

REFLECTOR AERIAL SYSTEMS—See page 247.

Practical and Amateur Wireless

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Edited by F.J. CAMM

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Publication

Vol. 11. No. 219.
November 13th, 1937.

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See Page 236.



Practical and Amateur Wireless

Edited by F. J. GAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sc.,
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VOL. XI. No. 269. November 13th, 1937.

ROUND *the* WORLD of WIRELESS

What is a Portable?

IN the early days of radio a portable consisted of a receiver, generally housed in a suit-case, complete with a frame aerial and two batteries. Such a receiver is entirely self-contained and may be made to work practically anywhere. The drawbacks to this type of apparatus are many—but the most important is the weight which has to be carried, as the batteries alone are in most cases considerably heavier than the receiver itself. There are many people whose manner of livelihood necessitates considerable travel, and they often find that a portable receiver is of great value to them. They do not, of course, require to be bothered with the problem of accumulator charging or of H.T. battery replacements, and in most cases the places at which they stay have mains facilities. Consequently, a universal type of mains receiver, that is, one suitable for use on D.C. or A.C. mains without modification, will be found of the greatest use. Furthermore, by keeping down the overall weight the field of usefulness is still further widened, and such a receiver may be relied upon to provide good entertainment practically anywhere in the British Isles. On page 242 will be found constructional details of a one-valver in which the reflex principle has been incorporated, and a metal rectifier employed in place of a valve in the detector stage. Consequently, the circuit is almost identical with a three-valve arrangement with economy in initial cost and maintenance.

League of Nations

THE new broadcasting studios of the League of Nations headquarters in Geneva are practically complete. It is proposed, when they are finished, to broadcast any important proceedings through the two short-wave transmitters at Prangins. A recording room is to be fitted so that records may be made when required.

Police Eavesdrop

IN the prison at Greenwich, Conn., U.S.A., microphones are fitted to a number of cells with a view to ascertaining the value of the police authorities being able to hear the conversations of the inmates. It is thought that this arrangement will enable confessions to be obtained and other valuable disclosures to be conveyed to the authorities unknown to the convicts.

Automatic Store

IN a store at Memphis, Tennessee, a customer selects her goods automatically. On entering the store she is given an individual key and selects goods by turning her key in a slot beside each article. On arrival at the end of the store the key is surrendered to a cashier who places the key in another slot and this brings all the selected goods on a conveyor belt for charging purposes. Communication between the assistants who replace the goods and the cashier is maintained by an inter-communication system.

and consist of a 15-valve chassis covering six wavebands from 9.4 up to 2,150 metres. The chassis is available separately at 39 guineas.

Marconiphone Public Address

AT the recent State Opening of Parliament Marconiphone carried out some elaborate public address work. The first operated at the foot of the grand staircase and notified Ambassadors and Judges that their cars were waiting, and the other was controlled by the police, using a microphone on an island site adjoining Lambeth Bridge, and operating five speakers. The co-operation with the police greatly speeded up the departure of all personalities taking part in this public function.

"Two-and-a-Half Octaves More"

THIS is the title of a neat little booklet just issued by Ferranti, explaining a new development in radio receiver technique. It is claimed that by this new process the latest Ferranti receivers give reproduction which includes 1½ octaves more music at the top and bottom ends of the piano scale as compared with the ordinary type of receiver. A copy of the publication will be sent to any reader who writes direct to Messrs. Ferranti, at Moston, Manchester 10.

Songs You Might Never Have Heard

AFTER the second broadcast of this programme 15,544 postcards were received, and the "City of a Million Dreams" came first with 5,404 votes, "Snow Bird" second with 3,828 votes, and "I'm Sending You Back My Engagement Ring" third with 2,002 votes.

Radio Communicators

A NEW type of inter-room communicator is announced in America, operating at radio-frequency instead of at low-frequency as in other systems. The signal is then carried from one point to another over the normal telephone wiring, and by using different frequencies two or more conversations can be carried over one line without interference.

Testing Gramophone Needles

TO ensure highest fidelity on radio-gramophones a needle manufacturer is now employing a shadowgraph method of testing. The needle point is cast as a very large shadow on a screen and thus imperfections are easily found.

ON OTHER PAGES

	Page
Frequency Changing in the Superhet ..	231
Practical Television ..	233
Operating the A.C. All-wave "Corona" 4 ..	234
Simple "Quality" Circuits ..	236
On Your Wavelength ..	239
Readers' Wrinkles ..	241
A One-valve Reflex Portable ..	242
The Amateur Set Designer ..	246
Short-Wave Section ..	247
Practical Letters ..	251
Queries and Enquiries ..	255

Indian Engineers Study Television

A PARTY of Indian radio and electrical engineers are in this country studying radio and television theory and practice at the National Radio and Television Service company's headquarters. They have passed their B.Sc. and other honorary degrees, and are all students at the Bombay Technical Institute of Maxagaon, Bombay.

McMurdo Silver Receivers

IT has now been decided to produce three preliminary models of the well-known American receivers in this country, prices being fixed at 48, 68 and 78 guineas. The sets are to be known respectively as the Homeric, the Olympic and the Georgic,

ROUND the WORLD of WIRELESS (Continued)

Jack Hylton Visits His Native Town

THE town of Stalybridge made big plans for the return recently of one of its local boys who "made good." The "boy" was Jack Hylton, who, thirty years ago, earned his first pennies in his native town by playing on an old piano in a public house. He returned with the band he has taken all over the world to give a free show at the local theatre in aid of holidays for the town's poor children. He played on the same piano on which he earned his first pennies. There was a civic reception by the Mayor and Corporation to welcome him back, and his father and mother took part. One of the illustrations on this page shows Jack Hylton being greeted by the Mayor of Stalybridge.

Short-wave Station for Singapore

ACCORDING to a recent report, the erection at Singapore of a modern short-wave station is being proceeded with. The new station, which will probably be on the air by next March, is to broadcast on a wavelength of 31.48 metres in the daytime, and on 49.9 metres at night. A radio service is to be provided for the whole of Malaya.

Caught by Radio

THREE London youths were recently accused at Southend of taking a car away from a Southend car park without the owner's consent. It was stated that ten minutes after the car had been reported missing it was stopped on the arterial road by a Metropolitan Police car which had received a wireless message.

Interchange of Announcers

ARRANGEMENTS have now been made for the temporary interchange of B.B.C. announcers between London and the various Regions, starting this month, when Mr. R. MacDermot will be transferred to the North Region, his place in London being taken by Mr. J. B. Selby of the Manchester staff.

INTERESTING and TOPICAL NEWS and NOTES

Edinburgh staff and Mr. T. W. Chalmers of the Belfast staff. These transfers will be of approximately one month's duration in each case.



Josephine and Earl Leach, the famous American and International dance impressionists, who are appearing in cabaret at the Embassy Club, London. They have recently appeared in the television programme.

New Appointment

WE are informed that the Institute of Public Address Engineers, of 83, Cannon Street, London, E.C.4, has appointed a new Secretary, Mr. C. S. Grace, B.Sc., F.I.C., and all inquiries concerning membership and matters pertaining to the Institute should be addressed to him at 22, Spencer Road, Chiswick, London, W.4.

Two Canadian High-power Stations

TWO 50-kilowatt long-wave stations are now under construction, one near Toronto, and the other near Montreal. These stations will be followed later by a similar transmitter for the Prairies,

and one for the Maritime service. A powerful short-wave transmitter of 50 kW, to enable Canada to participate in world broadcasting, is also under consideration by the Canadian Broadcasting Corporation.

Unknown Radio Artists

CARROLL LEVIS is at present searching for the "discoveries" that he will bring to the microphone in the second of his series of three programmes of new and unknown artists from all parts of the British Isles, to be broadcast on the Regional wavelength on November 10th.

Concert from Falmouth

ON November 12th, from the Princess Gardens Pavilion, Falmouth, another popular concert will be broadcast by the Falmouth Town Band, and Bernard Fishwick (baritone). The band, conducted by T. G. Moore, is composed mostly of shipyard workers. This broadcast will be given in the Western programme.

Theatre Organ and Robert Easton

MANY listeners wrote appreciative letters to the B.B.C. when some weeks ago Robert Easton, bass, broadcast a programme during which Reginald Foort accompanied him at the B.B.C. Theatre Organ. There were requests for another broadcast on similar lines, and this has now been arranged. It will take place on the National wavelength on the evening of November 12th.

Armistice Day Broadcast

ARMISTICE DAY services will be held all over the country on November 11th. Many schools, no doubt, will hear the broadcast from the Cenotaph in the morning, and during the afternoon listeners will hear an account of how Armistice Day is held in "Our Village." A visit will be paid to the War Memorial and the Village Hall, and listeners will hear something of what various villagers have to say about war and peace.

Music from the Movies

PETER YORKE has now completed his orchestral arrangements for the next production of "Music from the Movies," to be broadcast by Louis Levy and his Symphony on the National wavelength on November 12th. The numbers will include selections from the films "On the Avenue" and "Firefly," and the songs "Sunset in Vienna" from the film of the same name, and "Never in a Million Years," from the film "Wake Up and Live."



The Mayor of Stalybridge, Alderman Walker, greeting Jack Hylton on his arrival at the local theatre during his recent visit to the town.

In January, 1938, the senior announcer, Mr. A. S. Hibberd, will be transferred to the Scottish Region, and in February Mr. F. Phillips to the Northern Ireland Region, their places in London being taken respectively by Mr. A. H. Thomson of the

SOLVE THIS!

PROBLEM No. 269.

No reception could be obtained from Howard's battery-operated receiver unless a high capacity condenser was connected between the P terminal of the parallel-fed L.F. transformer and the grid of the output valve. What was the fault? Three books will be awarded for the first three correct solutions opened. Solutions should be addressed to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Nowacs, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 269 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, November 15th, 1937.

Solution to Problem No. 268.

The lack of signals below 20 metres was due to the fact that the pentagrid valve would not oscillate below this wavelength.

The following three readers successfully solved Problem No. 267, and books are accordingly being forwarded to them: B. W. Hammond, Harfreys Farm, Gorleston, Gt. Yarmouth; L. H. Keates, 17, Stoney Hill, Park Row, Bristol; J. Emery, Sewell, Harpenden Road, St. Albans.

Frequency Changing in the Superhet

A Discussion of the Various Circuits in Present Use is Given in this Article - By W. A. FLINT

THE most popular receiver in use today is undoubtedly the superhet, and its rise to fame is due to its great sensitivity and selectivity. Before considering in detail the various types of frequency changing circuit, it is as well to understand the working of the circuit as a whole.

If two sets of alternating current of similar frequency are fed into a circuit, the resultant current will likewise be alternating, and its strength will be dependent on the phase relationship of the incoming

percentage separation between two given stations to be materially increased.

Essential Conditions

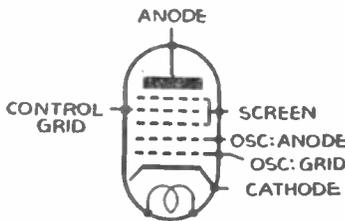
The conditions required in a frequency changer are:—

- (1) that a locally-generated source of constant oscillations shall be produced.
- (2) that the "local" oscillations shall be "mixed" with the incoming H.F. signals to produce beats;
- (3) that these beats shall remain constant whatever the frequency of the incoming signal, i.e., there shall be no frequency drift.

It is the problem of producing the local oscillations which has always presented difficulties in the design of superheterodyne receivers.

In the early days, two valves were generally used for frequency changing, and external coupling was therefore necessary. One valve was used as an oscillator, and the other operated as the mixer to produce the requisite beats at the desired intermediate

Fig. 1.—Arrangement of electrodes in a pentagrid valve.



signals. When the signals are of different frequency, however, the resultant alternating current will not be of constant amplitude, but, at regular intervals, peaks, which are known as beats, will be formed, the current falling to its lowest value between the beats.

In the case of a wireless receiver, the incoming H.F. currents are mixed with a source of local oscillations to produce beats. These are then rectified and amplified to operate a loudspeaker in the normal manner.

The beats between the carrier wave of the incoming signal and the local oscillations are not produced at an audible frequency, but at some relatively low radio frequency, usually at 110 kc/s or 465 kc/s. This is achieved by arranging the oscillator circuit so that the oscillations generated are always a constant frequency above or below the incoming signal. For instance, when the incoming signal has a frequency of 877 kc/s (342.1 metres) the local oscillations which are generated have a frequency of 987 kc/s (when using an intermediate frequency of 110 kc/s). When the frequency of the incoming signal is increased to 1,149 kc/s (261.1 metres), then the local oscillations assume a frequency of 1,259 kc/s, so that, no matter what the frequency of the incoming signal, the beats produced are of constant frequency. This constant frequency is in turn applied to a series of tuned circuits (I.F. transformers), resonating at that frequency, after which amplification the signals are detected in the customary manner and amplified at the relatively low audio frequency.

The obvious advantage of the method is, of course, that the tuning of the I.F. circuits remains fixed, and can be made very sharp, so that high and selective amplification is obtainable in a simple manner, while the use of a low frequency enables the

frequency. Separate tuning condensers were used, and the obvious disadvantage of this system was that there were two settings of the oscillator tuning condenser for each station received by the mixer valve—one above, and the other below the frequency of the received station, and separated from it by the intermediate frequency. This system is little used nowadays, and, where it is, improvements in coil and circuit design allow of the use of ganged condensers.

The first single valve used to combine the operations of frequency changing was the H.F. pentode and two circuits, known respectively as cathode injection, and anode injection, were evolved. The former was generally used with A.C. mains valves, but the circuit is so little used to-day as to merit but passing mention. It was, however, a pioneer and a step in the right direction.

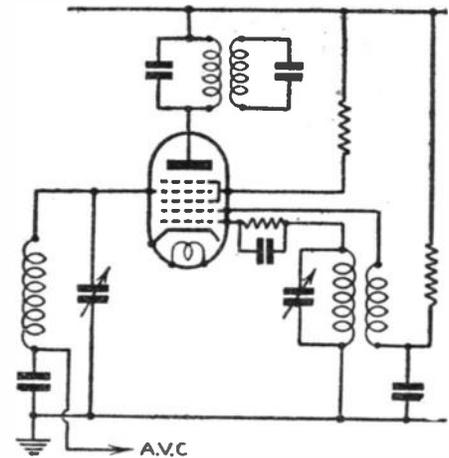


Fig. 2.—Circuit for a pentagrid valve.

The pentagrid, the heptode, the hexode and the octode valves all arrived close on one another. They have, with the exception of the hexode, retained their popularity and are still widely used to-day. In the case of the hexode, it has gone out of general use because, due to the oscillator section deriving its electrons from the virtual cathode of the second space charge, A.V.C. cannot be applied as oscillation would cease.

In each case the mixing occurs within the valve itself, and the valves actually comprise a three-electrode oscillator and an H.F. pentode, V.M.H.F. pentode or screen-grid section. The latter acts as the first detector, and may or may not be A.V.C. controlled. Each section functions independently, and all have the common feature of a second space charge in which a second control grid operates to form the I.F. beats without external coupling or rectification.

The Pentagrid Valve

In Fig. 1 is shown the construction of a pentagrid valve, this being a typical example of its class. The normal space charge occurs between the cathode and the oscillator grid, and there is a constant stream of electrons. The second space charge formed between the control grid and the screen is constantly varying, and the valve is so designed that the mutual conductance of the grid in this second space charge is varied by the variation of the

(Continued overleaf)

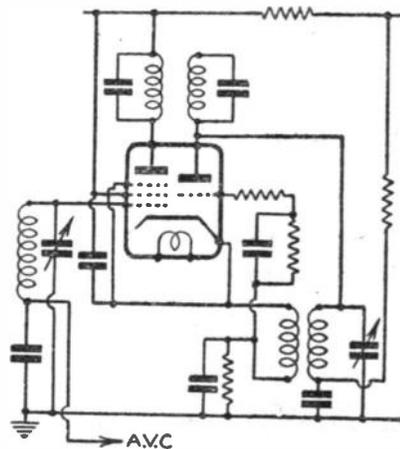


Fig. 3.—Circuit for a triode pentode.

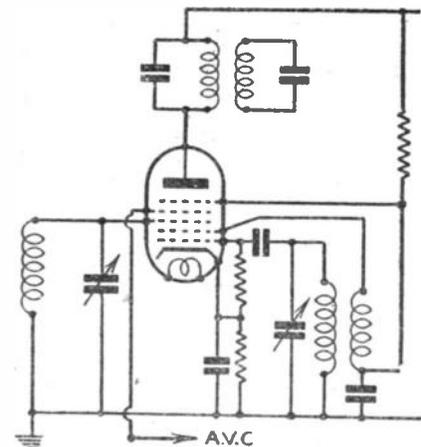


Fig. 5.—Circuit for the Hivac Harries all-stage valve.

FREQUENCY CHANGING IN THE SUPERHET

(Continued from previous page)

oscillator grid, thus giving an electronic coupling within the valve itself between the two circuits.

We will consider in detail the operation of the pentagrid as being a typical example of this class of valve. The chief advantages are negligible radiation from the aerial of the locally generated oscillations, the elimination of direct coupling between the signal and oscillator circuits, which prevents unwanted interaction between them and simplifies the circuit, the reduction of undesired responses due to oscillator harmonics, and to non-linear signal grid characteristic, the ability to control the valve by A.V.C., and the fact that only one valve is necessary for the complete operation. A typical circuit is shown in Fig. 2.

When the oscillator grid is negative, the mutual conductance of the signal grid is reduced, and when it is made positive, the mutual conductance increases linearly. Thus the amplification of the signal applied to the signal grid is alternatively increased and decreased at the frequency of the local oscillation on the oscillator grid. This results in the production of sum and difference frequencies in the anode. The tuned circuit in the anode behaves as a high impedance to the I.F. frequency, and a low impedance to all other frequencies, and thus the desired frequency is selected. The screen-grid screens the oscillator section of the valve from the modulator section, and also the signal-grid from the anode, and, by increasing the anode impedance, reduces the damping on the tuned circuit in the anode to a negligible quantity. The usual oscillator voltage is about 6 volts, but it is not very critical, and variations of plus or minus 25 per cent. will not affect the successful operation of the valve.

The conversion conductance (which is the ratio between the I.F. current in the anode and the H.F. voltage applied to the signal grid, and is the measure of efficiency of a frequency changer) of this class of valve is

very high, and a stage gain of 200 times is easily obtainable without instability or distortion.

The octode valve introduced in 1934, relies on the principle of electron coupling, and has a cathode and two grids to act as a triode oscillator to produce the heterodyne frequency, a screen between the oscillator and mixer portions, which also serves to accelerate the electron stream, a control grid, and, differing from the pentagrid and heptode valves, a suppressor grid. The circuit and operation of the valve is much the same as described above; the A.V.C. may be applied to the H.F. pentode portion as this has V.M. characteristics.

The Triode Pentode

Another very popular frequency changer in present use is the triode pentode, the circuit of which is given in Fig. 3. It will be noticed that the cathode injection circuit is used and, owing to the complete absence of any electronic coupling between the two sections of the valve, the oscillator frequency is independent of the operating conditions of the frequency changer section. Otherwise its operation is identical with that of the pentagrid described above.

With these advances resulting in the two

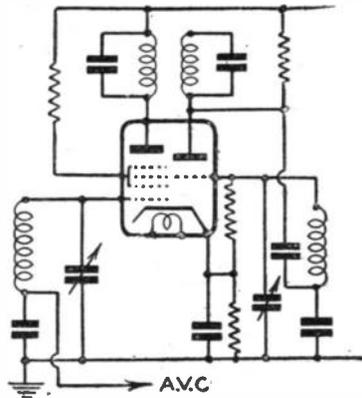


Fig. 4.—Circuit for a triode hexode.

processes being carried out in one valve, it seemed that nothing better could be evolved, and it was not until the prominence given to all-wave receivers in 1936 showed that on low wavelengths, and consequently very high-frequencies, the conversion gain dropped and reception at these frequencies became almost impossible. A new valve was then introduced—the triode hexode, the circuit of which is given in Fig. 4. It will be seen that the whole operation of a normal frequency changing valve is reversed, for the H.F. signals are now applied to the first grid of the valve, and the third grid, situated between the two grids of the screen, becomes the oscillator grid. The voltage transferred via the space charge from the input grid to the oscillator grid is negligible, and the fact that the latter grid is part of a triode amplifier makes this space charge coupling of even lesser importance. The result of this is that degenerative effects between the two sections of the valve are avoided even at very low wavelengths, while the triode section has a high value of mutual conductance, allowing it to maintain a satisfactory oscillator voltage at very high frequencies. The triode hexode gives a practically linear response at all frequencies, and shows remarkable freedom from pulling, etc.

