AUTO-FREQUENCY CONTROL—

See page 76

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

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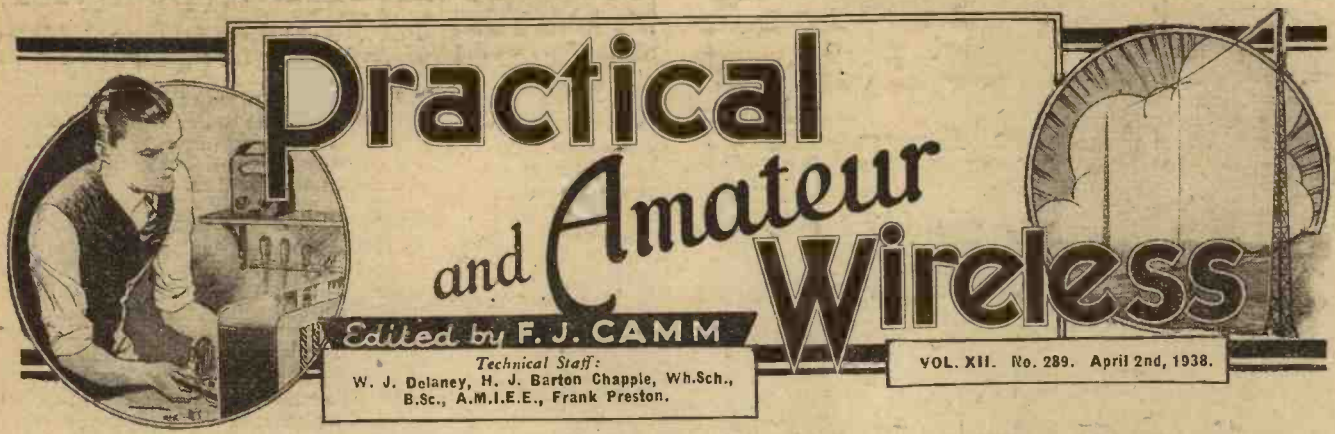
TUNING and OPERATING F. J. CAMM'S Sprite 3

TRANSMITTING TOPICS—See Page 69



ROUND *the* WORLD *of* WIRELESS

Auto frequency Control

THE introduction of automatic tuning in many cases will result in the need for some form of compensator which will ensure that the tuning condenser will be adjusted to the correct setting. In a modern superhet, the slightest error in tuning exactly results in distortion due to side-band cutting, and thus to enable a motor-driven condenser to give good results it is almost essential to use an automatic tuner which will compensate for slight inaccuracies. At the moment there appears to be only one manufacturer who has produced on the English market a motor-driven gang condenser, and this receiver, by Ekco, utilises the auto-frequency control device to ensure that the final setting is exact for every station. The push-button or other auto-tuning system which switches in pre-set condensers does not, of course, need this form of control as each condenser may be adjusted to give the exact setting required and the switch mechanism will not affect the adjustment of the condenser. It is essential, however, that the pre-sets retain their setting under all normal conditions such as will be met with in any type of receiver, and in this connection one or two interesting suggestions have been put forward by various manufacturers and will be mentioned in other articles in these pages.

Scottish Broadcasting

IT is claimed that broadcasting in Scotland does not satisfy the requirements of the Scottish listeners and a petition of protest is shortly to be presented to the B.B.C. in this connection. A summary of the position in Angus, Perthshire, Fife and other parts of Scotland has been drawn up and a deputation of listeners and traders from Dundee will visit London some time during this month and present the petition to the public relations officer of the B.B.C.

Radio-Normandie

MANY listeners do not appear to have noted that the wavelength of this station has now been lowered and this accounts for their inability to hear the station on its old setting. The new wavelength is 212.6 metres, and many listeners in the London area will now find that the station can be heard without interference. The previous position caused difficulty due to the proximity of the London National transmitter. Station-named dials may, of course, be altered by obliterating the old, name, or by scratching it out and indicating the new position with drawing ink.

Vatican Directional Station

THE new Vatican transmitter which was used for the first time in December last is now ready for final tests, although the directional European aerial has not yet been completed. The new wavelengths upon which this station is to work are 19.84, 25.55, 31.41 and 49.75 metres.

