight and occasionally sways dangerously in the vertical plane. At any rate, the author's experience of this has been disappointing and it is thought that at high aircraft speeds the device is a positive danger in all but perfectly level and smooth flying.

In view of the fractures of the aerial wire which are liable to occur, fairlead designs have been modified to allow of the slipping out of a complete aerial and weight through the fairlead.

In general, fairleads are permanent fixtures in the aircraft where they are installed with a slight trail to reduce stresses in the material. It would seem at first sight that the trail angle of the fairlead should be equal to that of the aerial in normal flight, but this condition is not permissible on account of the difficulty of paying off when the weight is within the fairlead and therefore out of the slip-stream. This difficulty is intensified when long lead-down tubes are used, as is often the case in large aircraft.
AVIATION
ed for Transmitting and
nals from Aircraft

In the case of flying boats the fairlead becomes a particularly difficult item of design and installation, since it has to be of rather greater length than usual and must be watertight for use on the water. The general practice is to provide a tube inside the hull with its lower end rendered watertight where it joins the hull. Before landing, the aerial and fairlead are withdrawn from the protective tube, which is then sealed at its upper end to prevent the ingress of water.

The insulation of the fairlead from the structure of the aircraft is a matter which calls for special care. Adequate leakage path has to be provided between the tube and the metallic "dope" or metal skin of the aircraft. One important addition to the substantially insulated lead used is to leave a path about 1 sq. ft. in area, free from metallic dope in order to avoid causing severe stress on the aeronautical coating, which is a semi-conductor of high-frequency currents.

The process of winding in the aerial becomes a pronounced physical exertion in the case of high-speed aircraft, and especially so when the operator has remained at high altitudes for some time and has required the use of oxygen. It frequently takes as long as five or six minutes for the operator to wind in 250 ft. of wire with occasional intervals for rest.

Designers have, therefore, been busy for years devising automatic power-driven winches, but it can hardly be said that these have been received with favour. There are no very substantial reasons for this failure, but perhaps the weight involved and the power consumption, derived from the aircraft's accumulator, are the chief obstacles. Wind-driven winches have also been suggested and tried out, but as

With the high-speed type of aerial of the present day the trailing aerial has become a very serious problem both to the designer of the aircraft and to the radio engineer. Trail angles have become extremely small, thus causing a risk of fouling the aircraft structure and giving a serious reduction of range of communication.

Short Waves

This has driven the radio engineer more and more towards the use of fixed aerials. With these it is impracticable to provide an effective height of more than a few feet or so, except in very large transport aircraft; in the case of small aircraft the effective height is limited to little more than 18 to 22 ft. Undoubtedly, it will be appreciated that long or even medium waves are no longer utilisable with any useful degree of efficiency. Nevertheless, on larger aircraft a fixed aerial above the aerodrome is employed even for long and medium-wave communication over short distances, and in the case of flying boats, when the aircraft is down on the water. On account of the small electric capacitance of these fixed aerials the radio apparatus has to be

loaded with inductance or capacitance, both of which cause a serious reduction of aerial current and hence of range.

The fixed aerial is a problem in itself, whether it is located below or above the fuselage. It becomes a particularly difficult one in the case of military aircraft. In the upper position it is liable to be in the line of gunfire, and in the underpass position it has to be clear of bomb racks and torpedoes and of retractable undercarriages. Both types have been employed, and in the case of the underpass aerial it has actually been found necessary to provide retractable gear to allow the aircraft to run along the ground, possibly in long grass, without risk of the aerial being torn away. As regards aerials in the upper position, it has always been a matter of compromise between the radio requirements and the aeronautical design.

The most general forms employed are shown in Fig. 1, where A represents a wing-tip-to-tail aerial, B a fore-and-aft single wire, C the broad-arrow type, and D the Y type. Each has its particular points. For instance, the wing-tip-to-tail type is a better radiator but it suffers from drag at high speeds and instability in the slip-stream; it is also a hazard when, in emergency, the occupants of the aircraft have to have recourse to their parachutes. It is also liable to be shot away when, after it has constituted a further hazard should it become entangled in the tail and rudder or the elevator. The fore-and-aft type is more stable but is less efficient, and perhaps a little less liable to be shot away, causes less drag, and is less dangerous from the point of view of parachute descent.

The broad-arrow type is inefficient owing to the close proximity of its lower member to the metal structure of the aircraft. It is also unsafe, however, from the point of view of gunfire since the joint is in a position through which the gun is not permitted to fire. The Y type is more efficient owing to its direct vertical limb, but its electric capacitance is small. It has the advantage of a reticulated symmetry, which improves conditions for direction-finding purposes.

Fig. 8.—This type of aerial has several advantages.