The New All-stage Valve

Another valve has recently been introduced and deserves mention here. This is the Hivac Harries all-stage valve, a frequency changing circuit for which is shown in Fig. 5.

A false cathode is produced in the neighbourhood of the control grid and is modulated by the oscillations produced by the oscillator grid and anode. No screening grid is used between the signal frequency and oscillator sections, as this has been found to be inadequate at very high frequencies. Instead, an automatic capacity bridge balance is produced within the valve itself which is found to operate more satisfactorily than screening, and there are no troubles as regards failure of oscillation on ultra-short wavelengths.

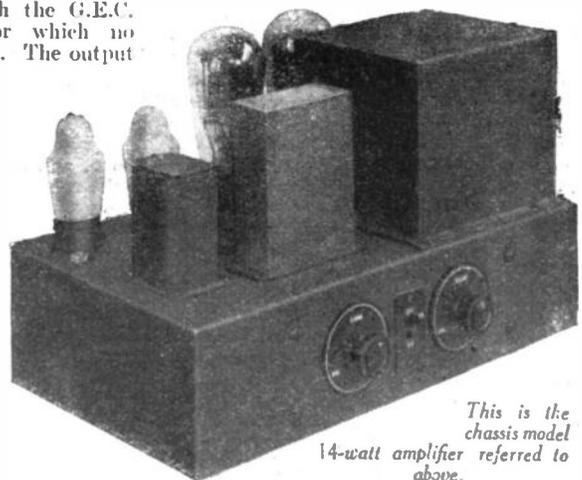
G.E.C. 14-WATT AMPLIFIER

THE General Electric Company announces the release of a De Luxe amplifier designed for microphone, gramophone, or radio amplification. The accompanying illustration shows the chassis model, in which four valves are employed for the amplifier section with the addition of a full-wave rectifier in the mains section. The circuit which is incorporated consists of a three-stage L.F. amplifier with a push-pull output stage, the valves utilised being M.H.41's for the first two stages and a pair of PX.25's in push-pull (Class A) for the output stage. The couplings are designed to provide a level response and high quality, the first stage being straightforward resistance-capacity coupling and the second a resistance-coupled transformer arrangement. When fully loaded the output from the push-pull stage is rated at 14 watts and it is claimed that the response curve is linear from 50 to 10,000 cycles (plus or minus 1.5 db). The first valve is intended primarily for additional amplification when a microphone is employed and the overall gain with all stages in circuit is 90 db. With the first stage eliminated, such as when using the amplifier on gramophone or radio (for which purpose the inputs for this type of apparatus are fed to the second stage) the gain is 28.9 db.

There are three controls, consisting of an input selector switch, a mains switch and a volume control, and an input and output transformer are both fitted as standard. The input circuits are separated, pairs of terminals being provided for mike, gramophone, and radio, and the appropriate input is selected by means of a three-position switch. The microphone transformer is designed to match the G.E.C. moving-coil microphone, for which no energising current is required. The output transformer is of the multi-ratio type, offering correct matching for any normal loudspeaker grouping, either low-impedance or high-impedance speakers.

The amplifier is available in five different models, all of which are designed for use on A.C. mains (200-250 volts, 40-80 cycles). The first model, BCS.2214, comprises the chassis with valves, and costs £22 10s. complete, whilst the second is identical except for a metal cover which may be locked over the chassis to prevent unauthorised use. This model, reference

BCS.2214/5, costs £24. A panel model is available, in which the chassis is secured to a metal frame assembly for permanent installation, and it costs £25—list number, BCS. 2214/1589. A transportable model, housed in an oak carrying case, type BCS. 2214/1588, costs £26 10s., and the remaining model includes a turntable and pick-up in a sturdy oak cabinet, and costs £34.



This is the chassis model 14-watt amplifier referred to above.

Practical Television

November 13th, 1937. Vol. 3. No. 74.

CATHODE-RAY TUBE SCREENS

THE approved series of terms and definitions for cathode-ray tubes which was issued some time ago deprecated the use of fluorescent screen as applied to this particular device, giving preference to the simple term "screen." It was defined as a specially prepared surface which becomes luminescent under the stimulus of the electron beam at the point of impact. Now the screen of any tube used for television picture reconstitution is a most important item, and the problems associated with it have been both intricate and varied. First of all, it must not be too thick, otherwise a very considerable loss of picture brilliance will occur. The extent of this, even with modern tubes, can be gauged by comparing the brightness of the picture observed when looking at the front of the tube, and when watching the same picture in reverse from the back. Indeed, it was this difference of brilliance that led to one suggestion for magnifying the picture from the back of the tube instead of from the front, because of the additional brightness achieved in this way.

Screen Binding

The screen must be perfectly even over the whole of its face. Differences in thickness will show up as a picture with uneven illumination, while traces of impurity will cause luminescence of colours differing from the main one. One of the earlier screen troubles was associated with pieces flaking off during use and when the tube was mounted vertically the pieces found their way into the electrode system and either blocked the anode aperture or ruined the cathode emission. The degree of afterglow, that is the persistence of screen luminosity after the stimulus has been reduced or removed, is dependent upon the particular type of work which the cathode ray tube is called upon to undertake.

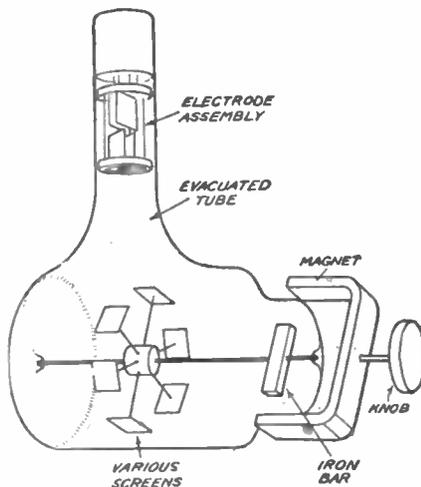
There are several ways in which the fluorescent powder is bound to the inside of the tube face, and two of the simplest binding agents for this purpose are sodium water glass and potassium water glass. This is run over the tube end in the form of a thin liquid and the powder is sprayed over evenly while the water glass is still wet. The process is a specialised and intricate one for all trace of impurities must be kept away, otherwise the screen, and in consequence the finished tube, will be ruined.

Television Requirements

Speaking in general terms, for television reception where picture reconstitution is observed by those looking in, the requirements of what may be regarded as a good screen are first of all that the degree of brightness shall be sufficient to give pictures of adequate contrast in a room which has a measure of either natural or artificial light. Viewing in complete darkness is definitely an unpopular feature in those times. There should be a sufficient degree of afterglow present to diminish traces of flicker in the brightest parts of the picture to a level

which can be tolerated over long periods of watching. On the other hand, the measure of afterglow must under no circumstances bring about a more important objection, namely, any blurred movement in the reconstituted picture. From black to peak white the excitation response over the whole screen must be reasonably linear, while the colour must be in conformity with modern standards.

The last named feature is associated with the chemical constitution of the powder employed for the screen. Green or greenish-yellow coloured screens, while possessing good brilliance, are not popular, for the pictures seem unnatural. A bluish white or cream to sepia seem the most favoured colours at the moment. The former screen is made up from a combination of zinc



The ingenious Baird device to show the differing luminescing colours for cathode-ray tube screens.

silicate and cadmium tungstate, while the latter is zinc sulphide and cadmium sulphide.

Demonstrating Screen Features

That screens can be made up so as to exhibit luminescence at any colour of the visible spectrum as well as the popular black and white is important in many respects, for cases have arisen when a receiver is required to give pictures toning with a room's predominant colour scheme. An interesting model was exhibited recently by Baird's, which showed these colour effects very clearly. The principle is portrayed simply in the accompanying illustration. Two cylindrical tubes are welded together to give the shape shown. In one end of these tubes is accommodated an electrode system to generate the electrons, and accelerate them forward in the usual manner with an associated power-pack unit. At the end of this neck is a form of drum consisting of eight spokes, at the ends of which are small rectangular sections on the front surface of which is sprayed the screen material. The drum is made to

rotate by having at one end a bar of iron—the bar and drum being, of course, inside the evacuated glass envelope—while outside the tube is a U-shaped permanent magnet. By rotating a knob on the outside of the cabinet housing the equipment, the magnet turns, and in consequence the drum. This brings each small screen area in turn into the field of the electron beam, and the screen was observed to luminesce at its own particular colour. The range of colours shown was violet, indigo, blue, green, yellow, orange, red and white, and it was possible to examine closely the degree of brightness associated with each particular colour. The device has proved most useful for demonstrating many of the features associated with cathode-ray tube working. Both the predominating colour of the luminous radiation from the screen under the electron impact, together with screen luminous efficiency, could be seen.

TELEVISIONS

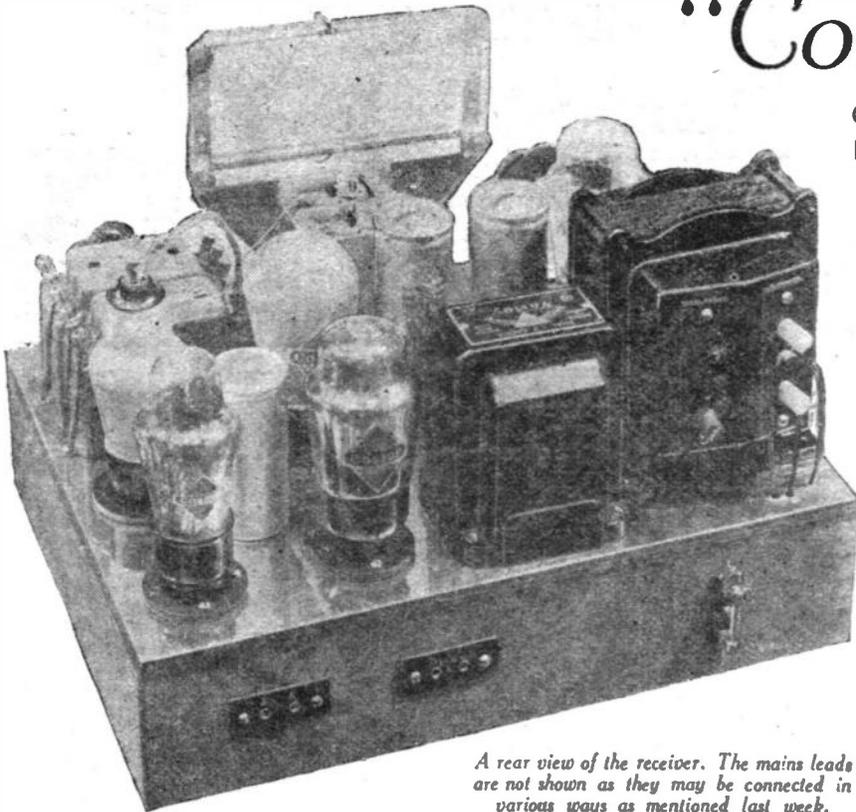
In Support

IN drawing attention in these columns recently to the work which has been undertaken by the Germans in transmitting television signals over ordinary telephone cables, we suggested that this may be the prelude to the distribution of television programmes by wire to subscribers, so as to make home television reception as widespread as sound reception. This view was quite unexpectedly supported by Sir George Lee when delivering his presidential address to the Institution of Electrical Engineers. He said that the technical problems involved in the transmission of television signals over land lines for long distances are very difficult, but he thought the popularising of television would inevitably lead to the linking together by land lines of all the main centres of the country. Continuing, he said, "I would even go further, and suggest that the distribution of television programmes by wire to subscribers may well be the means of so simplifying and cheapening the cost of television broadcast reception as finally to make entertainment by television in the home as widespread as sound broadcast reception is to-day." These remarks coming from such an authority as the engineer-in-chief of the G.P.O. must surely foreshadow developments of a very far-reaching character, based no doubt on laboratory research, details of which have not yet been made public.

Misplaced Fear

ONCE again the question of the opposition of theatre managers to the televising of artistes has come to the forefront, mainly on account of the B.B.C. proposal to televise music-hall shows from the St. George's Hall. The same type of opposition arose when sound broadcasting was being developed, and although it may tend to hinder, it will in no way arrest television's progress. Even if television receivers make big advances over those in use to-day so that the pictures seen are far superior, surely there will be a big difference between sitting at home to see and hear an artist some miles away, and feeling the mass excitement of a music-hall or theatre when the same person appears on the stage. Television must, and will, eventually take its place as an additional entertainment for the public both in the home and cinema (or theatre), but managers would be foolish to bar its progress.

Operating the A.C. All-wave "Corona" 4



A rear view of the receiver. The mains leads are not shown as they may be connected in various ways as mentioned last week.

Completing the Construction of this Receiver, and the Method of Carrying Out the Preliminary Adjustments

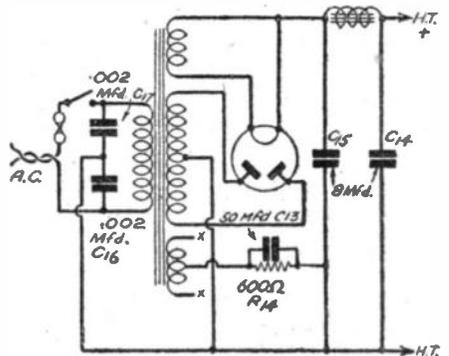
firmly in contact with the screening braid and it should be soldered. The screening material should be scraped gently in order to obtain a clear surface, but care should be taken not to break the fine strands from which it is made up. A really hot iron should then be used and if the work is clean and the merest trace of soldering flux applied, a neat joint should be made without damaging the internal insulated sleeving.

Operating Notes

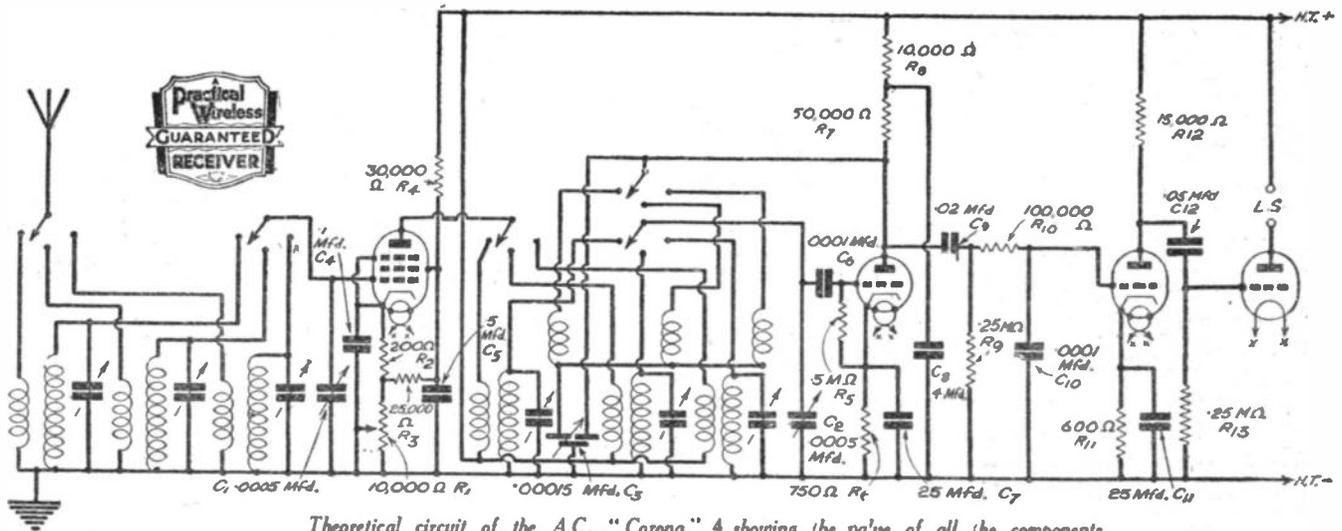
Before connecting the mains supply a very careful check should be made to avoid damage to valves or components due to a mistaken connection. When all is in order the mains leads should be joined to the appropriate mains sockets according to the voltage of the mains supply being used, and the aerial and earth leads connected to the appropriate sockets on the rear chassis runner. Do not be tempted to use a full size aerial in order to obtain maximum results. Not only will such an aerial introduce difficulties from a selectivity point of view, but on the short wavebands

THE main constructional details were given last week and there are very few points left which need description. It will be noted in the list of parts that a two-foot length of screened lead is specified. This should be cut and employed for screening the aerial lead and also the lead to the cap of V1. An important point arises in connection with these leads, and that is to avoid loss due to the proximity of the earthed metal screening. The lead from the aerial terminal to terminal P on the first coil should be of very thin wire—not the thick insulated material which is employed for the remainder of the wiring.

A similar fine gauge should be used for the anode lead, and to prevent the metal screening from coming into contact with the internal lead and thereby producing a short circuit the ends should be cut carefully to leave the insulated sleeving projecting, and it may also prove worth while to bind the ends with ordinary cotton or thread—or alternatively a thin strip of insulating tape may be cut and wrapped over it. The two screening cables are then earthed and this is carried out by wrapping a length of bare copper wire round the screening braid and connecting it to earth. This earth bonding will not prove effective unless it is



This is the mains section.



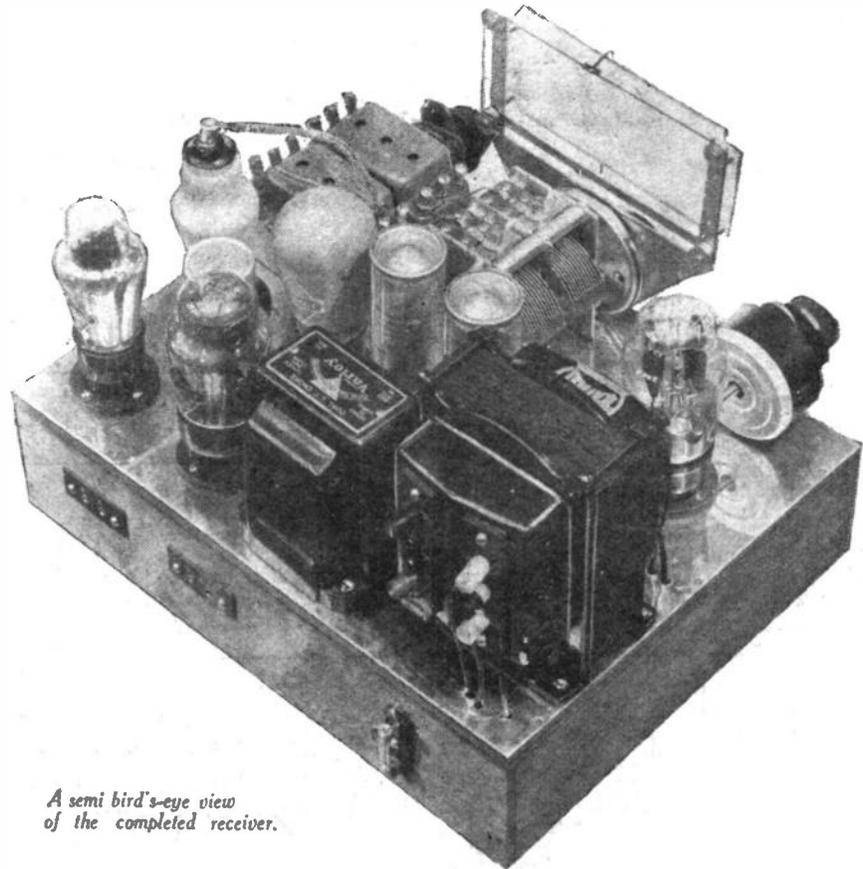
Theoretical circuit of the A.C. "Corona" 4 showing the value of all the components.



it may even prove detrimental and prevent signals from being obtained satisfactorily. Individual circumstances will govern the best type of aerial, and although a compromise will have to be adopted to obtain maximum results on the broadcast and the short wavebands, it will in the majority of cases be found that a short aerial will improve the performance on broadcast bands by providing sharper tuning and yet without reducing the number of stations which may be heard. It will therefore prove worth while to experiment, when the receiver has been found to work satisfactorily, to find the best type of aerial to employ. A vertical wire running up the side of the house, spaced from the wall by at least one foot, and not exceeding about 15ft. in length, should prove all that is necessary.