Marchesa Marconi Visiting Australia

HER EXCELLENCY THE MARCHESA MARCONI is visiting Sydney, N.S.W., this month, as the guest of the Institution of Radio Engineers, Australia. This visit coincides with the World Radio Convention, and Her Excellency is to be accompanied by her daughter Elettra. Readers will recognise this name as that which was given to his yacht by the late Marchese Marconi, and it was on the yacht that many of his epoch-making discoveries were made.

American Police Broadcasts

THE principal frequencies now employed by the U.S.A. police, and which may be heard in this country under favourable conditions are 30,100 and 33,100 kc/s. These correspond to wavelengths of 9.9 and 9.06 metres. These signals will be heard best after midnight and during the colder weather, and under favourable circumstances the car radio broadcasts may also be heard in this country.

"The Last Party"

EDITH SITWELL'S first excursion into radio drama will take place on April 3rd, with the broadcast of a new play entitled "The Last Party." Lance Sieveking is producing this as the opening play in the B.B.C. Drama Department's new schedule. Only a short time ago Mr. Sieveking discussed the problem of radio drama with her and he says "she grasped the medium of radio more quickly than any other novice in this line whom I have previously met. Within a very short time she presented me with that rare delight of the wireless producer, the script of a flawless broadcast play to which absolutely nothing has had to be done."

Empire Trophy Car Race

ON April 9th the Midland station will supply for the National programme a running commentary on the car race for the British Racing Drivers' Club's Empire Trophy at Donington Park. The race is over the T.T. circuit of 3¼ miles, and there will be, for the first time, a massed start. The commentators will be F. J. Findon and Alan Hess.

Harry Roy for the Argentine

HARRY ROY and his band are shortly leaving for a two-months contract in the Argentine, and on Saturday week they will give a farewell broadcast from the London station. It is claimed that he will receive a higher salary than has ever been paid to a foreign band visiting the Argentine, and that he will make three broadcasts a day whilst there. In his farewell broadcast he will introduce 14-year-old Johnny Green who is to lead a juvenile band under his direction, which will shortly be heard on the air and on the halls. They have already recorded for Parlophone.

ROUND the WORLD of WIRELESS (Continued)

Broadcasting in the U.S.S.R.

THE number of radio receivers in the U.S.S.R. is continually increasing. In 1929, the country possessed 350,000 receiving sets; at the end of 1937 the number had increased to five million. Large numbers of listening-in centres have sprung up in the rural areas, in the shape of village halls, collective farm club houses, etc. In addition to the big broadcasting stations like "Komintern," VTsSPS, RTsS, there are also eighty-two other broadcasting stations in different parts of the Union, as well as 8,000 relay centres, 1,200 of which also broadcast their own programmes. Broadcasting is carried out in the different languages of the peoples of the U.S.S.R.

INTERESTING and TOPICAL NEWS and NOTES

An O.B. Man's Desert Experiences

IT is reported that M. Paul-Edmond Decharme, a well-known outside broadcast technician of Poste Parisien, recently returned from a 10,000-mile journey across the Sahara desert and French West Africa which he undertook in order to make recordings of everything he could hear which was likely to interest European listeners.

It is the first experiment of the kind, and he was very successful, capturing not only native dances and songs, but also sandstorms! He has experienced the astonishing hospitality of the desert lords no less than the rigours of the desert treks.

Thieves Got a Haul of Pencils

WE are informed that on a recent Friday night Scott Insulated Wire Co.'s new factory at Queensland Works, Queensbury, was burgled. The thieves, however, must have been disappointed, as although the safe was expertly forced, the haul was comparatively small, owing to Scott's practice of paying wages to their workpeople on Fridays. Among the things taken, however, were a number of the now popular Scott wire pencils, and it is to be hoped that users of these will not be suspected of complicity in the crime.

American Radio Star's Fifteenth Anniversary

HENRY BURBIG, whose "Cheer Up America" programme is heard from WLW, the Nation's Station. 7.45 to 8 p.m. E.S.T. on Thursdays, recently celebrated his fifteenth anniversary on the air.

Way back in radio's infancy in 1923 a young man named Henry Burbig began his career as a radio comedian. Since that date he has taken part in more than 500 broadcasts, as a star and guest. He has starred for more than a dozen sponsors during that period. Noted particularly for his dialect interpretations of fairy tales and historical incidents, Henry Burbig has become one of radio's foremost American comedians. One of the high spots of his career was a series in which he and Fanny Brice portrayed famous lovers of history.