In recent years the demand that flying boats should have greater reliability over long distances has given rise to an improved technique in short-wave aerial design. Whereas it had been the practice to tune the aerial as part of the transmitter or receiver circuit, the increasing size of aircraft and the attendant installation difficulties occasioned heavy current losses in the feeder. Modern practice utilises elevated dipoles joined to a transmission line through a matching transformer and another matching transformer at the apparatus end. This practice should ensure a much improved aerial and set efficiency, but it is too early to give any figure for the improvement in terms of range and reliability. It will be observed that this technique, new for aircraft installations, seriously curtails the flexibility of the system, which is dictated by other conditions and the type of aeronautical design. A typical arrangement is shown in Fig. 8. This aerial system can be used on medium waves with fair efficiency by connecting the dipoles as the two limbs of a T aerial, the feeders being then parallel vertical radiators. On short waves the dipoles radiate horizontally polarised waves, and since long-range transmission involves ionised-layer reflections the radiators are effectively in a horizontal plane, and when the aircraft flies at right angles to the great circle of the ground station and aircraft.

Aerials require to be carefully insulated from the structure of the aircraft and must also be resiliently mounted. The usual practice is to terminate the upper wires with a length of shock absorber fixed at one end to the structure and at the other to the aerial wire through an insulator. In order that drag shall not be excessive the insulator has to be reduced to the smallest dimensions compatible with ade-
METAL RECTIFIERS

In Response to Many Requests, Practical Circuit Details are Given in this Article of Five of the Most Popular Applications of Metal Rectifiers

By The Technical Staff

Many constructors, when designing their own mains-operated receivers, are often faced with the problem of deciding which system of rectification they should use. And judging by the number of letters received, asking: "Which is the better, valve or metal rectifiers?" it would appear that quite a large percentage of the amateur designers leave it to our Query Service to solve the problem for them.

It is not always possible, however, to deal with such matters in detail in a letter, especially when the subject is made more complicated by the mention of certain components on hand, the restriction of further expenditure or unusual circuit specifications. Therefore it is hoped that this article will help to simplify matters by giving details of the general applications of the metal rectifiers, so far as the average constructor is concerned.

Advantages

Although it is not intended that this article should take the form of comparing the advantages or disadvantages of either system, it is only fair, as it is concerned with metal rectifiers, to give the outstanding features of these components. For example, the first point which is likely to be raised is the question of price.

Starting from the initial outlay, a metal rectifier will cost slightly more than a valve giving the same rectified output, but against this it must be remembered that the associated mains transformer should cost less for the metal rectifier and, what is even more important, the valve—by most makers' terms, is only guaranteed for ninety days whilst its metal counterpart is covered for a full twelve months.

With a full-wave valve rectifying circuit, it is necessary to employ a mains transformer having a winding for the filament heating, and a centre-tapped winding for the supply to the anodes, and it should be noted that the latter, in the case of a 330-0-330 volt type of rectifier, has the rather high voltage of 700 volts across its terminals. This not only calls for very good insulation of leads and winding, but additional care when dealing with such high voltages, from the point of view of safety.

With a metal rectifier, centre-tapped secondaries are not required and, owing to the "voltage-doubler" circuit, it is possible to get the input voltage to be actually below that obtainable from the rectified output. To quote one example, the type H.T. 14 rectifier with an A.C. input of 80 volts is capable of giving an output of 120 volts D.C.

Another very important consideration is the construction of the rectifier. In spite of the very robust construction of a modern valve it cannot be expected to withstand the same handling as the metal units, so one can add to the list of advantages the fact that the risk of damage is much less with metal rectifiers.

It must be appreciated that the outputs shown in Fig. 1 are not suitable for direct connection to the anodes of the valves in the receiver as, although they are of a direct-current nature they are still pulsating and such would produce a pronounced hum in the apparatus.

To smooth out the pulsating characteristics and to remove all traces of ripple, it is necessary to employ a component which will provide suitable voltage tappings together with normal decoupling precautions. The choke should be of reliable manufacture and capable of carrying the total current output of the rectifier without any fear of saturation. It is also essential that the chosen choke should provide an inductance of, say, 25 to 30 henries at the maximum current rating.

The capacities of the condensers are very important; it is advisable to adhere to the values specified by the makers of the rectifier for each particular type, otherwise there is a risk of damaging the unit if the capacity is increased, or reducing the output voltage if the capacity used is lower than that recommended.

The third or left-hand section of Fig. 2 shows the voltage-dropping resistance and decoupling condensers. The values of the resistances will depend on the currents flowing in the various circuits and the output voltages required, but the values shown can only be taken as a guide for average receiver requirements.

Q.P.P. and Class B Circuits

When these forms of output are employed in a receiver or amplifier the total current consumption varies over a wide range and the normal eliminator arrangements (Continued on facing page)
are not; therefore, satisfactory. This is due to the fact that if a sudden demand for current is made above the usual output, the voltage will decrease correspondingly.

An eliminator circuit recommended by the makers of the Westinghouse direct current is shown in Fig. 5. It consists of a tapped resistance across the A.C. main supply, which limits the current to 10 amperes. This, in turn, limits the voltage to a level that is suitable for the operation of a D.C. eliminator or set on the A.C. supplies. The taps on the resistance can be adjusted to give the desired current and voltage levels.