Trimming

Before switching on and testing the receiver, the trimmers on the gang condenser should be unscrewed to the limits, and if desired they may be removed entirely. If this is done, however, care should be taken to prevent the small flexible plate of the trimmer from coming into contact with any part of the condenser as it will short-circuit in so doing. If they are unscrewed to the minimum capacity they should not affect tuning, and the ganging or lining-up of the two coils is then carried out on the trimmers fitted to the coils. The dial should, of course, be temporarily locked to the condenser spindle, with the pointer at the extreme left of the dial and the condenser vanes fully opened. Turn the pointer to the name of your local station, switch on, and advance the left-hand control (volume) to a position where signals are heard. The lower knob (reaction) should be turned to the minimum position. The volume control may have to be turned full on before the station is heard, and the tuning knob may also have to be moved a short distance before the station is tuned in. Therefore, for the time being the station names should be ignored. Now adjust the two trimmers marked "2" on the top of the coil units, obtaining maximum volume, and readjusting the tuning knob to bring the pointer as near to the station name as possible. When best results are obtained, the condenser drive may be unlocked, and the condenser vanes held carefully, whilst the



A semi bird's-eye view of the completed receiver.

pointer is adjusted to register accurately the station you have received. It should then be found that the dial is accurate for all the remaining stations on the medium waveband. Reaction may, of course, be employed to increase signal strength in the usual way. Now turn to the long waves and adjust the trimmers marked "3," and it should be found that the long-wave station names will be accurately registered by the pointer.

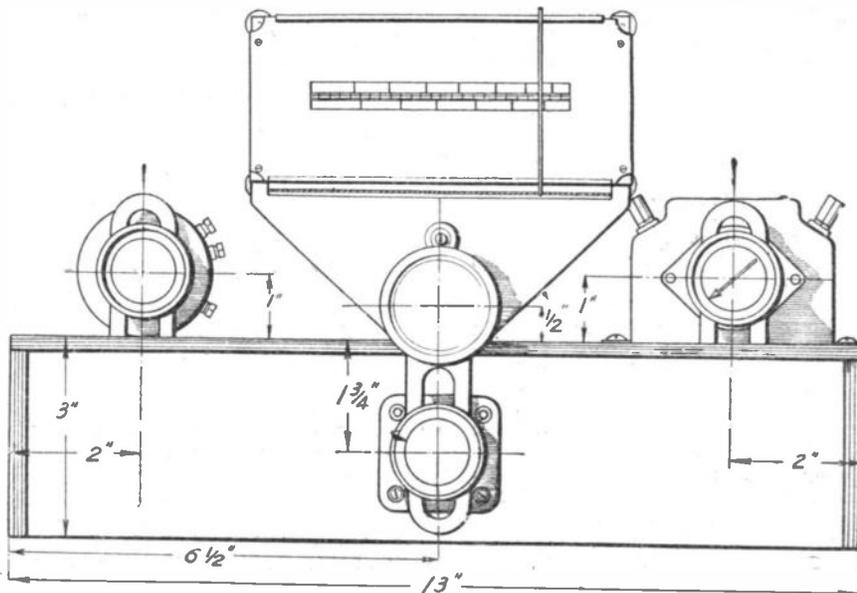
Short-wave Adjustments

On the short waves the trimmers marked "1" are to be adjusted, and a little more care may be needed here in order to provide an accurate setting, as the short waves will be found to tune very sharply. It should be

noted that the condenser drive which is specified is of the automatic two-speed type, the first portion of its travel being at high ratio, and a reverse movement effecting a much greater reduction. This will be found of the utmost assistance in locating the short-wave stations, as the moment a station is heard a slight movement of the control knob in the opposite direction will enable the exact setting to be found without difficulty. This type of drive is to be preferred to the two-knob two-ratio type, as the large control which is provided, together with the automatic reduction brought into play when the direction of rotation is reversed provides a quicker and, more certain way of finding the weak short-wave stations which may be picked up.

LIST OF COMPONENTS

- Two all-wave coils, type Triogen with 2-gang spindle (Wearite).
- One 2-gang condenser, .0005 mfd., bar type (Polar).
- One Micro-horizontal drive (Polar).
- Fourteen fixed condensers: Two .0001 mfd.; two .002 mfd.; .02 mfd.; .05 mfd.; .1 mfd.; .5 mfd.; type tubular; two 25 mfd.; type 3016; 50 mfd.; type 3004; 4 mfd.; type F2921; two 8 mfd.; type F2920 (Dubilier).
- Thirteen fixed resistances: .5 meg.; two .25 meg.; 100,000 ohms, type F1; 50,000 ohms; 30,000 ohms; 25,000 ohms; 15,000 ohms; 10,000 ohms; 750 ohms; 600 ohms; 200 ohms; type F1; 600 ohms; type F2 (Dubilier).
- One volume control, 10,000 ohms, type CP158 (Varley).
- One reaction condenser .00015 mfd.; type differential (Polar).
- One L.F. choke, type DP11 (Varley).
- One mains transformer, type 803 (Heayberd).
- One Q.M.B. switch, type S80 (Bulgin).
- One fuse-holder and 1-amp. fuse (Bulgin).
- Two socket strips L.S., A.E. (Clix).
- Three component brackets (B.T.S.).
- Five valveholders: one 7-pin, two 5-pin, two 4-pin, type V1 and V2 without terminals (Clix).
- One Plymax chassis, 13in. x 10in. x 3in. (Peto-Scott).
- Two-ft. metal screened lead (Ward and Goldstone).
- Five valves: MVS/Pen. (7-pin met.), 41MHL (met.), 41 MLF, 4XP, 506BU (Cossor).
- One P.M. speaker, type Stentorian Senior (W.B.).



The panel layout of the A.C. All-wave "Corona" 4.

Simple "Quality" Circuits

The Experimenters Give Details of a Few Circuits for Both Battery and A.C. Receivers. These are Designed for Simplicity Combined with Good "Quality" Reception of Local Stations

OUR article a few weeks ago on the subject of "Quality Battery Receivers" aroused a good deal of interest, judging by the letters we have received concerning it. Contrary to all our expectations, the majority of our correspondents were in agreement with our remarks, that real "quality" reproduction cannot be obtained with a battery set in normal conditions. Nevertheless, several readers explained that they were not super-critical with regard to the "quality" question, although they do insist on good reproduction. (By the way, what is reproduction if "quality" is not perfect?)

It is evident, therefore, that there are many who would be prepared to sacrifice

would be present whether using a gang condenser or two separate controls. Before giving this point full consideration you will probably disagree, but the difficulty of avoiding cut-off in two tuned circuits at the

by The Experimenters

same time is not a small one, especially at certain settings of the condensers.

Tuning

By eliminating one tuned circuit, a possible source of trouble is dismissed. The

almost any type, of the approximate values shown. The first valve can be any H.F. pentode, whilst a detector or L.F. valve is suitable as detector, with two high-efficiency triodes or output tetrodes in the push-pull stage. The output will not be as high as we have previously postulated for "quality," but if you try the arrangement we believe that you will be satisfied with results. If you must use a battery for H.T., see that it is of the super-capacity type; it is better to use an eliminator, H.T. accumulator or Milnes unit.

Three-R.C.C. Amplifier

Those who use a 4-volt accumulator (for charging a Milnes unit, for example) and those who have provision for keeping an accumulator charged, can use a still more simple circuit by using a 3-valve resistance-capacity-coupled L.F. amplifier in place of the push-pull stage shown. A circuit for this is shown in Fig. 2. Here again you will recognise an old favourite, but one that still has many uses for the "quality fan." The first valve is of the ordinary L.F. type, and is followed by a high-efficiency power triode and by a PX.4 output valve. This valve will not give its theoretical maximum undistorted output for two reasons: it will not receive the full H.T. voltage of 250; and the input to its grid circuit will be insufficient fully to load it. At the same time, an output of considerably more than 1 watt is obtainable if an H.T. unit giving 150 volts at about 60 mA is employed.

The beauty of this L.F. amplifier is that it can be made very cheaply. No special precautions need be taken to avoid L.F. oscillation and instability, and construction is particularly straight-forward. Remember, however, that it cannot be satisfactory unless there is a generous H.T. supply and unless the 4-volt accumulator has an ampere-hour capacity of about 60 and a normal output of not

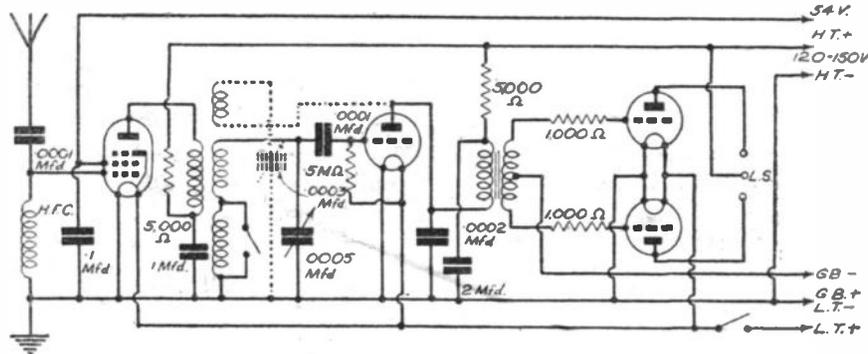


Fig. 1.—A three-stage four-valve "quality" set which is simple to make and use.

long range in order to have the best possible reception of local stations; but cost must be given serious consideration. We have, consequently, spent a good deal of time recently in attempts to see just how simple a "quality" battery set can be made. Do not think that by simplicity we mean a skimping of the specification with the sole idea of reducing costs; simplification is valuable in "quality" sets of an unpretentious kind if the many pitfalls are to be avoided.

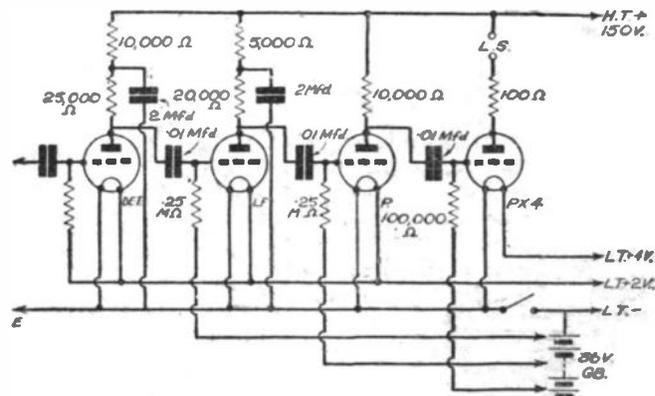
Four-valve Battery Set

Of the circuits that we have used we are best pleased with that shown in Fig. 1. How simple it is! An untuned H.F. pentode feeds into a power-grid detector through a tuned H.F. transformer, and the detector is followed by a transformer-coupled push-pull stage. Some of you will probably remark that the use of an aperiodic aerial circuit is a retrograde step. Perhaps it is in some respects, but it avoids many complications and is very satisfactory when the receiver is used within about 30 miles of the "local" medium-wave transmitter. Of course, there must be a great sacrifice of selectivity but that can generally be afforded if the listener is content to have local-station reception only.

The only advantage of the H.F. stage is that it provides a slight degree of H.F. amplification, so that the input to the detector is high enough to enable that valve to operate efficiently. If the aerial circuit were tuned there would be the difficulty of matching the two tuning circuits. This

tuned transformer can be an efficient one, and might be iron cored. It will tune sufficiently sharply to prevent interference with the local transmitter, except in really awkward situations, whilst tuning will be much too flat to cause any "sideband cutting." The tuned circuit is also damped to a certain extent by the power-grid-type

Fig. 2.—A form of three-valve R.C.C. amplifier that can be used satisfactorily when a 4-volt accumulator is available for the L.T. supply.



detector. For push-pull we show a circuit similar to one we have discussed before.

Those who might occasionally wish to "reach out" would prefer to add the reaction connections shown by broken lines; for normal "quality" reception the reaction condenser should be turned to its minimum-capacity position.

As for the components, they can be of

less than 2 amps.; this precludes the use of the mass-plate type cell that is now very popular with ordinary 2-volt valves.

The Speaker

At this point we might be excused for again making reference to the loudspeaker. You cannot obtain "quality" with the

(Continued on page 238)



SHERLOCK HOLMES SAYS...

It isn't just for Radio - but for testing everything electrical

A fuse may have gone in the lighting circuit; the door-bell may have ceased to function; the radio, perhaps, is not up to standard; the vacuum cleaner, usually so reliable, has definitely "given up the ghost," faults... faults... faults... all equally perplexing... but they're all the same to the Pifco Rotameter... just another job, in fact. This precision-built instrument reduces electrical fault-finding to a mere bagatelle; saves hours of wasted time, money too; yet its price is only a modest 42s. Has it occurred to you how useful this Rotameter could be in your own home, workshop or garage?



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● Adapts or converts your battery set for short-wave reception, or may be used as 1-valve Short Wave Receiver. **25/-**
● Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! ● Air-spaced bandspread and tank condensers.
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On Your Wavelength



By Thermion

Car Radio

THIS country has always suffered from too much government. It is said that a community gets the Government it deserves, although what the listening public has done to deserve the present Government as far as wireless is concerned I don't know. It is despotic rather than democratic. I suppose it will remain so, unless the god Demos stalks abroad the land of broadcasting. I always feel that any monopoly which does not allow for effective opposition is bad, and the listener is in the position of having to like it or lump it. If he doesn't like the programmes he can do nothing about it. I think it is true to say that 99.9 per cent. of listeners dislike our Sunday programmes in spite of their changed form. It is a distinction without a difference. The mixture as before in water of different colour. The same old dreary and weary music with a few bright patches thrown in to keep the critics quiet. Take the case of a motorist who was fined £2 and had his licence endorsed for not driving with due care and attention because it was stated "he had been fiddling with his wireless set while driving." The Chairman of the Magistrates and a solicitor stated that if they had their way radio sets would not be allowed in cars. Why? If we are going to argue on those lines we ought not to permit gushing and alluring damsels to sit by the side of a driver, because his attention may be distracted. We should obliterate all roadside scenery for the same reason, and certainly we ought to remove 99 per cent. of the silly signs which are deliberately affixed by the roadside and on the road to distract the motorist's attention in order to make him careful. Isn't life a complete paradox? If the distraction of attention is to be made the subject of a charge, life will shortly become impossible. Surely, if radio keeps a man's wits

alive whilst driving it is in the interests of safety? But, as with wireless programmes and listeners, the poor motorist has no effective means of answering back. The law is largely administered by those who know little about it, in just the same way as a few lofty individuals who imagine they are poised between heaven and earth and do not belong to the sphere of common mortals decide our radio fare for us. What an excellent idea it would be if they were all lined up in Hyde Park so that the public could see the type of individual responsible for our radio programmes? We should all go home and smash our sets to smithereens and feel that we have been led by the nose.

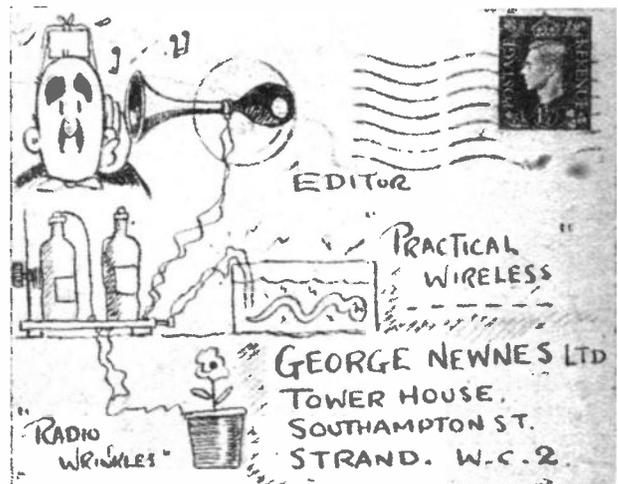
A Nice Job

LEARN from the General Electric Company that one of their employees is to make a 50,000-mile tour of the world by air, land and sea with an all-wave radio set as his sole companion. He will be listening-in to remote countries and isolated regions for eight months, and will cover about 1,500 miles a week. This employee will test reception under all conditions, and as a result of his experiences will issue a report so that the company may give even better after-service sales in any part of the world. The tour will embrace Gambia, Sierra Leone, Gold Coast, Nigeria, French Cameroons, Sudan, South Africa, Rhodesia, Kenya, Tanganyika, Bombay, Calcutta and Rangoon, and flights will include trips from Burma to the Straits Settlements and from Malaya to China, from where he will travel to Australia and New Zealand, and thence via Panama back to his regular job at

Coventry. This is the sort of job which would suit me down to the ground. Perhaps the Editor will one day allow me to snoop around the world listening to readers' reactions to my weekly screed.

"Confiscated by the State"

SEE that a Bill is being introduced into the House of Lords which proposes that in cases of dangerous driving or manslaughter the offender's car will be confiscated by the State. Now as this appears to be a period of extreme oppression and persecution of motorists, I do not see why we radio fans should be left out in the cold. I therefore suggest that our worthy and esoteric House of Lords should frame another Bill rendering it possible for the State to confiscate any radio set which on the evidence of two neighbours gives annoyance to those neighbours. The set should also be confiscated if it is more than five years old; if it has not the approval of the PRACTICAL AND AMATEUR WIRELESS technical staff; if it has more valves than there are rooms in the house; if it has fewer valves than there are rooms in the house; and if it can be proved that an individual is operating on a one or two-valve set and he could afford a three or four.



My friends over the borrrrrrder will rrrrrrrrestriction on their harrrrrrdy rrrrrrace, but I am assured that there are many in Binny

Scitland who are still operating crystal sets and are residing in houses with specially thin walls, so that the next door neighbour can listen in to the programme by the expedient of one carphone being pressed hard against the aforesaid thin wall, which latter acts as a most effective baffle. After all, there are not many liberties left in this free country of ours, and I do not see why listeners should not be permitted to join in the general fun. Remember, it is illegal to buy a couple of yards of flex on a Sunday unless you want it for a cycle dynamo. The law lays down regulations for the fitting of stop lights on cars, but according to a recent Appeal Court decision no notice should be taken of them. You must waggle your arm like a raving lunatic out of the window. This is much more confusing than the positive red of a stop light, and so the law prefers it. One other thing. I suggest that anyone caught listening to the B.B.C. Sunday programmes should not only have his set confiscated but also his car, his house, his ox, his ass, and anything that is his. He should also be imprisoned for life, and then be boiled in oil, and his corpse à la meunière thrown to the hounds. Let's all go mad!

Wrinkles

TO view with hollow eye and wrinkled brow an age of poverty," wrote the bard. Our Wrinkles experts have developed wrinkled brows, as a result of some of the queer contraptions submitted to them. Now and again their task is leavened and the wrinkles effaced by a humorous contribution from some wag with a puckish mind. I reproduce on page 239 an envelope which recently came through the post. Notice the ingenuity, the flower pot earth, the improvised accumulators, and the ice block on the listener's head. I have sent this reader a book as a reward for the trouble he has taken. By the way, I shall be glad to award a book prize each week to the sender of the most humorous sketch or joke I receive. My judgment final, of course. Address your letters to "Joke, Thermion."

How Long Should a Set Last?

IN view of the wide claims which are made for commercial receivers, I was interested to read the report of a case in which a man was summoned for non-payment under a hire-purchase agreement. The defendant said that he had the set for four months, and then the plaintiffs had it back. The judge remarked: "He has had his set for a little over four months and you say



Notes from the Test Bench

The 12-Watt Amplifier

SEVERAL readers have written to ask whether the 12-watt amplifier described in a recent issue can be used satisfactorily in conjunction with an I.F. unit for radio reception. The I.F. and detector stages of a modern all-wave receiver such as the All-World Ace are quite suitable for addition to this amplifier. If the theoretical diagram of the amplifier is studied it will be noted that a grid condenser is not used in the grid circuit of the first valve, and therefore connection must be made to the output end of the L.F. grid coupling condenser in the radio unit and not to the detector anode. One of the P.U. or one of the microphone terminals on the amplifier should be used for the lead to the coupling condenser. This method of connection should be used when maximum volume is desired, but if the combination is to be used in the home, better quality can be obtained by connecting the coupling condenser of the radio set to the grid socket of the second valve of the amplifier. There is one precaution which must be taken when this addition is made—the lead joining the radio unit to the amplifier must be effectively screened, otherwise hum is likely to be experienced.