In his "Cheer Up America" programme he is supported by the Funnybones, Kay Renwick, John Holbrook, and Frank Novak and his Orchestra.

The 150th performance of "In Town Tonight," the popular broadcasting item which takes place every Saturday night, was given recently. Our illustration shows Mr. C. F. Meehan, the producer of "In Town Tonight" going over the script with his secretary at Broadcasting house.

Radio Version of "Congress Dances" Film

WE understand that Conrad Veidt, the film star, has agreed to play his original part of the Prince Metternich in the radio version of the sound film, "Congress Dances," to be broadcast from studios at Broadcasting House on March 30th in the National programme and on April 1st in the Regional. Eve Lister will play the part of Christel, the little glove seller, which was created in the film by Lilian Harvey.

Production will be by Douglas Moodie, B.B.C. Variety producer, and B. Martin Marks has been responsible for the radio adaptation of the script. Besides adaping the old Viennese melodies, Jack Beaver, responsible for the radio score, has specially composed all the incidental music. The broadcast has been made possible by permission of Ufa Films.

Variety from Worcester

MIDLAND and Regional listeners will hear half an hour of variety from the stage of the Theatre Royal, Worcester, where there is a strong bill, on April 8th.

To-morrow's Songs

THE popular series of broadcasts entitled "To-morrow's Songs," presented by Ivor Moreton and Dave Kaye at two pianos, comes to an end with a programme on March 31st. It will consist of songs selected from the six previous programmes.

The vocalist, Bettie Bucknelle, has been singing in these programmes for some weeks, after scoring a notable success as a solo artist in the "New Voices" feature of the weekly variety broadcast, "Band Waggon."

Saturday Sport

THE B.B.C.'s Outside Broadcast Department has arranged for George Allison, the famous director of the Arsenal Football Club, to broadcast a description of the first half of the international match between England and Scotland on April 9th. Thomas Woodrooffe, of the B.B.C., will describe the second half. Both have established reputations in radio commentary.

Birmingham Military Band

ON April 7th Haydn Heard will conduct the Birmingham Military Band, of which he was the founder, in a light programme, including part of the "Cockney" suite by Ketelbey, who is a native of Birmingham. Dorothy Byrt, the Birmingham contralto, who has broadcast several times in the last eight years, will sing two groups.

SOLVE THIS!

PROBLEM No. 289.

Rodgers built a simple short-wave superhet converter for use with his S.G.-Detector-Pentode set, and when tested out he found that although results were quite good he could receive each station at two places on the dial. He spent some time endeavouring to adjust things to get one setting out but was unsuccessful. Was anything wrong with the converter, and if so, what was the cure for the trouble. Three books will be awarded for the first three correct solutions opened. Address your envelopes to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 289 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, April 4th, 1938.

Solution to Problem No. 288.

The trouble in Jackson's case was to be found in the L.T. battery leads. Either some of the strands of the flex had broken, giving a high-resistance lead, or the contact between flex and spades was corroded and the high-resistance was set up at that point.

The following three readers successfully solved Problem No. 287, and books are accordingly being forwarded to them:—J. Robertson, Aukengill, Wick, Caithness, Scotland. J. M. Leitch, 16, Abercorn Street, Glasgow, C.4. A Rigby, 23, Sunning Hill Street, Bolton, Lancs.

AUTO-TUNE UNITS

Some Suggested Ideas for Converting Existing Receivers for Push-button Tuning and also for Remote Control — - - - By W. J. DELANEY