Conversion of D.C. Apparatus

When the owner of a D.C. operated apparatus has his mains supply changed to A.C., or moves to a district where A.C. is in use, he is faced with the problem of adapting his set or eliminating the need for the old equipment. Two methods are possible for this conversion:

1. **Adding a D.C. Eliminator**
   - Obtain a D.C. eliminator and connect it to the A.C. supply. This will provide a smoothed, regulated output suitable for the D.C. apparatus.
   - Add a transformer for step-down from 220 V to 8-10 V A.C. mains.
   - Use a suitable metal rectifier to convert the A.C. supply to D.C.

2. **Changing the Apparatus to A.C.**
   - Purchase an A.C. receiver and replace the old D.C. equipment with an equivalent A.C. model.
   - New components may be required, such as transformers and rectifiers.

By use of suitable metal rectifiers, it is possible to construct simple rectifying units which will enable him to continue using his D.C. eliminator or set on the A.C. supplies. Two circuits recommended for such purposes are shown in Fig. 4. The values given are only suitable if the output of the D.C. eliminator does not exceed 40 mA and the total consumption of the receiver is not above 60 watts. The output can be adjusted according to the number of accumulators under charge, but in small installations, where it is not required to charge more than one cell at a time, this is not essential.

The resistance in the D.C. side of the circuit is very essential as it limits the current flowing and prevents damage to the rectifier. The resistance value can be adjusted by tapping the resistance to suit the current level of the output.

**Battery Charging**

One of the simplest forms of low-tension accumulator charging equipment being connected the wrong way round. A tapped resistance can be used in place of the tapping on the transformer.

---

**Fig. 4.**—The circuit on the left is recommended for supplying D.C. eliminators with a rectified supply from A.C. mains. On the right is shown a rectifying arrangement for use with D.C. receivers on A.C. supplies.

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**Fig. 5.**—One example of a simple, but efficient, L.T. battery charger.

---

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**WORLD**

All-Waves 9,200 Metres

**Multistage Receiver**

All-Waves 9,200 Metres

**Valves FREE**

*NEW TIMES SALES CO., Ltd., Ludgate Hill, London, E.C.A.*
The L.C.C. and Television

In connection with the Jubilee celebrations the London County Council staged a most interesting educational exhibition at the County Hall, Westminster, from March 21st to April 4th. Opened by Queen Mary, it provided a valuable cross section through the many types of training given by the schools and technical institutes which come under the jurisdiction of the council. It is generally admitted that one of the finest displays is that which exemplifies a modern development, namely, the technical training provided in the subject of television. The arrangements for this were left in the hands of the Norwood Technical Institute, as this was the first London school to give a two-year evening course of instruction in the subject. The classes are in charge of Mr. H. J. Barlow-Chapple, and the accompanying illustrations show quite clearly some of the equipment used in this work. A general view of the exhibit is given in the picture and on the left is a screened section where during B.B.C. television transmission hours a Baird receiver was operated. Not only can all the controls be demonstrated, but by means of a cathode-ray oscillograph the exact wave form of the vision signal radiated from Alexandra Palace was featured. In this way the student can study the effects of control panel adjustment and make checks on servicing work. On the roof of the cubicle are examples of disc and mirror-drum receivers to exemplify the changes made during the last few years and also to illustrate the principles of scanning. Apart from examples of receiver chassis, another built-up piece of equipment demonstrates photo-electric cell response to light changes. Coupled with this are forms of multiplier photo-electric cells, together with a model illustrating the electronic multiplication at each grid stage of the device. This is seen on the top shelf, and immediately below this is a display of the effect of a cathode-ray beam on different combinations of fluorescent powders. To the right of this is a simple form of time-base generator, constructed with the object of showing how the beam deflecting pulses are produced and the frequency of generation altered. Immediately below this is a most interesting piece of educational apparatus marketed by the Baird Company to show the whole action of cathode-ray tube working and servicing adjustments. Electron beam generation, focusing, line and frame scan generation, line and frame speeds, and scanning field brilliance are readily seen by operating the switches and knobs provided. By removing the cabinet side the student undergoing training is able to familiarise himself with all the adjustments that may be necessary in order to set up a magnetically operated cathode-ray tube.