The Vitesse

WE have now had the opportunity of testing a fair number of Vitesse receivers built by readers. In most cases poor reception has been due to I.F. instability or to incorrect adjustment of the trimmer condensers on the coil unit and the I.F. transformers. Constructors who are still having trouble with this receiver should, first of all, ascertain that the leads to the I.F. transformers are as short as possible. If it is found that reducing the length of these leads does not provide stability the lead from the first transformer to the grid of V_3 should be screened. There is a large number of trimmers, all of which have to be correctly adjusted, and therefore this work should be carefully effected. As the dial is marked in wavelengths, however, adjustment is not very difficult even without an oscillator—it is only necessary to adjust the I.F. transformer and oscillator coil (in back section) trimmers until the correct wavelength settings are obtained at both ends of the scale and then adjust the trimmers of the other coils for maximum volume.

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that the depreciation in value is half. It seems to be rather a lot." On this argument a commercial set is worth nothing at the end of the year, and if you keep it longer than that you will have to pay someone to take it away. The moral is to make a set so that it will last for five years.

A Colonial Impression

A COLONIAL reader writes to me and, among other things, says: "Reception of the short-wave stations is over a distance from, say, 5,000 to 10,000 miles, and in spite of this great distance, the sets do not reveal that indifferent reproduction so many British designers appear to believe is inherent in the superhet circuit; anyway, this weakness does not exist in the good American sets we know out here, and we are therefore reluctantly forced to the conclusion that British designers who hold these views are not as competent as the American designer. Of course, they will all hasten to deny such an uncomplimentary statement; their denial, however, will not convince us, because we are prepared to prove that reproduction both on the broadcast and the short-wave bands compares in every way with some of the best British sets out here.

"The American 6-8-valve commercial superhet can be purchased from £22 10s.—this is an all-wave instrument obtainable on very easy terms and carrying with it a substantial guarantee.

"Not the least important factor is that the American valves are standardised. Go to any 'Dorp' in this vast country, ask, for example, for a '24' valve; it does not matter by whom it is manufactured, it will operate under the '24' characteristics in any American set. But let a British valve require replacement, you are practically confined to one make, and ten to one such a valve is only obtainable from agents that are days away, or hundreds of miles away.

"Then, too, for instance, a British screen-grid valve out here costs from 18s. to 21s. retail. An American counterpart can be obtained for a price around 6s. Why? Superior workmanship you will say. Maybe it is so, but the superior complex exists only in the minds of those who haven't had any or little experience with American valves. Believe me, they are good, even if workmanship should be superior in British valves. The average person cares not a rap what is inside them so long as they function in a receiver well and give entire satisfaction."

Now, English manufacturers, what about it!

A PAGE OF PRACTICAL HINTS

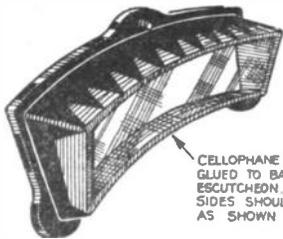
SUBMIT YOUR IDEA

READERS WRINKLES

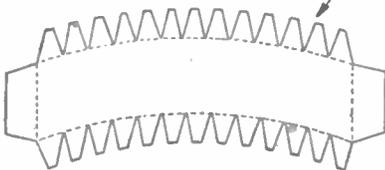
THE HALF-GUINEA PAGE

Hint for Excluding Dust

WITH some tuning scale assemblies, owing to the need for a slight clearance between the moving pointer and the back face of the escutcheon moulding,



CELLOPHANE SHAPED & GLUED TO BACK OF MOULDED ESCUTCHEON. CURVED SIDES SHOULD BE SERRATED AS SHOWN BELOW

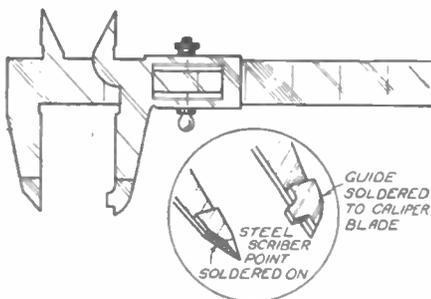


A method of excluding dust from an escutcheon.

dust will easily find its way into the interior of the set. This can be prevented quite simply by covering the escutcheon moulding with Cellophane. This is cut to shape and where the moulding is of the curved pattern, the Cellophane is serrated as shown in the sketch. It is then fixed to the moulding with glue.—R. L. GRAPER (Chelmsford).

A Useful Marking Gauge

THE accompanying illustration shows a useful marking gauge made from a sliding caliper-gauge which is obtainable for



GUIDE SOLDERED TO CALIPER BLADE
STEEL SCRIBER POINT SOLDERED ON

A useful marking tool contrived from a cheap caliper gauge.

6d. from any of the cheap stores. After cleaning the lower jaws, tin them, and then break off two pieces of hack-saw blade. Well clean one side of each piece, sweat them on to the extremities of the jaws, and then grind or file them to the shape shown in the illustration. This tool will be found particularly useful for scribing lines parallel to the edges of a metal chassis.—H. COLLINGWOOD (Handsworth).

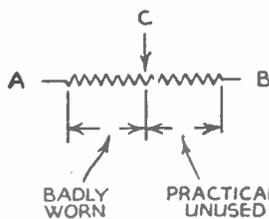
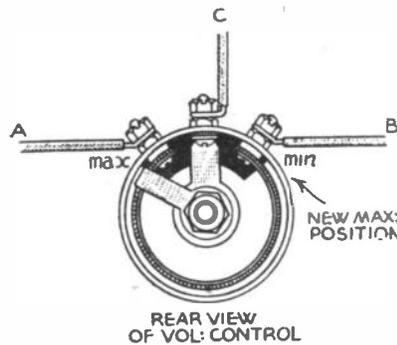
THAT DODGE OF YOURS!

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

A Volume Control Improvement

THE following dodge has proved itself valuable to me when servicing a receiver suffering from a faulty volume control, which crackles and distorts at the maximum position. I have noticed that very few receivers utilise the full movement of a variable volume control; in fact most of them use about half of the windings and leave the other half nearly unused.

From the accompanying sketch it will be seen that by reversing leads A and B the full or maximum volume position will also be reversed, and then the practically unused



Improving a volume control by reversing the leads.

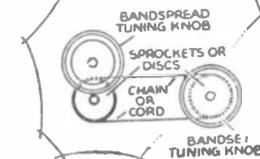
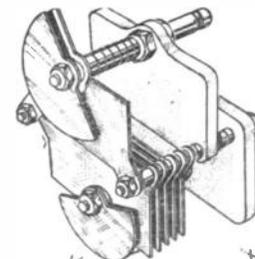
section of the volume control windings comes into play, and gives the component a new lease of life, where it would normally have to be replaced.—V. DIEDERICHS (Castle Donington).

NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

3/6, or 4/- by post from GEORGE NEWNES, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Improved Bandsread Condenser

HERE is an idea designed to cut the stray capacity of the combined "bandset" and "bandsread" condensers to a minimum. By eliminating the wiring



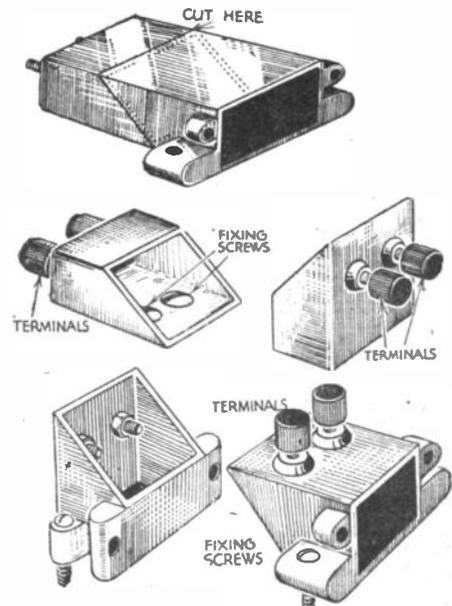
A combined "bandset" and "bandsread" condenser, and method of driving.

between the two components it does away with the extra two fixed plate supporting spindles on the bandsread condenser. The sketch explains matters clearly. Of course, the proximity of the two tuning spindles presents a problem, but this can be easily remedied.—A. LEMAY (London, S.W.1).

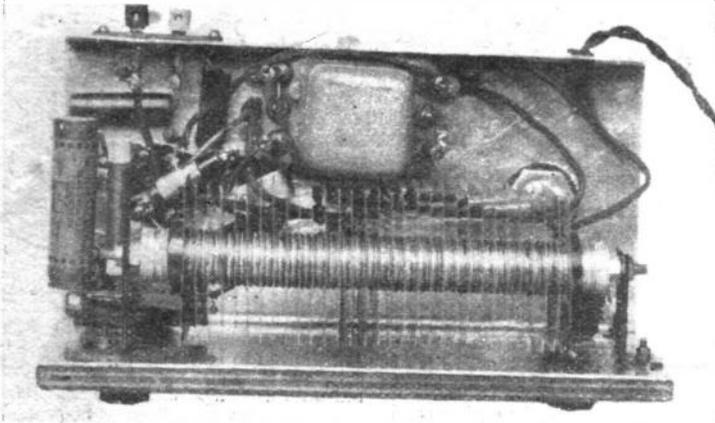
Universal Terminal Mounts

THE accompanying sketches show

how handy terminal mounts can be made from the bakelite cases of disused mansbridge condensers. With the condensers still intact, cut through the cases diagonally with a hacksaw. Drill the required holes for terminals, and fixing screws, then place the various parts in boiling water long enough to enable the interior of each part to be removed. The edges can be trimmed with a file.—H. NEWMAY (Steyping).



Various types of terminal mount made from bakelite cases of disused condensers.



View of the underside of the chassis showing the arrangement of the rectifier.

AN A.C.-D.C. REFLEX P

How to Build a Simple Mains Taken on Holiday or Carried Order to Provide Loudspeaker the Use of B

THE usual type of portable is heavy on account of the batteries which have to be carried, and a fair number of valves has to be used in order to provide good signal strength. The receiver now to be described overcomes this difficulty by utilising a high-power mains valve with a metal rectifier to take the place of a further valve and it may be used with any form of mains supply—simply

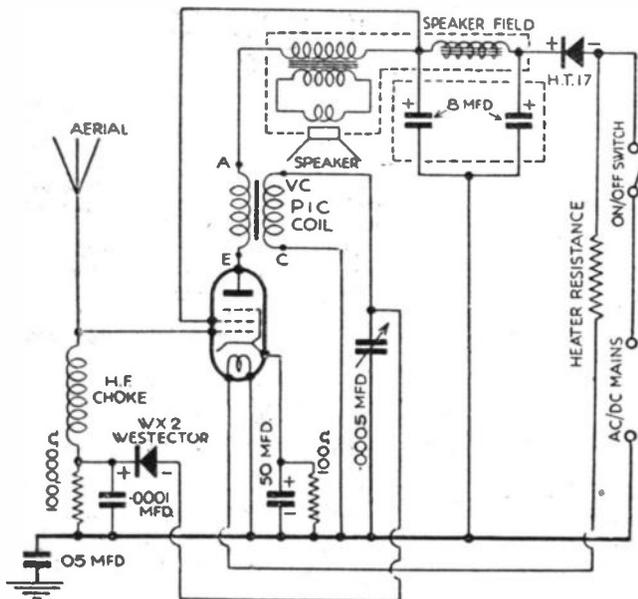
through the output transformer and the primary of the H.F. transformer.

The received signal is fed direct to the grid of the valve and amplified. The amplified voltage is built up across the primary of the H.F. transformer, the secondary of which is tuned and is connected to a W.X.2 Westector acting as a detector. The detected signal is then fed back to the grid of the valve *via* an H.F. choke, where it is again amplified, and used to actuate the speaker in the normal manner.

Construction

The constructional work is quite simple, and is easily followed from the diagrams. First bend and drill the chassis as indicated, and then mount the coil, valveholder, etc., in position. Leave the wiring complete. The smoothing and reservoir condensers are in one container, the red wires forming the positive connections, and the black the common negative.

In carrying out the wiring, great care should be taken with regard to insulation, especially where wires



Theoretical circuit of this one-valve reflex receiver.

by plugging in to the nearest mains socket. It is thus cheap to build, and the expense of replacing batteries from time to time is avoided. In spite of the compact design, standard mains equipment is provided, together with a standard loudspeaker, which is of the energised field type. The tuning range covers the normal medium and long broadcast bands.

The receiver may be operated from any A.C. or D.C. supply from 200 to 250 volts. The power supply is obtained through an H.T.17 Westinghouse Metal Rectifier. On D.C. the rectifier acts as a small series resistance, while on A.C. the rectifier feeds into the reservoir condenser, which also smooths the pulsating currents. Further smoothing is obtained by means of the speaker field and an 8 mfd. condenser. On 200-volt mains the 8 mfd. reservoir

pass through the chassis.

The top cap of the valve is the grid connection, the lead to which is screened in order to avoid hum pick-up.

Pins 1 and 2 of the valveholder are blank, and pin 2 has accordingly been utilised to anchor wires from the choke, aerial and grid of the valve. There is, of course, no connection between this pin and the valve itself through the valve leg.

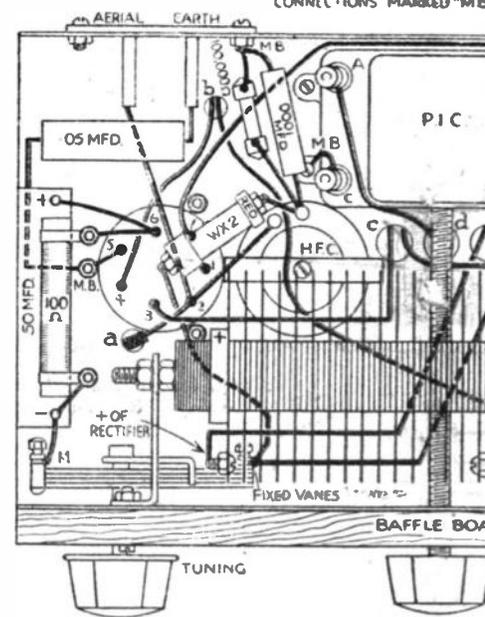
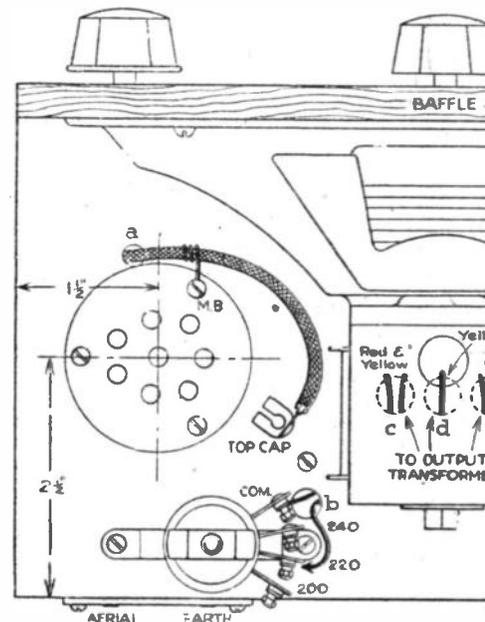
The connections to the speaker, viewed from the back with the transformer at the bottom, are as follows:—

Left-hand tag (yellow and black wires): Screen of valve, and one section of 8: 8 mfd. condenser.

Centre tag (yellow wire): Terminal "A" of coil.

Right-hand tag (black wire): Positive of

ABOVE AND BELOW CHASSIS



C. ONE-VALVE PORTABLE

Mains Receiver which May be Carried from Place to Place in Speaker Entertainment Without use of Batteries

rectifier, and one section of 8+8 mfd. condenser.

When the wiring is complete, the set is ready for operation—there are no adjustments to be made, nor ganging to be carried out.

Quick Tests

The following approximate voltage and current readings should be obtained:—

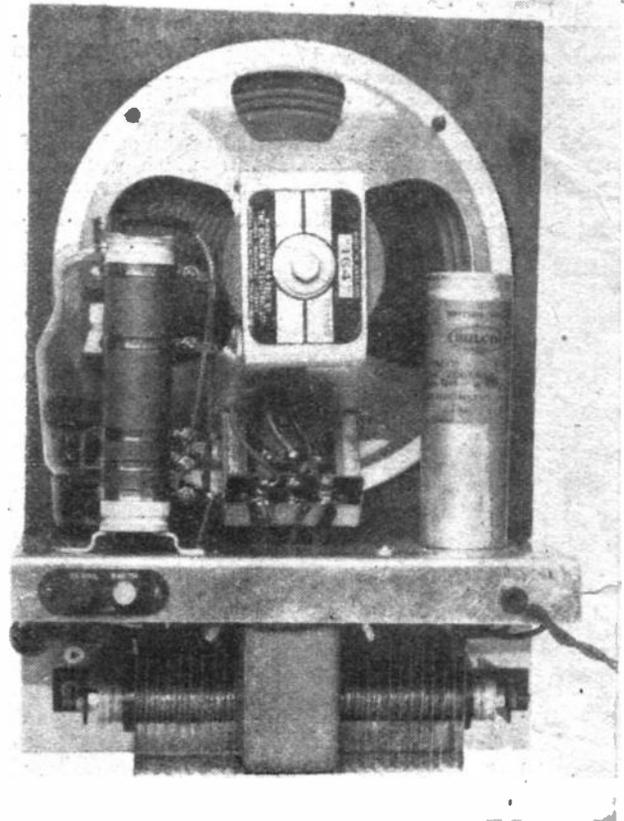
- Positive of rectifier 275 volts.
- Anode of valve 175 volts 44mA.
- Screen of valve 185 volts.
- Cathode of valve 4.5 volts.

Chassis is negative in each case.

General Considerations

The reproduction of the receiver is above the average. There is ample volume for an ordinary room, and the response is crisp with predominant medium and upper frequencies. Those who prefer a mellow tone may obtain it by connecting an 0.005 or 0.01 condenser across the output transformer primary. The condenser must not be connected from the anode to earth.

A rear view of the completed receiver.

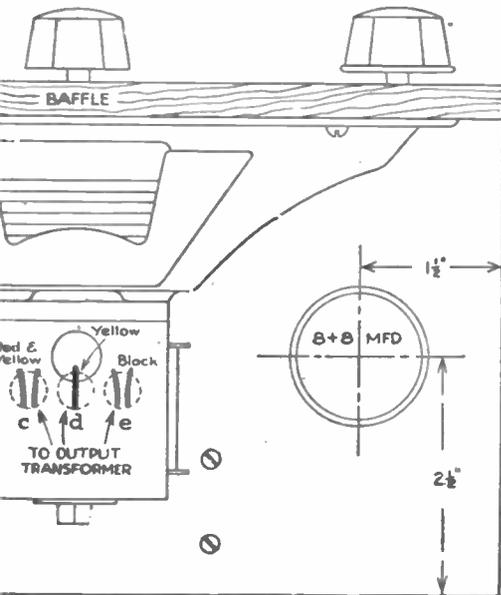


An advantage of the circuit is that it provides a form of volume expansion.

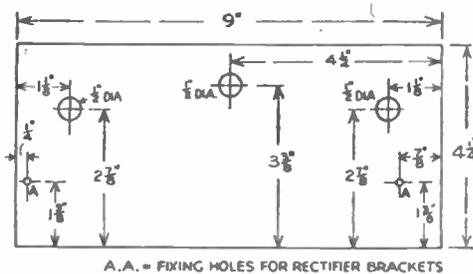
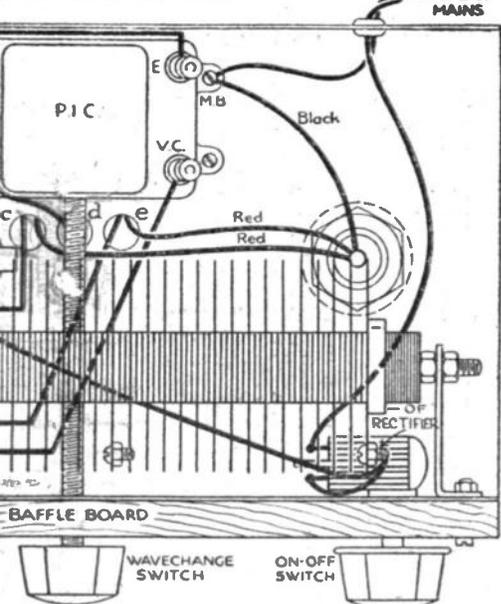
An efficient aerial and earth is essential in order to enable good signal strength to be obtained, and to reduce hum. The set will work on an indoor aerial, however, provided it is not situated at a distance greater than 20 miles from the station.