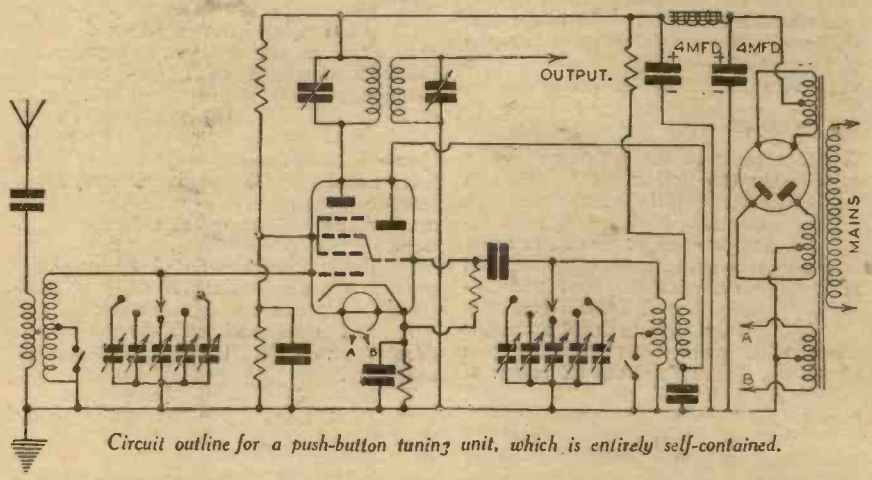
THE present development of push-button tuning will give many experimenters the opportunity of modernising existing receivers in order to incorporate this new idea. Fortunately it is a fairly simple matter to convert the majority of sets now in use so that this new form of tuning may be employed, and there are several schemes available for such a conversion. Undoubtedly the simplest of these is to use a superhet converter built on the same lines as the standard short-wave unit, but, of course, with standard broadcast coils in the tuning and the oscillator stages. In place of the ordinary ganged tuning condenser a push-button mechanism will have to be fitted, and at the moment such a device will have to be constructed at home as no manufacturer is yet in a position to supply units for the home constructor. The superhet unit may be built around a triode-hexode, triode-pentode, or a simple pentagrid valve according to the fancy of the constructor, and in order to make the unit compact, the valve may be placed on its side, when the overall height of the unit will be very little more than two inches. It will be found that the majority of modern coils are designed for use with special types of frequency-changing valve, and thus the coils and valve will have to be chosen together in order to obtain maximum performance in the H.F. unit. The question of the correct oscillator tracker will not arise when building a superhet unit of this type as pre-set condensers will obviously be used in conjunction with the push buttons.

Circuit Designs

In most cases, however, it will be found that pre-sets with a maximum capacity of .0005 mfd. should be used for the aerial tuning circuit, whilst .0003 mfd. maximum will in most cases give the required coverage on the oscillator section. With some coils .0005 mfd. condensers may be used for both circuits, but it may be found difficult to arrive at a critical setting on this capacity with some coils now available, and therefore the characteristics of the coils should first be carefully examined when building this type of unit. A standard I.F. transformer should be included in the unit, and the secondary should be earthed (ignoring any question of A.V.C.) with the "top" end of the secondary taken to an output terminal. To connect this unit to the existing receiver, the simplest plan is to disconnect the aerial tuning circuit already in use and connect the grid of the first valve (which must, of course, be an H.F. stage of some description) to the existing aerial terminal. The output terminal of the unit is then joined to the old aerial terminal and the remaining circuits in the receiver are tuned to a point on the long waves, exactly as in the case of using a short-wave superhet converter. The incorporation of the I.F. transformer in the unit and the cutting out of the first tuned circuit will be found to give better selectivity in most cases than using a choke-coupled superhet unit with the original aerial circuit acting as an I.F. transformer.

Power Supplies

With a battery receiver the above details are complete, but when a mains set is in use it will be found that best results are given if the unit is provided with its own supply unit. Quite a small mains transformer would be needed with a valve rectifier to supply the H.T. If the additional parts for the voltage supplies are not favoured, a plug will have to be fitted to the unit for insertion between one of the receiver valves and the valveholder, and although this will give the heater supply satisfactorily, provided that the original transformer delivers sufficient current for the extra valve, it may be found that a smoothing and decoupling circuit has to be included in the H.T. lead to prevent certain forms of instability. If the unit is employed at a distance for remote control, the separate voltage supply should definitely be fitted, and this will permit of a much simpler extension lead and will also avoid difficulty due to the carrying of the voltages through the extension cable.



Circuit outline for a push-button tuning unit, which is entirely self-contained.

Remote Control

Several different schemes have been tried for remote control with units of this type and some interesting facts have emerged. Up to 20ft. or so, a simple extension lead consisting of only one wire has been found quite satisfactory—the single wire in question being that connected from the I.F. transformer to the original aerial terminal. Beyond that distance, tuning has been found to be affected and hum introduced by pick-up from house wiring. In addition, at certain wavelengths instability occurred. An H.F.-choke-coupled scheme, with the extension lead taken from the condenser, overcame this trouble, but signal strength was weaker and could not be regained by tuning either the unit or the receiver. A scheme which worked very satisfactorily, but which did not answer in every case, was to utilise two I.F. transformers, the second being connected in the grid circuit of the input valve in the receiver, and the secondary of the first (included in the unit) then being joined to the primary of the second. With three makes of I.F. transformer this gave greatly improved results and perfect stability, when an extension was run through the entire house in order to find the maximum length of extension which should be used. With some other makes of transformer, however, there was a definite loss in volume, although no instability occurred.