Television Activities Abroad

From time to time reports reach this country concerning television activities in both the continents of Europe and America. Readers will no doubt be familiar with the Hays organisation in relation to films, and it is now learned that this same body has inaugurated a committee in order that the picture industry may watch television development in America. This same office made a survey several years ago, but this latest inquiry is to investigate the most recent developments. In America it is reported that 17 licences to operate television stations have been granted, while six more transmitters are in course of erection, but so far none of the licensees have sought powers for the purpose of selling time to advertisers. In Canada the chairman of the Canadian Broadcasting Corporation has declared that in his opinion television broadcasting is not economically possible in that country at the moment. Every encouragement is being given to television research, but the C.B.C. intends to prevent exploitation by the premature sale of receiving sets. When a service does materialise in the Dominion of Canada it will be under the exclusive control of the C.B.C. as a public monopoly. One of the biggest problems to be solved is that of range due to the vast areas of the country which are sparsely populated. Coming now to France it would appear that big-screen television has not made very vast strides at the moment. From details furnished of the Barthélémy apparatus it does not appear that progress has gone beyond a 3ft. picture. This was obtained by cathode-ray tube projection using an anode potential of 40,000 volts, which is about the same figure used in the Baird equipment for a 15ft. picture. The transmission signals were derived from films, while the line definition was one of 440 lines. In France it has been stated that nearly twice this definition would be required to obtain adequate cinema quality, but it is felt that this opinion is based on results already shown which are well below those featured in this country.
How easily the morning paper can come between man and wife. For men must read and women must chat! The solution is to hand over the cigarettes. Will's Gold Flake, of course, for that's the cigarette women are smoking nowadays. They appreciate the flavour of the really fine Virginia tobaccos of which Gold Flake are made. As the fragrant smoke ascends contentment reigns. Speech may be silver, but silence is Gold Flake.

**WILL'S GOLD FLAKE is the man's cigarette that women like**

Ten for £1. Twenty for £1-
and, for the weekend, Flat Fifty box 2/6d.

41 (30p), High Holborn, W.C.
Plimsoll (130) 0972
TELEVIEWS

Mechanical Systems in America

Although the majority of the television receivers it is proposed to put on the market when American service transmits to take the air at the World's Fair in New York are of the cathode-ray tube type, certain companies are still continuing experiments with mechanical reproducers. Perhaps the most important of these is William Preiss, who was formerly chief engineer for Leo De Forrest. The outstanding advantage of the Preiss device is the cheap cost of the scanning unit. It embodies a tuned vibratory mirror system and only half a watt is said to be required to supply the driving force at high vibratory speeds. This has been made possible by using a special resonant mounting idea so that the natural period of vibration coincides with the line scanning frequency at which the mirror has to work. Small mercury vapour lamp beams modulated by a Kerr Cell provide the modulation and Mr. Preiss has declared that his unit can be produced for a sum not exceeding five dollars. It is even suggested applying the idea to the transmitter to act as a light spot scanner, and plans are being considered for trying out the whole idea in a selected city so that it can be compared side by side with cathode-ray tube sets. It would appear also that America does not intend to neglect the home constructor market. Two kit sets are already scheduled, and although the picture size is only about 4 in. by 3 in., it is claimed that this is sufficient for the home experimenter, who is not so programme-conscious as the ordinary home viewer. It is anticipated that these kit sets will represent a financial saving to the purchaser of from £12 to £15 when compared with the price of the finished article, and this, of course, a very material factor in their favour.

An Exhibition Difficulty

From the public point of view there is no doubt that at the present time television is being featured in a manner which cannot help but impress on everyone that the results leave no doubt as to the technical efficiency of the sets, coupled with the high entertainment standard of the programmes radiated. In many stores, exhibitions are being staged so that a range of receiver types can be featured, and since these are all operative at the same time, everyone has an opportunity of comparing the individual performance of sets on a scale which has not been attempted before.

Television Film Flicker

Referring to the subject of flicker, readers may have noticed that when the B.B.C. are radiating televised film pictures a very marked flicker becomes apparent on occasions. For some time now the B.B.C. have been using Mechan projectors of the continuous motion type instead of the intermittent movement machines. This has had the effect of reducing very considerably the unpleasant picture flare which evidenced itself with sudden changes of picture light value, but the flicker defect referred to has crept into the transmission. In the film machine itself the film is passed through the gate at a steady rate, and by means of a very ingenious arrangement of rotating and cam-operated mirrors, the separate film frame images are faded one into the other, so that the camera mosaic has projected on to an uninterrupted moving picture. The successive picture frames move at a rate of 24 per second to conform to modern practice with sound-on film recording, but the success of the scheme is very largely dependent on the alignment of the mirrors which produce the frame fading of the film images. If the alternate frames are of unequal brightness then flicker will be very noticeable, and this is what has actually occurred in practice. A very small amount of mirror deviation is sufficient to produce the defect, but it is understood that steps are being taken to prevent a recurrence of the trouble, for it mars what would otherwise be a satisfactory transmission as well as giving a set user the impression that the receiver is out of adjustment, whereas the fault is located all the time at the transmitting end.

Airing a Grievance

One of the most popular items of the B.B.C.'s Sunday television programmes is the play which is usually featured in the evening transmission. Sometimes it is a special script written for television, while on many occasions the whole cast of a play running in a London or provincial theatre has performed in front of the camera and brought pleasure to viewers. This action has, however, raised a grievance among theatrical managers generally. They point out that while cinemas can open, and plays be televised on Sundays only, the theatre has, up to the present had to keep their doors closed. While realising that the players themselves need one day's rest, they are suggesting that the theatre should be allowed to open on six days of the week, such days to be of their own choosing, and to include Sundays if so desired. It is felt that there should be no discrimination in the entertainment industry as a whole, and it is certain that now the issue has been raised the matter will be investigated further.