(Continued on page 252)

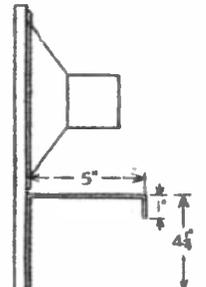
CHASSIS WIRING DIAGRAMS



POINTS MARKED "M.B." TO CHASSIS.



Drilling dimensions for the front of the chassis of the receiver are shown on the left; and on the right the principal dimensions of the chassis and panel assembly.



LIST OF COMPONENTS

1 Westinghouse metal rectifier, style H.T.17 ..	2	d.
1 Westinghouse Westector, style W.X.2 ..	17	6
1 Wearite H.F. transformer—style P.I.C. ..	5	0
1 7-pin valveholder—Bulgin type V.H.14 ..	7	6
1 .0001 mfd. condenser—Bulgin type P.C.301 ..	0	6
1 .05 mfd. condenser—Bulgin type P.C.105 ..	0	4 1/2
1 50 mfd. dry electrolytic condenser—Bulgin type E.C.3 ..	0	9
1 Mains resistance—Bulgin type M.R.44 ..	1	9
1 .0005 mfd. bakelite dielectric tuning condenser, Polar ..	3	6
1 8+8 mfd. dry electrolytic condenser, Bulgin E.C.8 ..	2	6
1 On-off switch—Bulgin type S.91 ..	7	6
1 A-E terminal strip—Bulgin P.51 ..	1	9
1 100 ohm resistance—Bulgin type A.R.100 ..	0	4 1/2
1 100,000 ohm 1-watt resistance—Bulgin H.W.25 ..	1	0
1 2,000 ohm energised loudspeaker with pentode output transformer, Magnavox type No. 164 ..	0	6
1 Marconi N.31 pentode output valve ..	27	6
Wire, sleeving, aluminium for chassis, etc. ..	13	6
	1	0

NEW PILOT MODEL U.535

INCLUDED in the wide range of receivers and radiograms manufactured by Pilot Radio is a low-priced A.C. mains superhet embodying a 5-valve 3-band circuit, type U.535. The accompanying illustration shows the general outward appearance of this receiver which, it will be noted, incorporates the novel Pilot

Test Report and Details of the Pilot 12½-guinea 5-valve All-wave Superhet

finish and tone of the cabinet is of a type which will harmonise with any modern furnishing scheme.

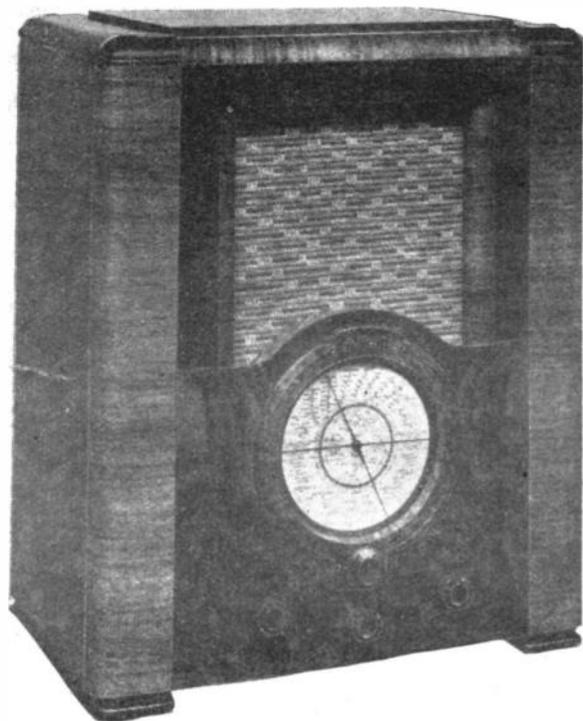
The circuit employed is of the standard superhet design, with the latest Octal valves. These include a frequency changer, I.F. pentode, double diode-triode, output pentode, and full-wave rectifier. A two-circuit tuner is employed on the H.F. side, with two I.F. transformers, thus providing high selectivity. The output from the mains section is fed through a field winding on the speaker, giving good smoothing and a hum-free supply to the receiver, whilst the four dial lights are illuminated from the heater circuit in the usual way.

position provided a reduction gear of 12½ to 1, but which may be pulled out and then gives a reduction of 95 to 1. This is of the greatest value when tuning on the short wavebands. The dial is divided centrally and at the top carries the medium and long-wave station names and wavelengths, whilst the whole of the lower section is devoted to the short waves. The wavebands covered are from 16 to 53, 183 to 560, and 760 to 2,150 metres. The speaker is of the 8in. high-fidelity type.

Test Report

The receiver was tested on our standard aerial and was fully up to the Pilot standard. The A.V.C. action was very definite and worked admirably on all stations which were usually difficult to receive. The tone control gives a very full control over the reproduction, and is of the greatest value when receiving very long-distance stations, as it reduces the general background noise. The volume control is smooth and noiseless in action and the wavechange switch works faultlessly. The two-speed drive is very effective in use and smooth in action. The majority of the stations marked on the dial could be obtained and the selectivity was of a very high order. On the medium and long wavebands all of the European stations could be heard at good volume, and even with a small aerial there was ample material for entertainment purposes in daylight. After dark it is difficult to decide which station to listen to as there are so many available at good strength.

On the short waves the Americans were clearly heard during an early evening test and during daylight many of the stations, such as Tokio, Prague, Vatican City and Huizen were heard at good volume, whilst Radio-Colonial and Havana were also heard during the period of test. No doubt all of the other short-wave stations marked on the dial could be heard during a prolonged test, and the short-wave performance may be classed as really high for a receiver of this type. The mains consumption is approximately 55 watts so that the receiver is very economical to maintain. The output is rated at 4 watts.



This is model U.535 reviewed on this page.

General Features

The receiver is assembled in the standard Pilot manner, with a four-pin plug (American type) for connection to the speaker field and input transformer, and with clips for connecting aerial and earth. A flexible lead is used for the aerial connection and a clip is riveted to the chassis for the earth

connection. Extension speaker sockets are provided, with a jack for gramophone connection. The panel controls consist of a combined on/off switch and volume control on the left, main tuning top centre, tone control bottom centre and wave-change switch on the right. The tuning control is of the two-speed type, which in its normal

selectively-illuminated dial. The cabinet is substantially constructed and, in addition to its attractive appearance, it is designed to avoid many of the difficulties of reproduction by utilising substantial thicknesses of timber at all points and thus gives no troubles due to resonances, even when the output valve is fully loaded. The general

A QUESTION OF DEFLECTION

ALTHOUGH the original schemes theoretically proposed for the use of cathode-ray tubes to give television picture reconstitution suggested scanning carried out by magnetic means, it is only of comparative recent date that this form of working has achieved a degree of popularity. The advantages associated with this method of working have been detailed in these pages, but so far there has been little mathematical data published in connection with the circuits and design of equipment for deflection purposes. This is due partly to the fact that since the deflecting coils and magnet yokes are arranged external to the tube, large air gaps and magnetic leakage flux paths are caused which become difficult to evaluate exactly. Certain principles have been established, however, which set designers and home constructors must follow if the best results are to be achieved. First of all, in order to be certain that no defocusing

effect will become evident in the electron beam the deflecting coils have to be placed in positions determined by the makers only after considerable research and experiment. To prevent the beam of electrons from fouling any part of the interior glass walls of the tube before reaching the screen, the deflecting coils, both line and frame, have to be placed as far as possible from the electrode assembly in the cap end of the tube. Careful positioning is essential to avoid any degree of magnetic coupling between the pair of line coils and the frame yoke.

BOOKS RECEIVED

"Radio Progress" and "Radio Service Manual"

THESSE two publications, issued by A. F. Bulgin and Co., Ltd., are full of useful information for the experimenter and home constructor. "Radio Progress, No. 3," which is the third in the Bulgin annual series of this title, contains 40 well-

illustrated pages. Full explanatory and constructional details are given of various pieces of apparatus, including a 12-valve All-wave A.C. Superhet, a Paraphase Amplifier (14-16 watts output), a Universal Mains All-wave Seven, a Four-band A.C. Four, a 5-valve receiver using the Bulgin Vibrator for H.T. supply; 5-range Coil Units, and a Pocket Amplifier. There is also an article on the construction of a Vibrator H.T. Battery Eliminator with an output of 50 mA at 150 volts from a 6-volt accumulator input, which is also suitable for use with car radio. Theoretical circuit diagrams, wiring diagrams, and photographic illustrations of all the apparatus described, are included in the book.

"The Radio Service Manual" should appeal strongly to servicemen and experimenters, who will find the book packed from cover to cover with practical information on the subjects of fault-finding, the uses and construction of servicing apparatus, and methods of building extensions, relays and other accessory items. Every stage in a modern receiver is illustrated by a pictorial diagram, and there are also several circuit diagrams. Both publications are priced at 1s. 0d. each.

THE AMERICAN VIEWPOINT

MR. DAVID SARNOFF, head of the Radio Corporation of America, returned recently to his home country after a visit to England where he had an opportunity of studying radio and television. In a statement dealing with B.B.C. television he remarked that fewer than 1,000 high-definition television receivers had been sold in this country, and that Radiolympia only served to dispose of 100 sets. It is difficult to understand how a foreigner, on what was essentially a flying visit to England, could acquire information of this character when the Government's Television Advisory Committee are not in a position to specify the number sold. The R.C.A. president has either been completely misinformed or is talking with his tongue in his cheek in an endeavour to justify the attitude of the Americans towards the commercialisation of television in the United States. British television is well ahead of America, and excuses cannot alter this fact. As soon as the B.B.C. obtain more money from the Government there will be increased programme hours and this, coupled with better programme material, will rapidly increase the present rate of progress. It is to be hoped that those responsible for the development of British television will read, mark, learn and inwardly digest the recent outspoken comments of "Thermion." His trenchant remarks were most opportune, and had the merit of destructive reasoning being flavoured with constructive sauce. It is a matter for regret that so few critics have "Thermion's" courage to make helpful suggestions for the improvement of a new industry.

A Standard Comparison

PROBABLY the most important major problem to settle prior to the initiation of any high definition television service is that of the picture standard to be radiated, coupled with the electrical nature of the signal itself. It is, therefore, very strange that English and American practice should differ so widely, when it is remembered that the Emitron camera is really a development of the Iconoscope first shown practically in America. As a result of careful investigation carried out in this country, American engineers are admitting quite frankly that unless changes are made in the type of signal now being employed in many of the experimental American transmissions then the U.S. receivers will be difficult to service, more expensive, and give a performance inferior to their British prototypes. This will not be on the score of picture definition, for the picture definition in America is 441 in America against the 405 here. Lack of synchronism, and insufficient contrast, are the two main items where the American sets are likely to be inferior, and this is due partly to the difference in the radiated signal. First of all, the B.B.C. radiate a picture which has positive modulation, whereas America at the moment shows a preference for negative modulation. The contrast range from black to white is definite between the 30 per cent. carrier which represents zero picture modulation and 100 per cent. carrier corresponding to peak white. With this form of positive modulation the bottom bend of the valve characteristic curves is in the region of the synchronising pulses, and the varying amplitudes of the picture modulation are preserved without distortion, since they

take place on the straight portion of the valve's characteristic.

An Advantage

A GAIN, in America a preference is shown for a radiated carrier wave which, through the omission of the D.C. component, has no definite level corresponding to black. For the best results there is no question but that the absolute brightness of the scene scanned must be incorporated in the radiated picture signal. The alternating component gives the range of tone values between the extremes of the picture televised, but this is not enough for the proper pictorial effects. Imagine an outside scene taken without sunlight—

the mean brightness level will be a certain quantity, and the range of tone values between two figures dependent upon the nature of the objects in the scene. A burst of sunshine will not alter the tone value range, but will quite definitely increase the mean brightness of the picture, and unless this latter factor—that is, the D.C. component, as it is now called—is radiated the change of brightness level will not be noticed in the received picture. Fortunately, with the B.B.C. picture signal any changes in the D.C. level are by special methods included, thus making the mean carrier amplitude correspond with average picture brightness. The best receivers are so designed that they respond to this, so that after setting the brightness control at the beginning of the programme it is generally unnecessary to make any further change unless the transmission alters.

PETO-SCOTT EVERYTHING ALL-WAVE

PETO-SCOTT'S 1938 Range of ALL-WAVE and SHORT-WAVE Apparatus is again unsurpassed for RELIABILITY, QUALITY and VALUE. This all-round supremacy is the natural outcome of PETO-SCOTT'S long experience in Direct-to-the-Public Radio. You know in 1919... you know TO-DAY, that you may order from PETO-SCOTT in the knowledge that you will receive BRAND-NEW GOODS, backed by a GUARANTEE of SATISFACTION.

"DOUBLE 2" S.W. KIT

Save 25!—Buy a Complete Kit!
 ● Amazing new circuit, obtaining 4-valve performance from 2-valves ● Wavelength 9-50 metres ● Bandspread tuning simplifies world-wide reception ● Easy to build, will bring you hours of thrilling entertainment.



KIT "A" All parts, including ready-drilled panel and chassis, four 6-pin and four 4-pin coils, drawings and instructions, less valves, phones, cabinet. List Value **£4.5.4.**

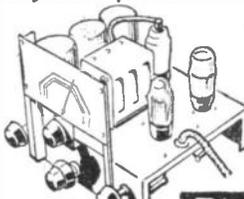
OUR PRICE
£2:19:6

Cash or C.O.D. or 5/- down and 11 monthly payments of 5/6.

KIT "B" with valves, Cash or C.O.D. **£4.4.6** or 7/9 down and 11 monthly payments of 7/9.

ALL-WAVE S.G.3. KIT

Save 25!—Buy a Complete Kit!
 ● 4 Wavebands: 14-31, 25-32, 200-550, 900-2,100 metres. ● Self-contained ready-assembled switched coil unit simplifies construction. ● New Peto-Scott Duplex Epicyclic slow-motion tuning system simplifies world-wide reception. ● Screened air-core coils.



KIT "A" All parts including ready-drilled chassis, drawings and instructions, less valves, cabinet, speaker, batteries. List value **£4.9.3.** **OUR PRICE** **£3:3:0** or 5/- down and 11 monthly payments of 5/9.

KIT "B" with Valves, Cash or C.O.D. **£4.5.9.** or 8/6 down and 11 monthly payments of 7/9.

1938 Stentorian SPEAKERS



MODEL 325 (Illustrated). Further improvement on the famous W.B. Senior 375. New higher flux density and increased sensitivity. Microphone device for matching any receiver. Cash or C.O.D., Carr. Pd., **£2.2.0d.** or 2/6 down and 11 monthly payments of 4/-.

MIDGET MODEL 328. A new thoroughly efficient permanent magnet moving-coil speaker in extremely compact form. Complete with 3-ratio transformer. Cash or C.O.D., Carr. Pd., **17/6** or 2/6 down and 7 monthly payments of 2/6.

CORONA ALL-WAVE 4

BATTERY VERSION KIT "A" £4:7:6
 Cash or C.O.D. Carr. Pd. or 7/6 down and 11 Monthly payments 8/-.
A.C. MAINS VERSION KIT "A" £7:19:6
 Cash or C.O.D. Carr. Pd. or 14/6 down and 11 monthly payments 14/7.

New 5-valve ALL-WAVE A.C. SUPERHET RADIO/GRAM CHASSIS

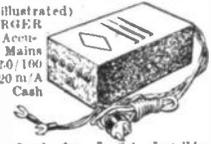
with 5 British Valves & Moving-coil Speaker
LIST VALUE £10:0:0
OUR PRICE £6:6:0



Dimensions: 10" high; 11 1/2" wide; 8 1/2" deep

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The Amateur Set Designer

Further Notes on H.F. Couplings are Given in this Tenth Article of the Series

(Continued from page 206, November 6th issue)

FIG. 47 illustrates the choke-capacity coupled tuned-grid system. The chief merits of this arrangement lie in the facts that the tuning condenser has one side earthed and that, as far as the mains receiver is concerned, L forms a very low impedance shunt for any hum currents. The success of this H.F. coupling system will be very dependent upon the efficiency of the H.F. choke which is connected in series with the anode circuit. The requirement is that the latter should present a consistently high impedance throughout the whole range of H.F. values covered by the receiver. Any pronounced resonant peaks or absorption troughs in the choke's characteristic may lead to ganging vagaries. If ever an occasion demanded a really good H.F. choke it is here.

In Fig. 48 a simple modification of Fig. 45 is given. It will be observed that a tapped tuned-anode circuit is in use, only part of the tuning coil being directly in series with the anode circuit of the valve. The use of the tapping leads to two results: (1) The effective load presented to the valve is now less than the dynamic resistance of the tuned circuit and (2) The damping effect of the valve impedance upon the tuned circuit is now reduced. The latter

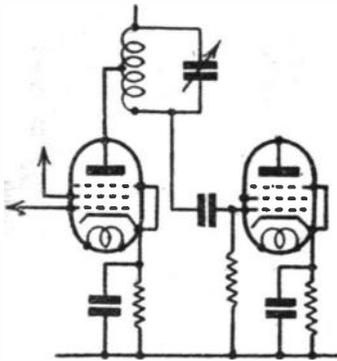


Fig. 48.—A tapped tuned-anode circuit which may be compared with Fig. 45 published last week.

result will give a considerable improvement where selectivity is concerned.

The tapped tuned-anode circuit is really acting as an auto coupled H.F. transformer with untuned primary, and as it is much more satisfactory and the more common practice of to-day to use an H.F. transformer with separate primary and secondary windings, we will at once proceed to consider this better alternative.

The basic circuit is shown in Fig. 49. Undoubtedly this inductively coupled, tuned secondary H.F. transformer is the best interval coupling for the T.R.F. receiver. It should perhaps be mentioned here that the transformer with tuned primary as well as tuned secondary is rather out of the question for the T.R.F. receiver, although

it comes into its own in the superhet receiver, as we shall consider later.

The H.F. transformer of Fig. 49 has got several advantages over alternative

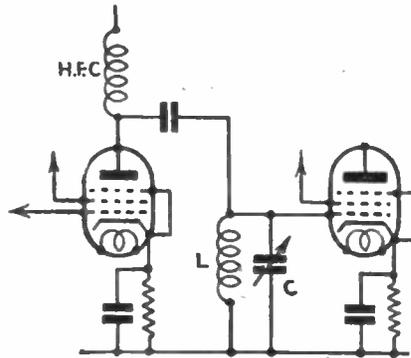


Fig. 47.—Tuned-grid coupling is shown here.

forms of coupling. It lends itself excellently to ganged condenser tuning. The tuned LC circuit gives us more or less a free hand in design in the sense that both the effective load on the valve and the damping of the latter upon the tuned circuit can be controlled by suitable choice of the mutual inductance value between the primary and secondary. As we have already seen, there is some confliction between the requirements of stage gain on the one hand and selectivity upon the other. With the H.F. transformer the tuned circuit can be constructed with full regard to circuit efficiency, and the degree of coupling between primary and secondary can be made the key to solve the question of compromising with the valve impedance. Very roughly (because there could not be 100 per cent flux linkage between primary and secondary), the effective load in the anode circuit will be R_d/T^2 where R_d is the dynamic resistance of the tuned circuit, and T is the ratio of secondary to primary turns. The damping effect of the valve will be approximately equivalent to that of shunting the tuned circuit with a resistance of T^2R_a , where R_a is the valve impedance.

Another advantage of the H.F. transformer is represented by the fact that it

gives no risk of hum voltage transfer in a mains receiver.

Against it may possibly be counted the necessity of having to have primary as well as secondary wave-range switching.

It will be understood that for any given H.F. valve, and any given value of secondary dynamic resistance, there is actually an optimum value for the mutual inductance between the windings.

Variable-mu

The non-variable-mu types of S.G. and H.F. pentode valves have been largely superseded for H.F. amplification by the variable-mu types, although the non-variable-mu H.F. pentode still figures prominently as a detector.