Replacing Condensers

If the unit built on the above lines is not needed for remote control it may, of course, be built into the receiver to replace a ganged condenser tuner in order to simplify tuning in certain types of quality or short-range receivers. In such a case it may be found possible to omit the frequency-changing stage and to utilise the circuits already incorporated in the receiver, but it should be remembered that selectivity will not be improved and thus some difficulty may be experienced in avoiding overlap when the automatic tuning system is employed. The inclusion of the additional stage as outlined at the beginning of this article results in a considerable improvement in the performance of the receiver even if it is already a superhet, as apart from the increased selectivity (which may not always be a desirable factor) there will be an increase in the range of reception.

If it is desired to make the additional unit comprehensive and to avoid risks of second-channel whistles and other forms of interference, an H.F. stage may be included before the frequency-changer, with the additional tuned circuit coupled to pre-set condensers in exactly the same way as for the stage already described. This will result in the unit being made slightly larger and slightly more complicated to wire, but the improvement may be considered well worth while.

Constructional details for a push-button tuning unit on the lines given will be published as soon as the push-button mechanism is released for general use, but for those readers who wish to go ahead, a system may be built up as outlined in the previous article on this subject in our issue dated October 30th, 1937.

Stability in Radio Receivers

In this Article an Explanation is Given of how Greater Gain may be Obtained from Existing Radio-frequency Stages

SOME years ago the radio industry was revolutionised by the introduction of the now universally-used screen-grid valve. This valve superseded the triode for high-frequency operation, since, due to the introduction of an electrostatic screen between anode and control grid, it would deliver much greater amplification than the three-electrode type. This statement may not be clear to everybody, but it must be remembered that the triode is unsuitable for H.F. work since any attempt to obtain a large stage-gain results in self-oscillation. This is due to feedback of H.F. currents from the anode to grid circuits via the inter-electrode capacity between anode and grid. The grid-anode capacity of a screen-grid valve is so small as to be negligible, and therefore this type of valve is not prone to self-oscillation.

H.F. Stages

The conception of the screen-grid valve was probably the first important step in obtaining greater stability in radio receivers. The second was that of decoupling. Nowadays most receivers are decoupled in every stage and, of course, employ screen-grid or H.F. pentode valves throughout the radio-frequency stages, but it is still generally considered impracticable to build a straight receiver with more than two low-gain H.F. stages, because of the difficulty of obtaining stable operation.

I am of the opinion that, providing due care is exercised in design, no difficulty should be found in obtaining perfectly stable operation with three or four high-gain H.F. stages. In point of fact I personally use a 4-H.F. type of set for long-distance reception, for I prefer a really good T.R.F. set to the superhet as a greater signal/noise ratio can normally be obtained, and there are no annoying self-generated whistles to mar reception.

The circuit is typical of a good type of H.F. amplifier. It will give excellent results, and is very popular in commercial receiver practice. Supposing three such circuits are employed in a receiver, and it is found impossible to prevent self-oscillation in one or more stages; well, the first step is not, as most people imagine, to find the faulty stages and endeavour to rectify the trouble, but to carefully consider whether the lay-out of the circuits can be causing trouble. The faults given in the list below are very common and cause considerable trouble, as many constructors imagine their methods of spacing components, etc., to be irreproachable.

Common Faults, and their Remedies

(1) Grid wires should preferably be not more than ½in. long, but should the necessity arise for the use of longer grid wires it is essential that screened leads (earthed at each end) be employed, thus obviating any interaction between the various wires.

(2) It is important that the anode leads be well separated from the grid wires, since any stray coupling between them is liable to cause self-oscillation, or even damping, dependent upon the direction of feedback through this coupling.

(3) It is easy to realise that the anode leads will be longer than the grid leads as they must reach to the anode cap of the screen-grid valve, and consequently they should always be screened.

(4) All the screen-grid valves should be screened, and if they are not already metal-coated a valve screen can be employed, and will be found to provide a satisfactory substitute.