There is no doubt that enterprise on the part of certain companies is being shown in America to meet the demand for television equipment. Two kit sets are already scheduled, and it is claimed that this is sufficient for the home experimenter, who is not so programme-conscious as the ordinary home viewer. It is anticipated that these kit sets will represent a financial saving to the purchaser of from £12 to £15 when compared with the price of the finished article, and this, of course, a very material factor in their favour.

Routine Tests

Every day the Alexandra Palace television equipment is subjected to a routine test so as to eliminate as far as possible the likelihood of faults arising during the course of the day's run. The camera has a special test of its own so as to grade them according to sensitivity, and also learn whether the colour characteristics of the mosaic signal plate has changed, and even the dresses to be worn come under the same category. Very often the colour of a frock has to be broken up by the ingenious use of a scarf or sash, so that the best pictorial result can be given to the picture and retain good contrast values.

PRACTICAL AND AMATEUR WIRELESS

April 22nd, 1939
A REVIEW OF THE LATEST GRAMOPHONE RECORDS

ELISABETH SCHUMANN returns to Tider for her record this month, serving as a useful song by Liszt, "Oh! quand je dus," and one of Wagner's few songs, a lullaby, "Schlaf ein, holdes Kind" that has not been recorded before—H.M.V. DB 3654.

Opera lovers will be interested in the excerpts from "Daphne," Richard Strauss's latest. It was produced at Dresden on November 18th, 1938, and was dedicated to Karl Bohm, who conducted the first performance. The records were made with the great principals (including Lalo Schifrin and Torsten Ralf) with the Dresden State Opera Orchestra, Karl Bohm conducting. H.M.V. DB 6262 contains "Vergangenheit der Daphne" and H.M.V. DB 6482 "O wie gerne bleib ich bei dir," and a duet, "Götter! Bruder im hohen Olympus."

Operas in English

To their recent series of records of opera in English, the English Opera Group add a first class version of the famous quartet from "Rigoletto," and the trio from the Prison Scene of "Faust." The quartet, which reveals Marie's kind nature as she overhears the Duke making love to another girl, is sung by Webster Booth, Noel Esdaile, Eric Coates and Arnold Matters. The "Faust" trio (which occurs when Mephistopheles and Faust visit Marguerite in prison) is sung by Webster Booth, Joan Cross, Norman Walker and the Sadler's Wells chorus.

CATALOGUES RECEIVED

Edison Industrial Lighting Handbook

EDISON have issued a new industrial reflector catalogue, which has been compiled with the aid of objectors presenting a simplified handbook on industrial lighting. The handbook is in which the new Edison reflectors are known, clearly indicates the method of the catalogue contains full details of of the particular car dealt with, and are, therefore, absolutely authoritative, and are, therefore, absolutely authoritative, and whether the Service Managers or service directors of the leading makes of cars.

MOTOR REPAIR AND OVERHAULING

A NY of our readers interested in the technical side of motor engineering—or even owner-drivers of a sufficiently mechanical mind—will like to know of an important new work which is to be issued in weekly parts commencing on April 19th. Motor Repairs and Overhauling will provide in convenient form all the practical points, and special repair methods applicable to the leading makes of cars. These special notes have been compiled under the supervision of the Service Managers or service directors of the particular car dealt with, and are, therefore, absolutely authoritative, and up to date. A very valuable feature of the work is the inclusion in each weekly part of "A Quick Check-over Data Sheet." On these sheets are given all the data required when a particular make and year of car is ready for tuning, repair or overhaul.

Some of the chief items covered by these sheets are as follows: Carburettor Setting; Location of Valve-timing Indication; Valve timing; Location of Ignition-timing Indicators; Ignition Timing; Tapet Clearances; Best Plug Gap; Distributor Gap; Tyre Pressures; Toe-in on Front Wheels, etc.

As there is likely to be a big demand for these books, readers are strongly urged to secure their copy without delay.
In an ultra-short wave receiving set employing a half-dipole or dipole aerial and designed to receive only a comparatively-narrow waveband, maximum energy transfer is obtained by making the electrical length of the radiator or radiators of the aerial equal to about five-eighths of the wavelength corresponding to a frequency within the band to be received, the input resistance of the receiving circuit being made equal to the radiation resistance of the aerial and the input reactance being opposite to the aerial reactance at the said frequency. (Fig. 1.)

**NEW PATENTS**

These particulars of New Patents of interest to readers have been selected from the Official record of Patents and are published by permission of the Controller of H.M. Stationery Office and the Official Journal of Patent can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 4s.).