The non-variable-mu valve has a comparatively rapid cut off at the lower end of the anode-current/grid-volts characteristic. As a consequence, rectification is very liable to occur unless the H.F. signal input is severely limited in value. Now, rectification in an H.F. stage gives rise to most undesirable effects. One of these is "cross modulation." If an H.F. stage is tuned to a wanted signal, but oscillations of an unwanted signal are also present in its tuned circuits, the rectification process may lead to the unwanted signal modulating the wanted signal oscillations. Once this happens the unwanted signal will work its way through the receiver "sitting on top of the wanted signal," so to speak, and what is unfortunately the case, no amount of H.F. circuit selectivity after the cross-modulating valve will remove the interference.

The variable-mu valve has an anode-current/grid-volts characteristic which tails off very gradually with increasing negative grid potential. The slow change of slope minimises risk of curvature rectification, and the variable-mu valve gives the freedom from cross modulation which is essential on modern standards.

The use of variable-mu valves is necessary for A.V.C. operation, but also makes the incorporation of a manually operated H.F. volume control a convenient matter. H.F. volume control with a non-variable-mu valve is rather a problem. Control by grid bias is not satisfactory because the cut-off is too sharp, and cross modulation tendencies are bad enough without any

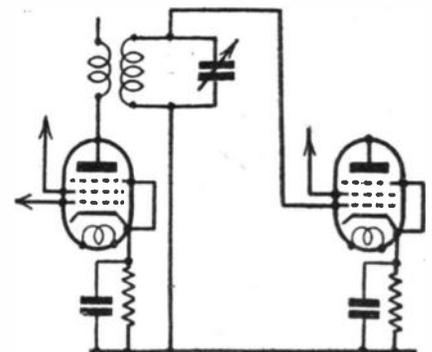


Fig. 49.—This is the direct fed transformer coupling.

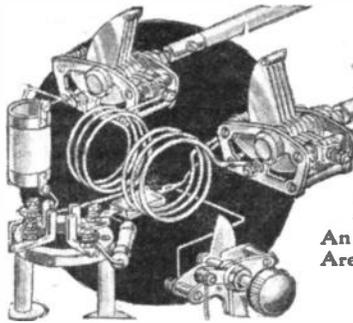
deliberate trespassing upon the lower bend of the curve. Control by screen volts has the disadvantage that reduction of voltage increases the characteristic's curvature, and gives greater risk of cross modulation. With the variable-mu valve, however, volume control by variation of grid bias is entirely satisfactory.

(To be continued)

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Short Wave Section

REFLECTOR AERIAL SYSTEMS

An Explanation of the Special Short-wave Aerials Which Are of the Greatest Advantage in Increasing Signal Strength in a Given Direction.

By W. J. DELANEY

THE reflector or beam aerial is of the greatest use to the transmitter, and those readers who are on the air will no doubt have experimented with this type of aerial and have found its advantages in obtaining maximum radiation in a given direction with the minimum of power in the aerial. But it is not only for transmitting that this type of aerial proves its worth. The user of a receiver—either for broadcast or for the short wavelengths—will very often find that the erection of a reflector aerial system will enable signals to be received at greater strength than otherwise, and also may result in a reduction of outside interference, or, in other words, a greater signal-to-noise ratio. It must be mentioned here, however, that the directional properties of this type of aerial are not so marked on the medium waves, although experiments at my particular location show that there is definitely an increase in signal strength when a reflector is employed. More of this will be dealt with later.

Principles of the Reflector

The principles upon which the reflector aerial is designed are really quite simple, and in the crudest form a reflector consists merely of a duplicate aerial erected in such a position that the aerial proper is situated in a line between the reflector and the station which it is desired to receive. Fig. 1 shows this in a plan view, where the aerial and reflector are indicated as vertical wires or rods. In the most advanced form, a reflector may consist of a number of wires or rods arranged in various patterns round the aerial, and the particular type of aerial to use will depend upon the wavelength upon which the signal is radiated, the location at which it is being received, and the amount of interference which is to be cut out. Thus, for the reception of television, for instance, maximum signal strength would be required on the television wavelength, and provided that there is no interference-producing apparatus in the vicinity a single reflector will suffice. In this connection also, it is important that the receiving aerial shall be polarised, or erected so that it is in the same plane as the transmitting aerial. For the present television transmissions, for instance, a vertical

transmitting aerial is employed, and consequently the receiving aerial must also be in a vertical plane and the reflector or reflectors must be vertically arranged behind it.

Various Assemblies

Thus we see that the first consideration in erecting a reflector aerial is to ascertain the direction from which the signal is arriving at the receiving location, and then to ascertain the source of any interference which may exist. If the latter is spread over a wide region, the reflector may have to be extended so that the aerial is inside

vision signals, it may be made a permanency.

The first consideration is to erect the aerial and this may be of the single type or a dipole. The latter is, of course, a wire or rod having a total length which is one half of the wavelength being received. It is not restricted to that wavelength, however, and acts quite efficiently over a wide band, maximum signal strength being obtained at harmonics of the wavelength as has already been explained in other articles in these pages. The dipole may be split into two sections, each one quarter of a wavelength, and a twin feeder taken from the

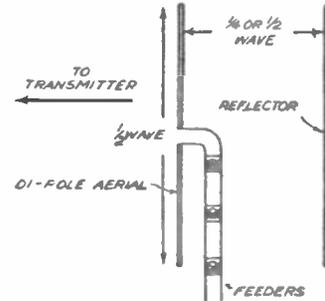


Fig. 3.—Leading proportions for a simple reflector aerial system.

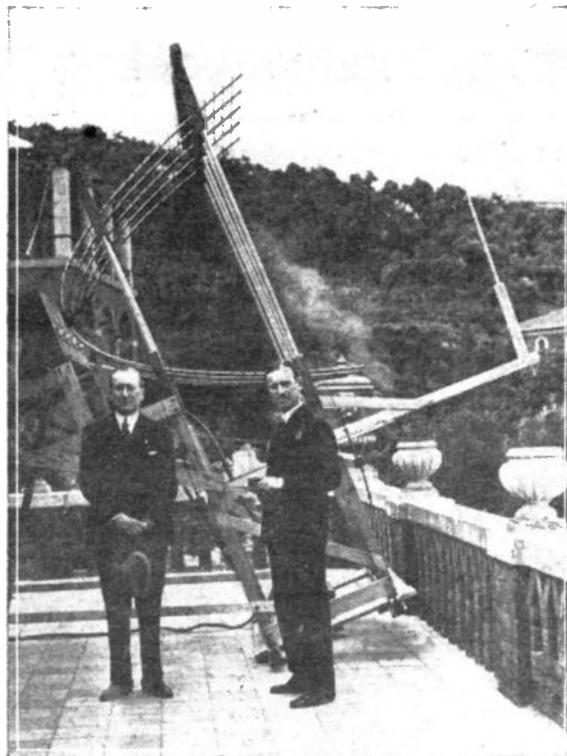


Fig. 2.—This illustration shows a commercial beam or reflector transmitting aerial and clearly indicates the method of assembly.

centre point. The reflector will, however, not be split but will be a continuous wire or rod half a wavelength long as in the case of the first type of aerial. Should it be necessary to erect more than one reflector, then each must be identical in length and the only difficult point to arrive at is the spacing between reflector or reflectors and the aerial, and also between individual reflectors.

Reflector Spacing

The transmitter is favoured in designing his reflector aerial as he can arrange for listeners to measure field strengths over different distances and in different directions and find the best arrangement for his particular situation. The listener is not so fortunate, although if a suitable signal-strength measuring apparatus is to hand, he can rig up different arrays and ascertain the improvement on a given station—always taking into account, of course, the fact that a distant station may fade, and that signal strength may vary from day to day, especially on the shorter wavelengths. In the case

of the television signals, however, a fixed station is available for experimental purposes. For measuring the signal strength, the simplest arrangement is to include an ordinary milliammeter in the detector stage and to note the needle deflection when the station is tuned in. Alternatively, the new Bulgin Neon signal strength indicator may be connected to the output valve and used for the purpose. In most cases it will be found that the reflector will give best results on a receiving aerial when it is arranged as far behind the aerial as the length of the aerial. Thus, if the aerial is 5ft. in length, a 5ft. reflector would be arranged 5ft. to the rear of the

it—except for a space in the direction of the transmitter. This indicates that for general purposes, the aerial array will have to be mounted on some form of rotatable table so that it may be directed to the required transmitter, although if it is to be used only for the tele-

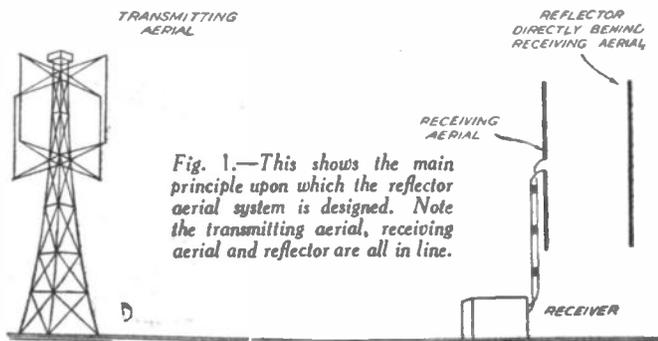


Fig. 1.—This shows the main principle upon which the reflector aerial system is designed. Note the transmitting aerial, receiving aerial and reflector are all in line.

(Continued on next page.)

SHORT-WAVE SECTION

(Continued from previous page.)

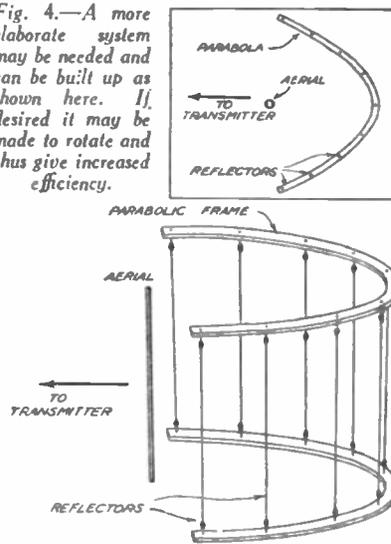
aerial. In some cases it should be only one quarter of the wavelength behind—that is, a dipole aerial 5ft. in length would need a 5ft. reflector arranged 1ft. 3in. behind the aerial. If a number of reflectors are to be used they may be mounted on a light wooden framework and the positions first planned with the framework on the ground. Tests indicate that the parabola is the best form of multi-reflector, and the shape must be very carefully plotted before the supporting wooden strips are fitted together. Tests on the television signals in my case show that the parabola gives no increase over a single reflector, but there is a remarkable reduction in the background noise which is received when a parabola is employed. Furthermore, using an aerial for this particular signal made from copper tubing, and with reflectors made from copper tubing and also from ordinary 7/22 copper wire, there is no noticeable difference, and the wire is lighter and cheaper.

Broadcast Band Experiments

On the ordinary broadcast band experiments were conducted with the "No-

Mast" aerials, and it was found that the North Regional station could be received at nearly twice the normal volume when a

Fig. 4.—A more elaborate system may be needed and can be built up as shown here. If desired it may be made to rotate and thus give increased efficiency.



second No-mast aerial was erected about 10ft. from the receiving aerial—actually each aerial being supported on a separate chimney stack. The reflector was not, of course, connected to the receiver or allowed to come into contact with the aerial, and the signal faded as soon as the additional aerial was lowered. The effect is enhanced in my particular case owing to the fact that there is a very high bank or rise in the ground at the bottom of the garden and this obviously acts as a considerable screen—the ground at the top of the bank being above the level of the roof.

Reports from readers show that the reflector is definitely worth while on the short waves, and we should be glad to receive details from readers who have carried out experiments with this type of aerial and, if possible, measurements of the aerial, reflector(s) and distances which have been employed in the separation.

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Leaves from a Short-wave Log

U.S.A. Broadcasters Seek New Channels

WIXAL, Boston (Mass.), W9XF Chicago (Ill.), and W2XAD, Schenectady (N.Y.), have applied to the Federal Communications Commission for the temporary use of four channels so far reserved by the U.S.A. Government for the establishment of a Pan-American short-wave broadcasting service. The frequencies desired are: 9.55 mc/s (31.41 m.); 11.73 mc/s (25.58 m.); 15.13 mc/s (19.83 m.) and 21.5 mc/s (13.95 m.), the first and the last of these being those on which W2XAD wishes to carry out experimental transmission. All four channels are also wanted by WIXAL (Boston) and W9XF (Chicago). W2XAD has also filed an application for authority to increase its power to 100 kilowatts, and W9XF is also asking permission to use 50 kilowatts.

Yua, Belgrade Regularly Logged

On almost any evening it is now possible to pick up programmes from Belgrade (Yugoslavia) through the 1.5 kW short-wave station working on 49.18 m. (6.1 mc/s). The daily schedule is as follows: G.M.T. 07.10, gramophone records; 13.15-14.30, news and concert; 19.15-23.30, news, vocal and instrumental concert. The call is: *Orde Radio Beograd* (phon.: *Bay-ove-grad*), and the interval signal a musical box rendering of an old Serbian folk-song. Announcements are made in several European languages by a woman.

Another Mystery Station?

Has any reader picked up a transmission recently from Bucearest on about 31 m.? The address given by the announcer is: *Institut d'Electricité, Victor Emanuelstrasse, Bucearest (Romania)*, but no call-letters have been heard.

Proposed New Brazilian High-power Station

It is stated that a new short-wave station is to be erected in the immediate vicinity of

Rio de Janeiro (Brazil) for the sole purpose of broadcasting Roman Catholic sacred services and radio entertainments. One report mentions that the studio still style itself: *Radio Vera Cruz* (?).

Monte Video on the Air

Many listeners report the reception of strong signals from CX44, Monte Video (Uruguay), operating on 48.98 m. (6.125 mc/s). The station relays its main programmes from the CX6 medium-wave transmitter in the capital from G.M.T. 13.00-17.00, and again from 19.00-03.00. The call would appear to be *Estacion Oficial de Monte Video* (phon.: *Montay Vee-day-owee*).

The Javanese Stations Heard in Europe

The recent relay by the B.B.C. of a Javanese concert from the Netherlands East Indies prompted the writer to search for the various short-wave channels on which the programme was broadcast. The following stations were logged: PLQ (Bandoeng), 28.09 m. (10.68 mc/s); YDC, Batavia, 19.8 m. (15.15 mc/s); PLP, Bandoeng, 27.27 m. (11 mc/s); PMN, Bandoeng, 29.24 m. (10.26 mc/s); PLV, Bandoeng, 44.64 m. (6.72 mc/s);

Bandoeng, 31.86 m. (9.415 mc/s), and PLG Bandoeng, on 18.8 m. (15.96 mc/s).

Warsaw on Two Wavelengths

For its special transmissions in the English language to the U.S.A., Warsaw uses for its late broadcasts 26.01 m. (11.535 mc/s), in addition to the regular channel of 22 m. (13.653 mc/s).

Try for China on 30 m. Band

Readers have reported the reception of war news bulletins in the English language from Nanking through XGOX, now working on 30.61 m. (9.8 mc/s).

Nationalist Stations in Spain

The short-wave transmitters at the disposal of the Spanish "Franco," or Nationalist Government, have been increased in number. Those operating daily are: Radio Castilla (Burgos) on 48 m. (6.25 mc/s); Falange Española No. 1 (Valladolid), 42.83 m. (7.006 mc/s); Radio Requete (Durango) on 42.26 m. (7.099 mc/s) and 41.5 m. (7.21 mc/s); Radio Jaca (Jaca), 41.8 m. (7.177 mc/s); Radio Requete (San Sebastian), 41.65 m. (7.203 mc/s); Radio Nacional, Salamanca, 41.5 m. (7.229 mc/s); Frente de Madrid (Madrid) on the same channel; Radio Requete (Toledo), 41.4 m. (7.24 mc/s) and Radio Club de Tenerife. EDR3, el Tablero, Las Palmas (Canary Isles) on 28.93 m. (10.345 mc/s), which relays the Salamanca (Radio Nacional) broadcasts.

Stand by for Canada

Canada's two new 50-kilowatt short-wave broadcasting stations, CBL, in the vicinity of Toronto, and CBF, at Montreal, were expected to be sufficiently completed to permit tests on November 1. With another station to be installed in the Prairie provinces and one on the Eastern Coast (Maritime Provinces), a complete link up of the Canadian Broadcasting Corporation chain will be achieved.

Listen for South African Tests

On 8.9 mc/s (33.71 m.) the new 22 kW transmitter at Kliphevel (Cape Province, Union of South Africa) has been carrying out transmitting tests occasionally between G.M.T. 17.30-22.30. The broadcasts have been clearly picked up in the British Isles.

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RADIO CLUBS & SOCIETIES

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

Perth Radio Club

THE above club is making fine progress but we are very much handicapped by the lack of mains supply in our present club-rooms. However, we hope very soon to move into more suitable club-rooms. One of the club members gave a very interesting series of lectures on the "Power Supply in Modern Mains Receivers." The club was very fortunate in being able to test the 1938 W.B. Senior Speaker through the courtesy of Messrs. Whiteley Electrical Radio Co. The members were very much impressed by its very fine performance. On Monday, October 18th, two of the members demonstrated their S.W. receivers, one a 4-valve straight receiver, and the other an 0-v-1. Their respective merits and demerits formed the discussion which followed. The club will welcome new members, and enthusiasts in the district are invited to get in touch with the Sec.: Mr. R. Adams, 2, Croft Park, Craigie, Perth.

The Croydon Radio Society

NO one of the Croydon Radio Society misses a member's lecture if he can help it, and such an occasion was Tuesday, October 26th, in St. Peter's Hall, Ledbury Road, South Croydon. The lecturer was the hon. secretary, Mr. L. F. Marshall, speaking and demonstrating on: "Making Electrical Measurements." He first dealt with five effects of an electric current, namely, the physiological, electrostatic, chemical, magnetic and heating. After giving typical and varied examples of each, he went on to remind members of the meaning of resistance, currents and volts, including rather necessary definition.

Very interesting, also, was his description of commercial measuring instruments. There was, for instance, the hot wire ammeter, using the thermal effect of electricity. Then there was the moving coil ammeter, very sensitive, had a uniform scale, but could only be used on D.C. Other types and their uses included moving iron instruments, and Mr. Marshall even found time for mention of the use of the Westinghouse metal rectifier in instruments. The loudspeaker night is on Tuesday, November 16th, and PRACTICAL AND AMATEUR WIRELESS readers are particularly invited to bring their loudspeakers, or at least themselves, to make a very interesting evening. Hon. Publicity Sec.: E. L. Cumber, "Maycourt," Campden Road, S. Croydon.

The Faraday Radio Society

THE above-named society has commenced its winter session and meets every Tuesday and Wednesday, at 7.45 p.m. at the Nelson L.C.C. School, Trafalgar Street, London, S.E.17.

In addition to the usual club activities, arrangements have been made with the Marconi Co., for a course of lectures concerning "Marconi's Life and Work." and embracing the whole history of radio during the past fifty years. The lectures are illustrated by means of lantern slides and original photographs, together with representative examples of Marconi's early

apparatus. Morse practice is available for both beginners and experienced operators. A hearty invitation is given to potential new members. For full particulars write to J. Payton, Hon. Secretary, at the above address.

Bradford Short-wave Club

ON Friday, October 29th, Mr. F. B. English, Radio G6AZ, lectured to the club on "Aerials." He dealt with the subject very capably, and the club were very much impressed by him.

At 8.30 p.m. on Friday, November 12th, we are holding a club social and supper, and a number of friendly amateurs from Leeds will be present. Anyone who wishes to come will be very welcome, and members of other clubs are included in this invitation. Supper will be charged for at 1s. 3d. per head. S. Fischer, Hon. Sec., "Edenbank," 10, Highfield Avenue, Idle, Bradford, Yorks.

The Exeter and District Wireless Society

AT the meeting of this society held on Monday, October 25th, Mr. R. C. Lawes, A.M.I.E.E., took as his subject for a lecture, "Direction Finding."

The latest types of apparatus were described in detail, and the lecture was made more interesting by the fact that during the last few months, Mr. Lawes has installed on ocean-going racing yachts various types of direction finders.

Mr. Lawes mentioned that he found it quite practical to navigate any sea-going craft by using radio alone, and he instanced a crossing from Fastnet Rock to the Scilly Islands, a distance of approximately 200 miles. On this particular leg of the yacht race, no stellar observations were obtained owing to thick weather, but the lighthouse on Round Island in the Scilly Islands was found with ease.