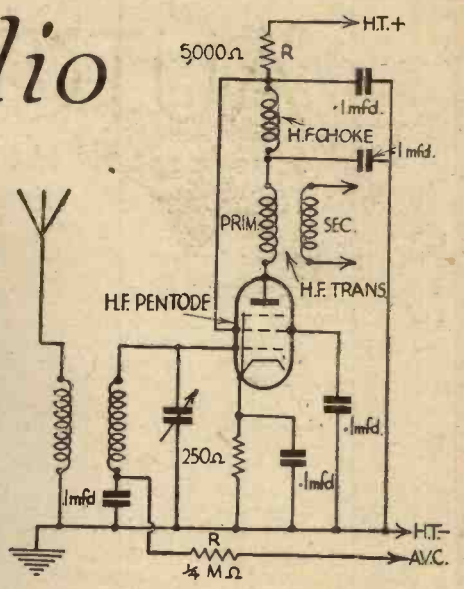
(5) When using indirectly-heated mains valves care should be taken to ensure that the leads connecting the by-pass condenser between cathode and earth should be as short as possible. On no account should this by-pass condenser be of the electrolytic type—electrolytic condensers, should, in fact, never be included in any high-frequency stage—mica and paper condensers are specially suited for H.F. work.

(6) The coil and associated section of the gang condenser should preferably be completely screened, although with some of the iron-cored coils and semi-screened condensers available, this is not always necessary.

(7) Precautions should be observed in mains receivers to ensure that heater wiring does not run near to leads carrying H.F. current. If this precaution is not observed, A.C. ripple will be superimposed on the incoming signal, and become apparent in the loudspeaker as a loud hum.

(8) The insulation of all components must be beyond reproach, since faulty insulation is a frequent cause of loss at radio frequencies.

(9) Lastly, unwanted coupling between stages must be eliminated, since this is a common cause of poor selectivity, as well as instability. Even if all these precautions are taken, they will be of no avail if the chassis is earthed haphazardly.



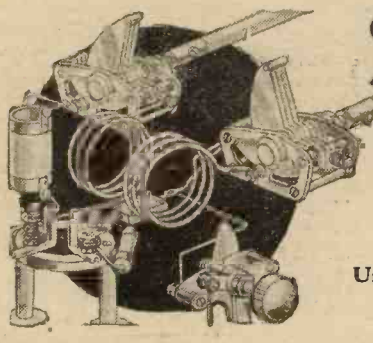
A typical circuit for an H.F. amplifier.

Bus-bar Earthing Strip

I have spent some considerable time experimenting with the earthing of metal chassis, and found that if all earthed points were taken straight to the chassis, as is often the case, H.F. currents were found to be flowing from one stage to another through the chassis itself. This led me to adopt the following method: The chassis must be earthed at one point (the earth terminal) and a bus-bar run from this terminal to the far end of the chassis. All metal components, including the gang condenser, are then carefully insulated from the chassis. The next step is to take a wire from the negative filament of each valve (the earth end of the cathode-biasing resistor in the case of an indirectly-heated valve) to a portion of the bus-bar, in such a manner that there is a space between each of the valves. Then all the earthed points in the set are taken to the portion of the bus-bar belonging to their respective stage.

Each section of the gang condenser must be earthed to its appropriate strip of bus-bar by means of a wire from the earthing connection for the section. (Usually a strip of metal bearing on the moving vanes). If these precautions are observed an increase in selectivity and sensitivity will be the probable result in most cases, and at least three H.F. stages will normally give stable operation even when used at the limit of their amplification.

If greater stability is required, the H.F. stages may be decoupled in their anode and screen circuits, or even double-decoupled. To obtain perfect decoupling the circuit illustrated is very suitable, but unfortunately more components are necessary. With this circuit, however, four H.F. stages may be employed at full gain. An indirectly-heated valve is shown in the diagram, but battery valves may be used in the same manner, the only difference in the circuit being the exclusion of the cathode bias resistor, and the screen of the H.F. pentode (or S.G.) must be potentiometer controlled. Although A.V.C. is shown fitted, this not essential, but would be of great advantage in a large T.R.F. set, and also assists in "holding the circuits down" as this process of stabilisation is sometimes called.—R. J. S.



Short Wave Section

UNTUNED H.F. STAGES

Untuned and Semi-tuned H.F. Short-wave Receivers are discussed in this Article by A. W. Mann.