**Latest Patent Applications.**

8912.-Baird Television, Ltd., and Jones, V. A.—Television, etc., apparatus. March 12th.
8913.-Baird Television, Ltd., and Tingley, G. R.—Means for controlling the deflection of cathode ray, etc. March 22nd.
8958.—Belling & Lee, Ltd., and Strafford, F. R. W.—Means for attaching radio aerials to supporting masts, etc. March 21st.
8971.—Brown, C. O.—Systems for television, etc., a photographic record of a scene. March 16th.
8975.—Clothier, S. L., and Hogenkamp, H. C.—Apparatus for television communication. March 21st.
8922.—Izzard, A. T.—Wireless receiving aerials, etc. March 21st.
8932.—Koster-Brandes, Ltd., and Beatty, W. A.—Carrier wave transmission systems. March 21st.

**Specifications Published.**

502,172.—Mallory & Co., Inc., P. R.—Variable-inductive tuning devices for radio apparatus. (Cognate Application, 21914/37.)
502,258.—Carpentier, A. (Velede, H. C. Van de).—Television receivers.
502,190.—Monge, G. de.—Radio aerials.

That Elusive Friendly Spirit

SIR,—Let it be thought that the Croydon Radio Society's views on this topic are elusive, please permit me to offer a few observations from our angle. This society is naturally puerile and when it sees accusations of the missing friendly spirit, as that is one part of our activities which always receives full attention. The difficulty is that for the first meeting of the new member is necessarily among strangers and time must elapse before he is thoroughly at home. The new member must do all he can to make one of us is he who seems to know everything, scorches the way we do things, and expects to change the type of programmes to suit his particular branch of wireless. At the same time he, being so vastly superior, expects us to flock round him and beseech to make one of us is he who seems to know something, please permit me to offer -

E. YALDEN (London).

Decoupling

SIR,—With reference to the paragraph on decoupling, on page 8 of the March 18th issue, may I give the "unknown reason" ?

Decoupling is geometrical and not mathematical. Let us consider 100 cycles and call 24 = 600. The decoupling potentialmeter 100 ohms and 4 mfd. 20,000-400 ohms, and the decoupling index is 51:1.

If we substitute two cascade potentialmeters each of 10,000 ohms and 2 mfd each becomes 10,000+800 ohms and the decoupling index of each is 13:1. The combined decoupling index is 131:1, or about 1821.

In short, 10,000-2 mfd, twice is, at 100 cycles, 51+56 times as effective as 20,000-4 mfd. at 1000 cycles.

SIR,—Other readers may be interested in my log of amateur stations received on the "Prefect" Short-Wave Three. The following were heard during the DX Amateurs' contest week. March 15th to 22nd, on the 20 m. band.

W3FP, 5AA, SM6WE, LX1AY, LY1J, 64, 18, CICK, 1OG, 1QA, 1EZ, 02RH, HUT, G0VX, S6U, 8CP, ES5C, F3DY, LA1F, HAC2, SU1MW, 1CR, EQ1AY (?), HMPK, L1VOA.

W4DRZ, 6GRL, 7DRX, 8CMA.

W3PF, EOZ, FQP, FJG, BNC, ENN, HOK, AQM, ADM, ATK.

W0FE, JT, HPM, LH1, AZ, EOA, IK, KDX, IZ.

W3PF, EQZ, F0Q, FJG, BNG, EMN, CH81, UF, TA (?), W4EZ, G0DL, 7DRX, SCMA.

The aerial used was a 20 ft. horizontal one outdoors. The end of this was connected direct to the wire netting of an aerial mast and, as it was claimed to have worked well, for these are the first long-distance amateurs I have yet received.

E. ANDREW'S, (Brighton, Sussex).
The meeting held on March 30th, there was a discussion on the site has been chosen. It was agreed that the construction of the club’s receiver is in progress, and that the first report will be given at the next meeting.

The visitors were particularly interested in the Selector Switch and Relay which automatically tapped out Morse code. The radio was working perfectly, and the Morse code transmission was clear and audible.

One way which has been suggested for solving this problem is to fit a short baffle in front of the insulator, to prevent the lead-in or deck insulation from being disturbed. This has been found to be an effective expedient of partly enclosing the aerial wire in a cowl.

This afternoon some interesting demonstrations were carried out, and it is hoped that the amplifiers can be used in future lectures, together with other equipment.

At the meeting held on Monday, April 3rd, an interesting demonstration was given by Mr. F. J. Tucktield. The lecturer dealt briefly with the construction of an oscillator and the possibility of using it for transmitting radio signals. He also demonstrated the use of crystal detectors and an electrolytic detector, and went on to illustrate his own method of building a straight receiver. The talk was given by Mr. H. G. Nicolls, who is well known for his contributions to the field of radio.
Twin Turntables

I am anxious to make up a really good public address system, and have now in my possession two turntables with separate pick-ups—they are taken from a portable home-recording set. What is the best way of mounting up these so that they will offer the widest scope of use, and should the motors be separately controlled? Any help you can give me in making a really good unit would be appreciated."—J. E. B. (N.W.S.).