At the next meeting the lecture will be given by Mr. F. Rumball, who takes for his subject, "Radio Apparatus on Moving Vehicles." Meetings are held each Monday at 3, Dix's Field, Exeter, and those interested should get in touch with the secretary, Mr. W. Ching, 9, Sivell Place, Heavitree, Exeter.

Wellingborough and District Radio and Television Society

THE fortnightly meeting of the above society was held at The Exchange Hotel, Wellingborough, on Wednesday evening, October 27th, when a lecture entitled "Television and the Cathode-ray Tube" was given by Mr. Bettridge, of Messrs. Marconiophone.

Television, said the speaker, was not quite such a new science as most people thought, and as long as 30 years ago, a mechanical system was being experimented with. Mr. Bettridge then went on to describe in detail the operation and present-day application of the cathode-ray tube in television receivers.

The president of the society, Mr. A. E. Fletcher, was in the chair, supported by the hon. sec., Mr. L. F. Parker (G5LP), and a fair attendance of members.

Edgware Short-wave Society

THE above society has held a series of very interesting meetings during October. We have also arranged a programme of field days for the winter months, at which visitors will be welcome. It is being arranged for a special 40-metre section to be active on these, and transmitting members in the locality will be searched for, if they let us know if they will be on the air on these various field days. The club meetings are well attended,

morse practice is progressing well, and members are proving quite good at speed tests. We wish to record our thanks to PRACTICAL AND AMATEUR WIRELESS for all the help it has given us since the society's beginning, and for the way it has encouraged the club spirit among its readers. Also, I wish to thank the various clubs, at home and abroad, that have written to me wishing us luck. Full particulars of membership and meetings can be obtained by writing to the hon. sec., George Yale, 40, Raeburn Road, Edgware.

Portsmouth and District Wireless and Television Society

LOUDSPEAKERS was the subject dealt with at the meeting of the above society held at their Hudson Road headquarters on Wednesday, October 27th.

A lecture and demonstration was arranged by one of the members, which included a test of a W.B. Stentorian speaker, kindly loaned by the manufacturers, and a unit of unique construction designed with the object of providing greater frequency range and output in the upper register.

Various types of reproducing equipment showing the evolution of the loudspeaker were available for inspection.

It was also announced that the G.P.O. had granted the application of the society for a full radiating licence.—Hon. Sec., F. L. MOORE, 78, Laburnum Grove, Portsmouth.

International Short-wave Club (Guernsey Chapter)

AT the weekly meeting of this club, held on Tuesday, October 19th, at 4, Well Road, the president, Mr. J. Dowding (G8DO), was in the chair, supported by the full committee and a good attendance of members.

After being shown over the president's transmitter room and studio, the members were entertained by Mr. T. de Putron (G8MF), who demonstrated his Hallcrafters Super Sky rider communications receiver. A new G.E.C. all-wave instrument, kindly submitted for test by a well-known local radio dealer, was next on the agenda. Among other activities, the club indulges in technical instruction, and morse code classes, under the direction of G8DO, are a popular feature.

All information concerning the club's programme may be obtained from the secretary, Mr. F. S. LE PAVOUX (2BTP), S. Upper Caniechers, Guernsey, C.I.

Swindon and District Short-wave Society

THE annual general meeting of this society was held on October 28th. The secretary reviewed the past year's activities and stated that it was a very successful year. The chairman, Mr. E. W. Mortimer (2BMM), congratulated the members on the sound financial position. The following officers were elected for the new financial year: Chairman, Mr. E. W. Mortimer; hon. sec., W. C. Barnes; treasurer, J. Rose; vice-chairman, P. Bailey. The president is W. W. Wakefield, Esq., M.P. vice-presidents, R. A. Hiscocks (G6LM) and E. Howell (G2HN). Arrangements are well in hand for the "Q.R.K." trophy contest, and a very active season is promised. Messrs. Whiteley have loaned one of their popular Senior model Stentorian loud-speakers for test purposes. New members are welcomed, and all communications should be addressed to the hon. sec., W. C. Barnes (2BWR), 7, Surrey Road, Swindon.

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Dept. 94, International Buildings,
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THE BRITISH LONG-DISTANCE LISTENERS' CLUB

Cutting Out Interference

PROBABLY one of the greatest problems of the present-day listener is that of curing interference. Unfortunately the term "interference" may cover a multitude of different types of noise, and extends from the overlapping of two or more stations to the noises introduced (either through the aerial or through the mains) from various types of electrical equipment. To tackle inter-

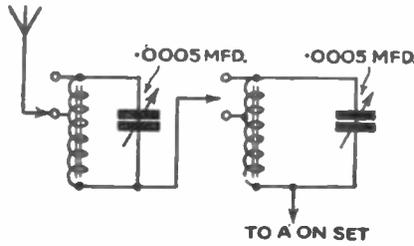


Fig. 1.—An effective double-wave trap.

ference problems the first step is to find out what is causing the trouble, and in many cases this is a simple matter. For instance, if a receiver is being used close to a main B.B.C. station it may be found that with the receiver in use this station forms a background over quite a wide range of the tuning scale. The remedy in this case is to rearrange the aerial system so that it is at right angles, or as nearly so as possible, to the direction in which the local transmitter is situated. Where this cannot be done, or the receiver is of the very simple type, a wave-trap can be employed. In its simplest form this consists of a tuned circuit joined between the aerial and the receiver, but where the interference is very severe, or in a superhet where it introduces second-channel whistles, a more comprehensive arrangement might be found desirable. In such a case the scheme depicted in Fig. 1 may be found of the utmost value. This is a double wave-trap, utilising two modern iron-core medium waveband coils, each tuned by a .0005 mfd. condenser and provided with tapplings. The method of connecting it is shown in the diagram, and it will be found very successful in practice.

Adjustable Filters

Sometimes, whistles of varying pitch may be received on various stations, due to the actual carrier waves of the transmitters mixing before reaching the receiver, or from some cause inside the receiver, and although the former trouble has been much reduced of late, it still persists in some cases. Unfortunately, the only way to remove this is to cut off the frequency

response of the receiver at a point coinciding with the whistle. It will generally be found with the modern station separation which is permitted, that the whistle occurs at a frequency of about 9,000 cycles per second, and thus a 9,000 cycle filter will eliminate the whistle. It will also eliminate all musical frequencies at this frequency, however, and therefore to preserve good quality of reproduction it is essential that any filter which is used shall peak at that frequency.

Fig. 2 shows a comprehensive filter built to fulfil this purpose, and the three special chokes which are needed will have to be very carefully made or purchased from a reliable manufacturer. The details are clearly set out in the circuit, from which it will be seen that when not needed—such as when receiving the local station—the

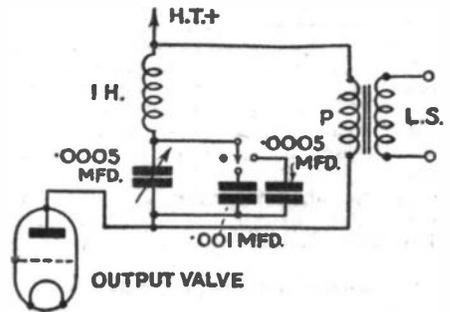


Fig. 3.—A simpler tuned filter arrangement.

filter may be eliminated by means of a simple switch.

A Simpler Arrangement

Where it is desired to fit a simpler circuit the arrangement of Fig. 3 may be adopted, and it will be seen that the variable condenser (which may be of the bakelite dielectric type) will enable the frequency response of the filter to be adjusted over a fairly wide range, and this type of filter

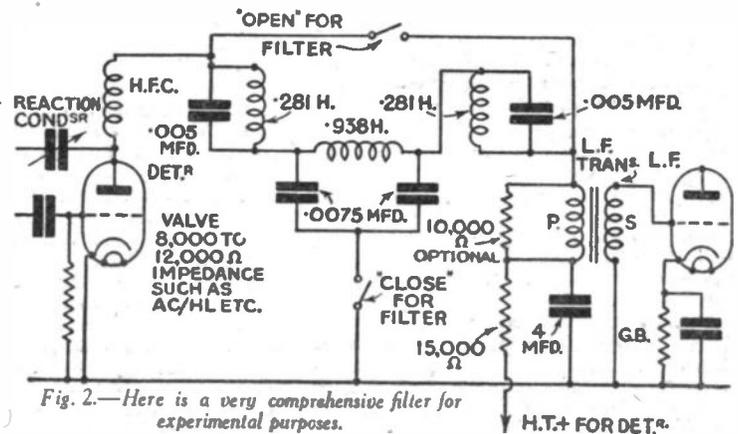


Fig. 2.—Here is a very comprehensive filter for experimental purposes.

is under control to reduce any desired type of whistle. Unfortunately, it does not peak so sharply as the Fig. 2 arrangement, and musical quality will suffer. If any members have experimented with other forms of interference preventer, we shall be glad to pass on to other members of the B.L.D.L.C. the results of their experiments.

LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Inter-room Communication

SIR,—I beg to submit a slight improvement on Mr. Westerhouse's recently-described system of inter-room communication by means of an extension loudspeaker. I think the accompanying sketch is self-explanatory. A single button on the extension speaker connects it *via* a relay to the "pick up" terminals of the set, and also switches on "L.T." When the relay is at rest, the speaker is connected to "Output" in the ordinary way. The relay consists of three sets of contacts, as shown. At the "set" end, the corresponding contacts may be arranged to be directly operated by a button, or another relay may be used. My relay is improvised from parts of an old bell, and the contacts at the main speaker are directly operated by the button. Operation consists of pressing the button and speaking, and then releasing the button and waiting for the reply.—C. J. D. FOREMAN (Ashford).

Mains-operated Valve Tester

SIR,—As a regular reader of PRACTICAL AND AMATEUR WIRELESS, I am eagerly awaiting the details of the A.C. mains-operated valve tester which was mentioned a few weeks ago. Might I suggest that the design be kept as simple as possible? An emission test obtained by causing the valve under test to act as an A.C. rectifier, together with a cathode insulation and internal electrode insulation test capable of being made whilst the valve is at working temperature, would meet the needs of the majority of amateurs, more detailed tests being well left to our friends, the professional service engineers.

I hope to make up the A.C. version of the "Corona 4," but the old "Hall-Mark 4" is going so well that the difficulty is to find a convincing enough excuse for replacing it.

Best wishes for the continued success of PRACTICAL AND AMATEUR WIRELESS.—S. C. DUFFETT (Weymouth).

SIR,—As a regular yearly subscriber since the paper began, I should like to endorse the suggestion already made by several readers that you publish a constructional article on a mains-operated valve tester.

I should also like to see an article fully describing the use of the T.V.4 or similar cathode-ray tube as a balance indicator for mains-operated capacity or resistance bridges.—MAJOR A. HILTON-JOHNSON (Sandhurst, Berks).

From Prize-winners in Our Radiolympia Competition

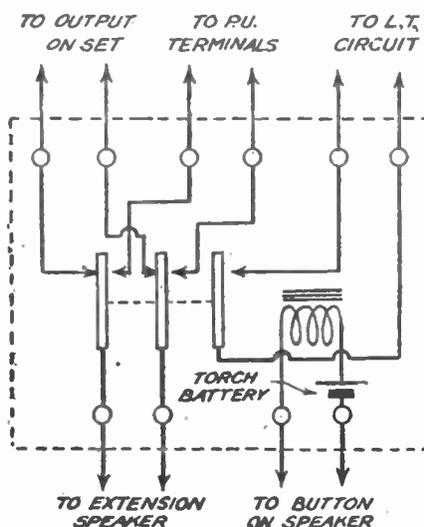
SIR,—I beg to acknowledge receipt of the W.B. Stentorian Senior Loudspeaker which I won in the recent Radiolympia Competition.

It is a very fine instrument and justifies

in every way the claims made for it by the manufacturers.

Wishing PRACTICAL AND AMATEUR WIRELESS every success.—HERBERT A. SMITH (Stanley, Perthshire).

SIR,—I received the "Stentorian" speaker in perfect condition, from the Whiteley Electrical Radio Co., Ltd., and I would like to take this opportunity to thank you for it. I am sure that the readers



Circuit diagram of Mr. C. J. D. Foreman's system of inter-room communication.

of PRACTICAL AND AMATEUR WIRELESS appreciate the very sporting way that you presented the extra loudspeakers, to cope with the runners-up in your recent competition. Once more, many thanks!—L. J. TEARNEY (Dartford, Kent).

Strange Phenomena

SIR,—Some time ago a rather strange occurrence happened with an accumulator charger of mine, which I thought might interest other readers. When I am not in England, my home is Portugal. I live about four miles outside Oporto; the voltage at our home is 220 50P. The charger is a Philips with a half-wave valve rectifier—I think it is argon filled as it glows mauve-orange. I plugged in the mains plug and joined up the accumulator, the valve glowed, showing that the accumulator was charging. When I put my hand near the rectifier, the glow vanished but the filament remained alight. On removing the hand the glow reappeared; but when I turned the mains plug round, one's hand made no difference. I took the charger to where I work, in the town of Oporto (the voltage is 110 50P). Would you believe it, but exactly the opposite happened here: unless I held my hand near the valve it refused to function! If someone can explain this, I shall be

much obliged.—ROY G. TAIT (Mundesley). [Here is an interesting problem, which other readers may like to try to solve. No prizes are offered but we shall welcome suggestions.—Ed.]

A Reader's Thanks

SIR,—I am pleased to say that I received the book forwarded to me for being successful in Problem No. 266. Many thanks for same. It is a most interesting and helpful book which, in my opinion, no wireless enthusiast should be without.

I have been a constant reader of PRACTICAL AND AMATEUR WIRELESS for over two years now and take a good deal of interest in the weekly problems, many of which I have solved correctly.—F. WALSH (Manchester).

Logged on Our Three-valve Bandspread Short-waver

SIR,—I read with very great interest the various station short-wave logs which appear each week in your excellent journal, and I enclose herewith a list of 20-metre 'phone stations I have heard on your 3-valve bandspread short-waver, published in PRACTICAL AND AMATEUR WIRELESS, September 5th, 1936.

The following stations were heard during September and October: ON4SS, ON4TN, ON4RR, F300, F3NF, F3LR, PAOFB, PAOMV, SP1DC, SP1CA, OZ5BW, ZB1H, ZB1L, LA1G, LA5N, VK2XU, VK4JU, VK2VB, ZU2LM, TF3P, ES5V, HB9AY, HB9CH, VE1DR, VE1AW, VO6Q, VO6M, CO6OM, NY2AE, VS2AK, FA4AI, CN8AL, CN8AM, CN8AN, VU2CQ, CT1AA, CT1AY, SUIKG, SUI5M, W9LVG, W8ANO, W8RED, W4TJ, W2IXY, and W1BLO.

Also, reports have been sent to the following who have returned their QSL cards:—

SUI5G, ON4LO, ON4UT, VE9HS, OZ3U, LA6N, HA4A, PAOMZ, SM5SI, W1ED, W2DH, W6GCT, and W8JOE.

Thanking you for such an excellent circuit and wishing your paper every success.—RONALD ROBBINS (Henley-on-Thames).

CUT THIS OUT EACH WEEK

Do you know

- THAT care has to be taken in the design of a frequency-changer for use on 10 metres and below.
- THAT standard superhet circuit arrangements may not be found suitable for the ultra-short wavelengths.
- THAT the anode by-pass condenser normally used in a detector stage may be omitted on the short waves.
- THAT two or more loudspeakers may be used to improve the balance of reproduction, but they must be connected in phase.
- THAT when using such reproducing systems, a special tone filter is desirable to pass the high notes or upper frequencies to the speaker which gives the better high note response.
- THAT earth tubes or plates should be of copper or other low resistance metal.

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

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

ELECTRADIX

NOTE THESE BARGAINS

RELAYS. For tiny currents from light cells or for radio circuits. Moving Coil pivoted, work on 50 micro amps. Half usual price, 60/- Also mov. 1 1/2" telephone type high or low res. coils, 8 G. 25-way Auto Selector 6-rang relays 10/-. Heavier current relays for Transmitters, American 7 G. Sounder type 15/-. Creed polarised 2-way 30 A. Ship magnetic 15/-.

MIKE A.C. Mains Amplifiers of famous make, complete with resistors valves 505 and AC 84 brand new and ready for use. Hum free, sound recorder quality, level response, in steel case M x 8 x 7 1/2". List £12, but for sale at the price of a kit. **60/-** Battery 1 valve model in oak case, 25/-.

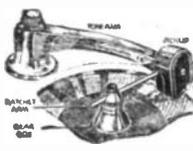
NEW G.E.C. Outfit, 6-watt Amplifier and Transverse Mike on stand, 100 3-stage unused set, bargain, £13/10 G. Larger set by Ardenre, fine job, 20 watts pure output, A.C. mains, £18.

DEAF AIDS. Equal to ten guinea sets. Midget earpiece, Lapel mike etc., 42/-. Popular set with watch earpiece, 18/6. Brown's Aural Box, a scientific sound amplifier for severe cases, £4. For total cases bone conduction is the only possible way to receive radio by the Osaphone no lighter than an earpiece, 20/-.

DIX-MIPANTA VEST POCKET TESTER. A wonderfully versatile moving-iron multirange meter for service on A.C. or D.C. jobs. No protective terminals. THREE ranges of volts: 0-7.5, 0-150, 0-2400. Used for MILLIAMMETS: reads: 124 u.a. and 75 m.a. In black bakelite case. Measures only 2 1/2 in. by 2 1/2 in., with pair of test leads and plugs. Leaflet "N" gives full information. **19/6**



SOUND RECORDING



Electric PITCH set has ball bearing centre gear box and geared traverse rod. Set with Tracking Gear, Pick-up and Tone arm fitted diamond. **37/6.** For experimenters requiring gear only, less Pick-up and Tone-arm, this is 21/6. Diamond Cutter Switch, fit all pick-ups, 7/6. Blank Discs: 4/- dozen. Complete Acoustic Sets de Luxe, 12/-; No. 2, 12/6; Junior type, 5/6 each complete.

STEEL CABINETS for Transmitters, Amplifiers or Televisors. One size, 24 in. x 42 in. high. Welded steel frame, sheet steel sides, hinged front door with grille. Worth 25/-, now at 17/6 each.

ABARGAIN IN DYNAMOS. Type "C." Our latest for Bengalow, Yacht, or Cell Charging. 140 watt. Enclosed Dynamo, 12-20 v. 12 amps. Ball Bearings, Vee Pulley, 25/-.

Marine Type Switchboard with Ammeter, maximum and minimum Auto Cutout Mains switch and Fuses, Field Regulator, 25/-.

CRYSTAL SETS. Buy the boy one, they cost nothing to run. No battery or valves wanted. Quiet and efficient reception. 500 ship-shaped sets cheap. Enclosed type, 5/6 and 7/6 each. Battery portables, 30/-.

LEDIX CELLS are light, sensitive with gold grids, moisture proof, 5/6. Mounted in Bakelite Case, 7/6. Super-flood in oxygenless body, with window, 10/-.

LIGHT AND RAY CELLS—Selenium Raycraft, 21/-; Kingston, 15/-. Raycraft outfit with relay and amplifier, 45/-. Photocells, for sound on film, Television and Ray Work. R.C.A., 25/-; G.E.C., 22/10/-; Beck Angle Prisms, mounted in carrier, 5/6. Micrometer adjusters for lens, 1/-.

Eye-pieces with prisms and lenses for photocell, 12/6. Projector Lamps, with lens and holder, 17/6.

METERS. Genuine Weston model 354. Central zero 1 to 16 amps, pol. mag. dead beat. Push panel, 2 1/2 in. dial, nickel or black. Sale price 7/6. Mounted in solid mahog. 3 in. sq., 9/6. Hoyt 477 mov. coil milliammeters, 35-95 m.a., 10/-.

Weston 5, 30 and 50 m.a. mov. coil milliammeters, 17/6. 0-100 m.a., 17/6. Switchboard Meters all sizes.

MICRO-AMMETERS for Valve Voltmeters, etc., 0 to 50 microamps, full scale, 50 mV, moving coil, 1,000 ohms, flush panel, 2 1/2 in. dial, 40/-, 2,000 Meters. All sizes.

FERRANTI TRANSFORMERS Intervalve and Push-pull, 6/6. B.T.H. 4 to 1 ratio, 5/-.