THE advantages of a stage of high-frequency ahead of the detector stage in short-wave receivers is generally appreciated by short-wave enthusiasts, but the question arises as to whether the high-frequency stage be tuned or untuned.

The technical point of view is that if an H.F. stage is to be used it should be tuned, in order to obtain the full benefits to be derived from the screen-grid valve as an H.F. amplifier, which includes improved selectivity and increased signal volume.

An untuned stage, whilst contributing some measure of H.F. amplification, acts principally as a buffer, and is instrumental in the prevention of dead spots in tuning, whilst on the other hand its use tends to broaden tuning. It should, however, be noted that there is a wide difference between broad tuning and flat tuning, the latter providing, in effect, very poor selectivity.

It should also be borne in mind that if the experimenter simply desires a buffer stage, and to take precautions against dead spots in tuning, or on the other hand is quite prepared to remain satisfied with the comparatively low gain in amplification, there is no reason why an untuned stage of H.F. amplification should not be used.

The question of cost also arises. It may not be convenient to consider the purchase of additional coils and associated components in order to build a tuned H.F. stage. If an S.G. valve is to hand, it can be used. The untuned stage will not introduce additional tuning complications, and will ensure a uniformity of efficiency throughout the tuning range of the receiver, together with some degree of amplification.

Coupling Methods

Fig. 1 shows the resistance coupling method and Fig. 2 the choke coupling method. Although the writer prefers the arrangement shown in Fig. 1, it is advisable to try out and experiment with both resistance and H.F. choke arrangements.

Both these systems are in common use, but there is another method which, whilst its merits are appreciated, is not so widely used.

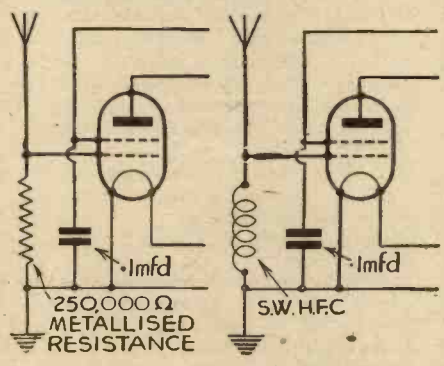
Before going further it will be as well to revert to the comparative merits and demerits of tuned and untuned high-frequency stages. A tuned stage enables us to peak all signals by tuning to resonance with the detector stage. An untuned stage, however, is semi-aperiodic.

Some method of compromise would appear to be acceptable, preferably one which would enable us to enjoy at least in some measure the advantages to be derived from a fully tuned H.F. stage.

Untuned H.F. Circuit

Reference to Fig. 3 shows a conventional untuned H.F. short-wave receiver circuit, consisting of a stage of untuned high frequency, and triode detector transformer-coupled to an L.F. pentode. There is, however, one modification, and that is the coupling between aerial and untuned H.F. stage. Instead of employing an H.F. choke or resistance, a tapped coil is used.

By employing a tapped coil, we are enabled to bring the aerial in resonance with the grid circuit. Thus, in effect, we have a semi-tuned H.F. circuit instead of a semi-aperiodic H.F. circuit.



Figs. 1 and 2. Circuit diagrams showing resistance coupling and choke coupling methods.

Readers who at some time or other have experimented with aerial tuning devices, in order to tune the aerial in resonance with received signal frequencies, will have noted that whilst it is possible to obtain satisfactory results with a tuning coil and parallel capacity arrangement, better results are obtained if the aerial or earth lead is tapped on to the coil, and that comparative tests prove that altering the tap position to another turn, or part of a turn, results in increased gain when the aerial tuner coil is retuned after tapping adjustment. This illustrates in a practical manner the importance of resonance, especially in the case of directional reception and the use of rotary aerial systems.

To take another aerial tuner example, there is the solenoid type fitted with a slider which makes contact with the bared portion of the coil. Thus adjustment of the slider in relation to different numbers of turns, semi-tunes the aerial.

In the instance outlined a definite signal gain is obtainable, but as the tapped coil is untuned, the gain to be expected is less than that obtainable when using a tuned H. F. stage.

Nevertheless, it is sufficient to warrant its use, and is definitely superior to the resistance and choke methods of coupling as common to untuned H.F. stages.