For best results we think the best plan would be to mount the two motors side by side with pick-ups in the correct tracking position as usual. A separate on/off switch for each motor would be desirable, and one pick-up should be joined to a volume control in the usual manner. The other pick-up would preferably be joined to a jack or pair of sockets, on which you could regulate the volume control and to the input of the amplifier in the manner needed for standard mixing, with which we presume you are familiar. By adopting the jack connection just described to it will be a simple matter to insert a microphone in place of the pick-up, a plug being joined to the mike transformer, and then you will have two pick-ups. Standard mixing and various combinations will then be possible.

Parts for Receivers

"I am a new reader of your paper, and should like you to tell me where I can obtain all the parts of F. J. Camb's 53s. All-wave Three,"—S. G. (Ellesmere Port).

All parts for any of the complete receivers described in this paper may be obtained from Kit form from firms who advertise in our pages, and Messrs. Peter Scott. Alternatively, you may be able to obtain the items from your local dealer or direct from the manufacturers, but by dealing with one firm you save postage costs and in many cases avoid delay by getting all the parts at once. Messrs. Peter Scott, of course, arrange Hire Purchase terms for most kits.

D.C. Mains and Earth

"I have completed the Experimental two-valve described in your issue dated January 14th last, and on testing it I found that when I connected the H.T. supply the fuse went. I had the G.B. and L.T. in circuit at the time, I get my H.T. supply from a D.C. mains eliminator. Could you tell me the cause of the trouble and how I could remedy it? The fuse is rated 250 volts and is a 25-mfd. fixed condenser rated at 250 volts would be suitable, and this is all that is possible without trouble. To charge at 5 amperes from a 200-volt supply you need a 100-watt lamp in series with the mains lead.

Adding a Pick-up

"I have a Cosmos AC4 (Model 3783). I wish to add a Reverted Phono, but there are no pick-up sockets. I have tried a mike and transformer with one wire to the grid of the MS/Pen. and the other to earth. The volume was ample, but when the set was switched on the set screeched, but gradually died down. Can you tell me the best way to connect up?"—J. E. R. (N.W.6).

When you connected the pick-up to earth you were using the valve without grid bias. To enable you to connect the pick-up to earth the mains and this blows the fuse. A 2-mfd. fixed condenser rated at 250 volts would be suitable, and this is all that is possible without trouble.

Visual Tuning Indicator

"My commercial set is fitted with a tuning eye which gives correct tuning indication. I am rather puzzled, however, by the behaviour of this component. On the broadcast band it does not make any difference if I adjust the crosses of light on the indicator do not move when once the station has been properly tuned in. When I tune the short waves, however, the crosses move with the signal, and on a morse station, for instance, you can read the signal with the volume wire turned up high, the signal moves all the time, but it does not do so on the broadcast band. Could you tell me the cause of this?"—J. E. R. (N.W.6).

Without a circuit diagram it is not possible to state definitely why this should be so. Take place of the broadcast band you will find that the set is so arranged that when switched to the short waves the A.C. circuit is cut out. On these broadcast bands the indicator gives a steady reading dependent upon the incoming signal, but on short waves the strength of a powerful signal may be sufficient to cause considerable current, and the connections to the indicator are then such that the current in the connecting lines changes with the signal modulation. Can you check the connections to see whether this is the case?

A Licence Problem

If our issue dated April 8th under this heading we gave an abbreviated reply which has caused some confusion. Under the terms of the normal broadcast licence a listener may install any number of receivers in his home for the use of himself, family or domestic servants. If, however, any part of the premises is let to others, then apparatus installed in that part of the premises must be covered by a separate licence. As mentioned in the reply, car radio, if permanent as in Messrs. Peter Scott's, would be separate, but a portable receiver may be used under the normal licence.
A.C. All-Wave Corona Four

A.C. Leader (HF Pen, D, Pow)

Double-Diode-Triode Three (HF, D, PM)

Nucleon Class B Four (SG, D, Pen)

Fury Four (2 SG, D, Pen, D, Pen)

1936 Sonotono Three-Four (HF Pen, D, PM)

Cameo Midget Three (D, 2 LF, Pen)

Hall-mark Three (SG, D, PM, Pow)

1937 Crystal Receiver

Sonotone Four (SG, D, LF, P, Pen, PM)

Three-Valve Crystal Set (SG, D, Pen)

Two-Valve Mains Short-wave Two (I), Pen

F. J. Camara's Oracle All-Wave Four (HF Pen, D, PM)

Blueprint, 1s. each.

1.11? Pen, D, Pen (RC))

Blueprint, 1s. each.

2.0.38 Four MP Pen, D, LF, P)

Blueprint, 1s. each.

Hall-mark Three (SG, D, Pen, D, Pen)

Two-Valve Mains Short-wave Two (I), Pen

F. J. Camara's A.C. £4 Superhet 4 (HF Pen, D, PM)

Blueprint, 1s.

The " Pyramid " One-valver (HIP S, D, Pen)

Blueprint, 1s.