SCHOOL CINE PROJECTOR 35 m/m steel enclosed for L.C.C. (cost £70; as new, bargain, 12/-, picture, £12. Sound-threads £4.

PARCELS of experimental odd coils, magnetos, wire, chokes, condensers, switches, terminals, etc., post free, 10/6, 7/-; 7 lbs., 5/-; 1,000 other Bargains in large illustrated Sale List "N."

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Telephone: Central 4611

FREE ADVICE BUREAU COUPON

This Coupon is available until November 20th, 1937, and must be attached to all letters containing queries.
PRACTICAL AND AMATEUR WIRELESS,
13/11/37.

BELLING-LEE VALVE-HOLDER

We have received the following letter from Messrs. Belling & Lee, concerning the high-voltage valveholder which was reviewed last week:—

"SIRS, **WARNING.**

"We recently sent you a sample of our new high voltage valveholder, stating that it was suitable for 11,000 volt peaks from sockets to chassis. A doubt has arisen as to whether this is strictly true under all the conditions likely to exist in a television receiver, such as moisture before the set warms up and dust attracted electrostatically. Our original calculations and tests were on new mouldings under favourable conditions, when the air gaps and creepage paths are probably adequate against breakdown, though in common with many other television components, these distances are considerably less than B.S.S.415 recommendations.

"A television engineer has now called our attention to the fact that whilst our design does not 'flash over,' it does exhibit corona which can be seen round the sockets if tested in the dark at 11,000 volts. This may in time lead to 'tracking' and breakdown of the bakelite, and may also lead to damage of rubber in the set by ozone.

"Careful tests are now being carried out in our own and other laboratories to ascertain the seriousness of this corona and at what voltage it starts and what change in design is needed.

"In the meantime, we have hastened to send this letter to all designers to warn them to carry out thorough tests before incorporating this valveholder in 11,000 volt positions in their sets. Incidentally, we hear that exactly the same phenomenon is sometimes occurring in practice with other television insulators, such as C.R.O. tube bases!"

AN A.C.-D.C. ONE-VALVE REFLEX PORTABLE

(Continued from page 243.)

Remember that the chassis is alive, and be careful not to touch it when the set is switched on. If severe hum is experienced on A.C. mains, reverse the mains plug.

In the case of D.C. mains, if signals are not heard after switching on, it indicates that the set is not receiving H.T., and the mains plug must be reversed. It is essential where the receiver is used on D.C. mains to insert a small condenser (a value of .002 mfd. is suitable) in the aerial lead. It should be joined between the aerial socket and pin 2 of the valveholder, the existing wire, of course, being removed. This is necessary in case the mains plug is inserted the wrong-way round, in which case, without the condenser in the aerial lead, the Westector would be damaged. The same remarks would apply should the aerial be earthed.

It will be noted that an H.F. choke is shown in the diagrams and is not included in the List of Components. This com-

REPLIES IN BRIEF

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

A. G. S. (Edinburgh). We do not favour the frequency-changing method indicated in your sketch. It would probably be preferable to use a standard electron-coupled oscillator.

J. G. R. (East Horsley). Any good printer would run you off cards to your own requirements, or you could find a firm who specialises in this type of work by writing to the Radio Society of Great Britain.

N. S. (Mansfield). The receiver in question utilises 6-pin coils and these are to be preferred. You could, of course, use 4-pin components, but they are not so flexible.

E. M. M. (Bournemouth). It is not possible to offer an explanation of the peculiar behaviour without a diagram of the circuit you used.

R. M. P. B. (N. 16). The speaker you mention should work satisfactorily, although you may find that a modern component will provide better results. Temporarily, however, there is no reason why you should not retain your present speaker.

E. M. (Manchester, 15). The set was not designed by us and we cannot therefore suggest modifications. Write to the paper which published the design.

A. W. (Everton, Liverpool). We suggest you write to the makers of your receiver and they may be able to supply you with a blueprint or other details. We do not publish blueprints of commercial receivers.

M. A. T. (Brighton). We are not familiar with the component number you mention, nor with the circuit of the receiver. We suggest you write direct to Philco regarding the replacement. The address is Wadsworth Road, Perivale.

F. E. B. (Rochester). It would appear that the insulation has broken down, but there may be some other more obscure cause for the trouble and a careful examination is indicated.

D. A. C. D. (Buckland). The H.T. applied to the output valve will be excessive, and a further resistance should be included in the H.T. positive main lead. This will necessitate a further reduction in the decoupling resistance values for the early stages. Alternatively, you can use a higher resistance smoothing choke.

D. L. (Devonport). The distortion is no doubt due to the fact that the valves in the second set are overloaded. Use a 1 to 1 transformer to couple the two, and a volume control will have to be employed.

O. A. D. (N.W. 11). The Morse code is given in several of our publications, but we do not publish a book which gives details from which you could practise telegraphy, etc. Learn the Morse code and then obtain practice at speed by sending to a friend and getting him to send to you through a small buzzer or oscillator circuit.

ponent is home-made and is constructed from a small bobbin of ebonite or other insulating material having a half-inch centre. Round this is wound about 500 turns of any fine-gauge wire—neither the number of turns nor the gauge are critical, but to accommodate the wire in a convenient space something about 36-gauge enamelled will be found desirable.

When mounting the receiver in a cabinet, care should be taken to provide adequate ventilation for the heat dissipated by the heater resistance and valve. It is also a good plan to mount the cabinet on short legs (1 in. long will be sufficient) and to drill a series of holes in the bottom of the cabinet underneath the rectifier. The rectifier itself is not delivering its full rated output, and in the normal course of events should not get warm at all. This extra ventilation at the bottom is just an extra precaution.

There are few components, and all of them combine cheapness, compactness and reliability, so that there is really nothing to go wrong. It is cheap and simple to build, and simple to operate.

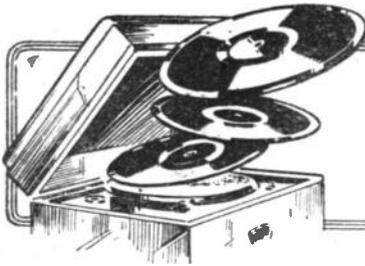
NEW PUSH PULL TRANSFORMERS

- DP 49 Parallel Feed Input Ratio 1 : 5
- DP 46 Output Ratios 20 : 1 and 40 : 1
- DP 47 " " 25 : 1 and 50 : 1
- DP 48 " " 34 : 1 and 68 : 1

Write for free circuit diagrams.

VARLEY (OLIVER PELL CONTROL LTD.), BLOOMFIELD ROAD, WOOLWICH, S.E.18. Tel.: Woolwich 1422.





Impressions on the Wax

Parlophone

TWO remarkable records are released by the Parlophone Company this month, both of which come under the heading of their historical series. The first, *Parlophone PO 69*, introduces famous voices of the past. On one side is "Don Giovanni"—(Champagne Aria), sung in Italian by Francesco D'Andrade, with orchestral accompaniment, and on the reverse is "The Barber of Seville" (Slander Song), sung in Italian by Adama Didur. Both of these were acoustically recorded in 1908.

The other record, *Parlophone PO 60*, introduces famous instrumentalists of the past. Featured on the disc are the "Norwegian Bridal March," played by Edvard Grieg, and "The Two Larks," played by Theodor Leschetizky. These were electrically transferred from a Welte music roll.

Richard Tauber has chosen two popular melodies for his latest record, *Parlophone RO 20346*. They are "One Night of Love" and that evergreen favourite "Love's Old Sweet Song," both of which he sings in English.

Herbert E. Groh, the popular tenor, appears in the classic series with two songs in German—"To-day is the Day" and "Wine Waltz"—on *Parlophone 2840*.

Popular Artists

VICTOR SILVESTER and his Orchestra have made a new Paul Jones record on *Parlophone E 11399*. It is in two parts and introduces a number of old favourites played in strict dance tempo with no vocals.

Harry Roy and his Orchestra have recorded a medley of popular tunes on *Parlophone F 931* and *F 932* under the heading of "Harry Roy Stage Show." It is in four parts and was recorded at their actual performance at the Garrick Theatre, Southport.

Leslie A. Hutchinson, better known as "Hutch," has made three new records this month. First we have "Singing for You" and "Paris is not the Same," on *Parlophone F 915*, followed by "That Old Feeling" and "Whiskers in the Dark," on *Parlophone F 916*, and finally "Stardust on the Moon" and "Good Night to You All" on *Parlophone F 917*. The last tune was used by "Hutch" as his signing off tune during his recent broadcast.

Harold Ramsey, at the Wurlitzer organ, has recorded a medley of famous marches on both sides of *Parlophone F 925*, and Patricia Rossborough, the popular syncopated pianist, has made a "Gangway" selection and "Going Greek" selection on *Parlophone F 926*.

Decca

THERE are several records published this month of unusual interest in their permanent music series. Of these, the first recorded performance of

the "Dohnanyi Symphonische Minueten," one of the first works by the famous Hungarian composer, appears on *Decca X 190-X 191*. It is presented by Sir Henry Wood and the Queen's Hall Orchestra, with George Stratton as leader. The Dohnanyi is full of fine tunes and is a miniature symphony in four short movements of roughly equal length.

I cordially recommend the Ambrose version of two of the best tunes from the Leslie Henson show "Going Greek," on *Decca F 6483*. "A Little Co-operation from You" will, I think, be a lasting "hit," and perhaps provide a family song for Christmas. I also like the quickstep on *Decca F 4684*, "Oh, They're Tough"—a most amusing number.

The Street Singer (Arthur Tracy) has recorded that popular tune "Shake Hands with a Millionaire," coupled with "Let Us Be Sweethearts Over Again," on *Decca F 6495*, and Lilli Palmer makes her first Decca record with "Sunset in Vienna," and "We'll Never Run Short of Love," on *Decca F 6500*. Both these tunes are taken from her new film "Vienna Sunset," which will be generally shown shortly.

Brunswick

CONNIE BOSWELL makes a welcome return on *Brunswick 02474* with "Yours and Mine" and "That Old Feeling."

Teddy Grace is the outstanding singer of Mal Hallet's Orchestra, and she presents her first two solos, "Dispossessed by You" and "Rock it for Me" on *Brunswick 02475*, with rhythm and clarinet providing a background that is excellent for dancing.

Judy Gurland, the fourteen-years-old youngster introduced on Brunswick last year, is one of the biggest hits in the new film "Broadway Melody of 1938." She has recorded the hit tune of the film, "Everybody Sing," on *Brunswick 02478*. On the reverse she sings "All God's Chillun Got Rhythm," a swing tune from the film "A Day at the Races."

Rex

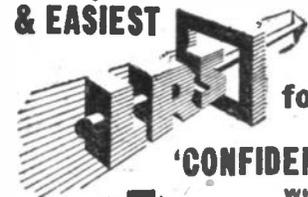
THE popular Lancashire comedienne, Gracie Fields, has made a first-rate recording of two very popular tunes of the moment—"The Greatest Mistake of My Life" and "It Looks Like Rain in Cherry Blossom Lane," on *Rex 9140*.

"A Sailor's Life," a naval fantasia on *Rex 9145*, is a splendid souvenir of the Brass Band Festival, held at Alexandra Palace, London, in September of this year. Three famous bands take part, conducted by Denis Wright, who is one of the leaders of the brass-band movement.

Reginald Dixon, Blackpool's versatile organist, records "Dixon Hits No. 16," on *Rex 9148*, and Morton Downey, the popular American artist, has recorded "You Needn't Have Kept It a Secret" and "Good Night to You All," on *Rex 9144*.

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QUERIES and ENQUIRIES

let me have the back numbers, which I will pay for."—A. G. C. (Northwood).

WE are not clear as to the exact type of instrument you require. It is possible to fit a microphone to any musical instrument and feed the output from the microphone through a standard valve amplifier in order to amplify the sound. Alternatively a stringed instrument may have the bridge carrying the strings in contact with the diaphragm of a microphone or gramophone pick-up to provide amplification. A more up-to-date idea is to fit small electro-magnets near the strings and to feed the output from these to an amplifier. Another instrument, and the one to which you may refer, utilises the oscillation produced by valves as the medium for producing a sound from the loudspeaker, and by varying the pitch of the oscillation, you alter the tone of the note produced. A reacting detector valve

Component Colour Codes

"I have been given a number of odd components by a wireless enthusiast and I cannot identify several of them. For instance, there are two electrolytic condensers, with no names but with coloured leads from the lower end. Two are red and one black. Is it possible to tell what these are? Also, a mains transformer which has no marking, but all the leads are different colours. Is there any publication which will explain to me what each of these is, and how I can identify other parts which I have got?"—I. U. A. (Newhaven).

UNFORTUNATELY, although there is now in existence a standard of colour codes for components and wires, certain manufacturers have adopted schemes of their own in the past and it is thus difficult to say for certain just what various colours may mean. An electrolytic condenser of the type you mention, for instance, may be a double component, the two red leads being the positive connections and the black the common negative. The values cannot be identified from the leads. Similarly, although there is a standard for identifying transformer leads yours may not conform to the standard and the best plan is to have it put on test by a good dealer who has instruments which would enable the output voltages and currents to be measured.

Home Recording Blanks

"In your issue of October 16th you state in connection with home recording, that record blanks can easily be obtained. I find difficulty, however, in finding a firm that deals in them. If you would be good enough to suggest a likely address I should be greatly obliged."—H. A. C. (Stamford).

THERE are two main types of record blank for home-recording processes—the aluminium and the plastic. The former may be obtained from Electradix Radios of 218, Upper Thames Street, E.C.4. The latter is available in several different patterns, some of which have to be treated after recording, either with a liquid or by heat treatment. The simplest for you will no doubt be the Simplat process, blanks for which may be obtained from the V.G. Manufacturing Co., Ltd., Gorst Road, London, N.W.10.

Musical Instruments

"Did you give in any of your back numbers instructions for making a musical instrument with valves, probably two years ago? I should be very grateful if you could

RULES

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

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

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

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newman, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

followed by an L.F. amplifier may be employed, with a metal rod connected to the grid terminal of the detector valve. By placing the hand near the rod the note will be varied and tunes may be played. This is the fundamental principle of the Theremin instrument.

Getting America

"Can you tell me which of your blueprint receivers will fetch in America and the amateurs at fair strength through headphones, and yet be cheap to build?"—G. W. (Northampton).

IT is impossible to guarantee that any particular receiver will produce good signals from America under all conditions. A simple single valve set may give you all the volume you require on 'phones from America one evening, and then perhaps for two or three evenings you may not hear a sound of the American stations. The

Prefect S.W. Three, blueprint, P.W. 64, may, however, be taken as a really good all-round short-waver and should give you reliable results under normal conditions, and as it utilises standard plug-in coils you can use any size of coil to receive on the wavebands you desire. This is about the best receiver we can recommend in your particular case, as it is cheap to build and economical to maintain. If you do not need three valves you can omit the output valve and connect the 'phones in the anode circuit of the second valve.

Ganging Accessories

"I am in rather a difficulty in ganging my superhet receiver. This is a commercial model and has been badly upset due to a non-technical person endeavouring to trim it. I should like to know what apparatus will be required in order to gang it correctly."—F. Y. (York).

ALTHOUGH a simple milliammeter could be included in the anode circuit of one of the valves to give an indication of the signal strength, and thereby the accuracy of the ganging, this would not be a simple process. You would need an oscillator in order to inject the intermediate frequency into the I.F. stages whilst ganging the I.F. transformers, and the oscillator section of the ganged condenser also has to be adjusted to provide this frequency. We do not know what adjustments have been upset, and consequently cannot tell you exactly what apparatus you should use.

Screened Leads

"I should like to ask some queries with regard to the screening of leads such as is often recommended in modern receivers. Take, for instance, the screening of an anode lead. Surely, the aim of the designer is to pass on energy from the anode to the next stage? If a screen is placed round the wire and the screen is earthed, it appears to me that most of the energy fed to the anode lead will leak through the screen to earth as this is of lower resistance than the H.F. transformer or choke joined in the anode lead. Perhaps you will explain where I am wrong, or where the design is wrong."—G. F. W. (S.W.1).

UP to a point, your ideas are right. But you must remember that the screening has not to be applied indiscriminately. In the case of an anode lead, for instance, the actual lead from anode to anode component is of small gauge, and is generally surrounded by some insulating material before the screening cable is applied. Thus, there is a wide space between lead and screen, and this provides adequate capacity to prevent leakage of the signals. If, of course, a thick wire is used and the screen is very close some leakage will occur.

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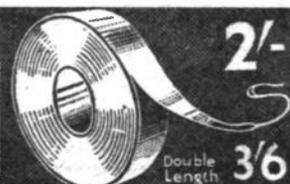
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LISSEN SET OF 2 Iron-Cored Coils for Aerial and H.F. complete with Switching and Circuit. List price 25/-.

LISSEN GENERAL PURPOSE IRON-CORED COILS, complete with Reaction, suitable for Aerial and H.F., without switch. List price 8/6. Our Price 3/3d.

All the above coils are fully screened. **Lissen Set of 2 Air-Cored Screened Coils,** for Aerial and H.F., 4/11d. per set.

BRUCE MAINS TRANSFORMERS AND CHOKES, standard for the season, these Transformers are British made and are fully guaranteed for six months. A comprehensive range of all types is carried in stock.

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350-0-350, 150 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 4 amp, 2-0-2 volts, 2 amp, 11/6d.

500-0-500, 150 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 6 amp, 2-0-2 volts, 2 amp, 2-0-2 volts, 2 amp, 17/6d.

BRUCE MAINS CHOKES. 30 Hys., 40 m.a., 500 Ohms, 4/-; 40 Hys., 60 m.a., 500 Ohms, 5/6d. 80 Hys., 60 m.a., 2,500 Ohms, for speaker replacement, etc., 6/-.

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4 Mfd., plus 4 Mfd., 450 volt working, 500 volt peak, 2/6.

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8 Mfd., plus 4 Mfd., 450 volt working, 500 volt peak, 2/9.

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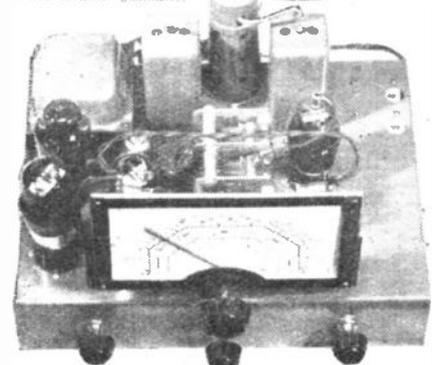
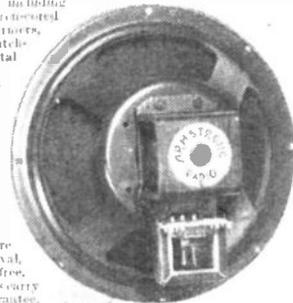
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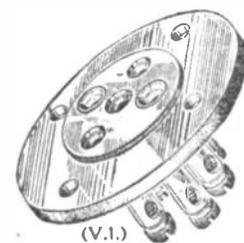
Armstrong Company has published a new illustrated catalogue, fully describing model 3BP 8, together with many other chassis of equal interest. A copy will gladly be sent on application. It is called "Armstrong Technical Catalogue No. 12."

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14 GNS.



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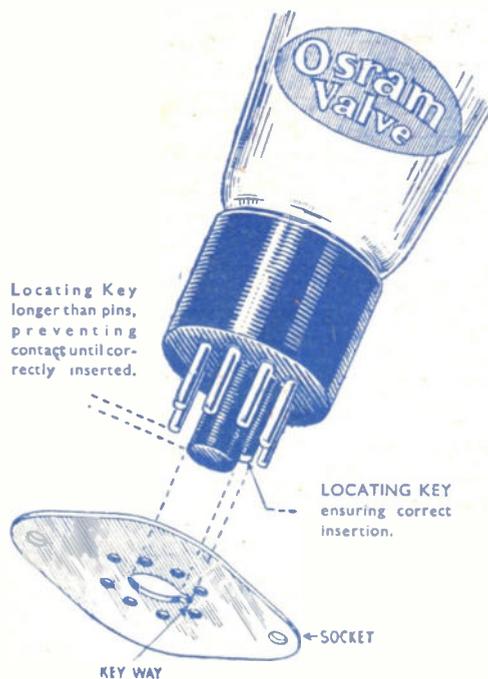


Diagram showing self-locating feature of "International" Octal Base.

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