1938 " Triband " All-Wave Three (D, 2 LF, Pen)

Three (318', Det., Pen)

The R.C.P. (Hip, 11, Pen)

22.1.38

Three (5, Det., Pen)

13.4.35

Two-Valve Mains Short-wave Two (I), Pen

Class B Quadradyne (2 SG, ll, Pen)

Blueprint, 1s.

Super-glit.y. Five..(2 HF,..D, RO..,)

Midget Short-wave Two (I), Pen

Three (2 SG, 11, Trans)

Three (3 SG, D, Trans)

One-valve :

Mains Operated.

Two-Valve Mains Short-wave Two (I), Pen

Mains Operated.

Two-Valve Mains Short-wave Two (I), Pen

Mains Operated.

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Two-Valve Mains Short-wave Two (I), Pen

Mains Operated.
MISCELLANEOUS ADVERTISEMENTS

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double the rate (maximum charge 2s. per paragraph). Display lines are charged at 4d. each line. Minimum order 10 words. All communications should be addressed to the Advertisement Manager.

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SOUTHERN RADIO'S WIRELESS BARGAINS
Thousands of Lines at sacrifice prices during Sale. All goods previously advertised still available—Southern Radio, 46, Little St., London, W.C.2. General Stock.

VAUXHALL—All goods previously advertised are still available, send now for latest price list, free—Vauxhall Utilities, 163a, Strand, W.C.2.

VALVES

A
MERICAN VALVES in Sealed Carton, all types 6d. post paid—Valves, 60/13, Harrow Road, N.6

LOUDSPEAKER REPAIRS

Loudspeaker repairs, British, American, any make. 24-hour service, moderate prices—Sinclair Speakers, Alma Grove, Copenhagen Street, London, N.1.

REPAIRS in Moving Coil Speakers, Cones and Chassis. All repairs charged and returned free—Price Quotations Including Fitting. Loudspeaker Repairs—L.F. and Speech Transformers, 1/2, post free. Trade invited. Guaranteed. Satisfaction, First Call, 78, High St., E.5.


NEW LOUDSPEAKERS

3000 SPEAKERS from 6d. each, P.M. and Emerged 5in. to 14in., including several for Wireless Sets, Shafton Speakers, Alma Grove, Copenhagen Street, N.1.

NEW RECEIVERS AND CHASSIS

A
L
L ARMSTRONG Radio chassis, including Press Button models, 9 latest models, can be seen at our Showrooms, Demonstrations daily. Armstrong chassis are sent on 5 days approval, carriage and packing free. Armstrong Company have a large and complete catalogue describing all models—Armstrong Company, 100, St. Pauls Way (formerly Kings Road), Clapham, London, N.W.1. Guviller 3105.

NEW RECEIVERS, COMPONENTS AND ACCESSORIES

BANKRUPT BARGAINS—List free. Few only 10/6, 10/-, 15/-, 25/-, 40/-, 60/-, 75/-, 10/-, 15/-, 30/-, 50/-, 100/-, 150/-, 200/-, 250/-, 300/-, 500/-, all prices include post. Valves, components very cheap—Banks, 6, Stafford Avenue, Brighouse. Write for quotations.

SITUATIONS VACANT


MISCELLANEOUS

SALE.—1938 Vicker S-walpeet box, also box of components—Hitch, 38, York Road, Bexley, E.C.

Cried that many, Cuthber Tartan—'You can't beat my reception, I say. Said wireless man, 'I'm mine with FLUXITE. So I'll back them again yours any day.'

See that FLUXITE is always ready to put Flute on the radio instantly. A little pressure on the right quantity on the right spot and you charging lasts for ages. Price 1/6, or filled 2/6.

ALL MECHANICS MUST HAVE FLUXITE IT SIMPLIFIES ALL SOLID FORMING FLUXITE LTD., (Dept. W.P.) DRAGON WORKS, BERMONDY STREET, S.E.1.

THE FINEST CHASSIS VALUE OBTAINABLE ARMSTRONG RADIO CHASSIS COMPLETE WITH SPEAKERS.

THE FINEST CHASSIS VALUE OBTAINABLE ARMSTRONG RADIO CHASSIS COMPLETE WITH SPEAKERS.

FREE ADVICE BUREAU COUPON

This coupon is valid until April 22nd, 1939, and must accompany all Queries and Writings.

PRACTICAL AND AMATEUR WIRELESS
GREAT NEW PRACTICAL PART WORK

MOTOR REPAIR and
OVERHAULING

THIS authoritative new part work is absolutely essential to Garage Proprietors and Mechanics, to service men and motor engineers—and all who have a practical interest in mechanical transport. Providing in convenient form all the time-saving repair methods applicable to the leading makes of cars and motor vehicles, it ensures that every job taken in will be carried out expeditiously and to the satisfaction of the customer! It is no exaggeration to say that MOTOR REPAIR AND OVERHAULING will quickly prove itself worth its weight in gold as a garage standard reference work.

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