Coil Winding

The winding of suitable coils offers a most interesting field of experiment and will, so far as the number of turns is concerned, depend upon the bands to be covered. The following data will assist in making a start, and other coils, consisting of more or a lesser number of turns, can then be wound to suit individual requirements.

1¼in. diameter paxolin former.

38 turns—26-gauge D.C.C. wire, close wound and tapped at 7, 10, 17 and 32 turns.

A coil of this type will cover the 18 metres to 75 metres bands approximately, a crocodile clip or rotary switch arrangement being used for tapping selection.

As an additional suggestion, experimenters should consider the construction of coils on plug-in lines, using seven-pin valve bases as formers, or making up a series of bare wire spaced wound coils with or without self-contained switching. In the writer's opinion, a rotary type panel switch and coil base will be found to be the most adaptable and convenient method. To duplicate the coils used in the detector circuit—i.e., grid windings—is a good idea on which to base experiments.

Constructional Details

With regard to constructional details, the writer has in mind later developments, namely, that at some future date a T.R.F. receiver will be contemplated, therefore the construction of a semi-tuned H.F. receiver along simple T.R.F. lines will avoid a total rebuild and only call for slight modification.

The first consideration is the form of

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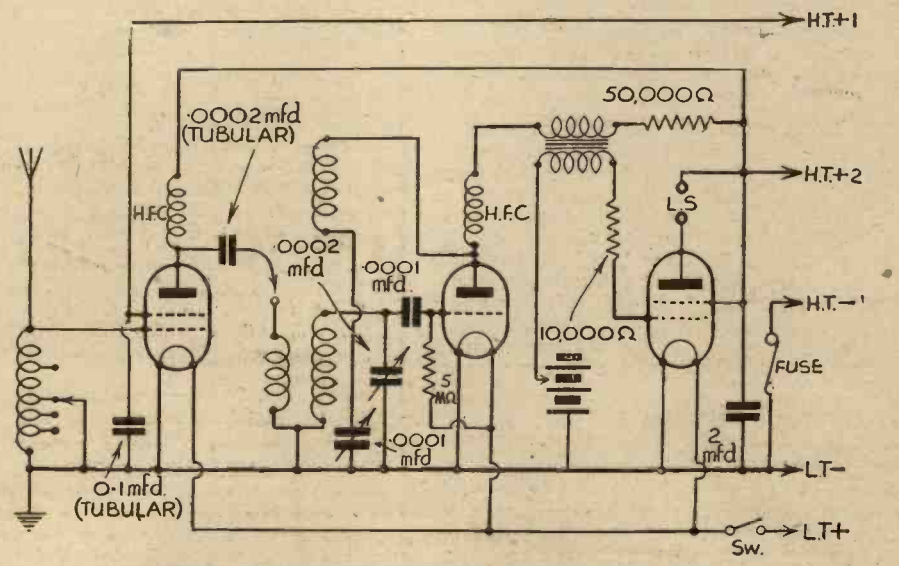


Fig. 3. A conventional untuned H.F. short-wave receiver circuit.

SHORT-WAVE SECTION

(*Continued from previous page*)

construction. The writer's preference is in all instances for the chassis method complete with metal panel.

The chassis may be of plywood construction metal-sheet lined on the top face, or copper foil lined on the underside, with end runners which will provide a depth of 2in. Alternatively the chassis may be of aluminium or cadmium-plated steel.

A metal panel of 20-gauge material or, as an alternative, a plywood metal or foil-backed panel can be used.

Choice rests with the constructor, but whatever method is used, the panel mounting brackets should be of robust construction with at least a 2½in. foot, in order to assure rigid assembly and freedom from metallic noises when tuning. Choice of lay-out is an important factor relative to all types of receivers, as contributing to over-all efficiency.

Screening in the case of an untuned stage is unnecessary, but in view of possible conversion to T.R.F. the screen, also additional panel space for tuning condenser mounting, are included, thus obviating a complete rebuild; a slight modification of wiring only being necessary when the extra coil base and condenser, etc., are fitted in position.

Mounting the Coil

The tapped coil should be mounted horizontally, and supported above the chassis by means of small stand-off insulators, a crocodile clip being used for tapping purposes.

Alternatively, and when some method of switching is to be used, the coil may be made on plug lines and mounted vertically in a suitable holder, the number of sockets depending upon the number of tappings, in addition to the two full winding connections.

Whilst arrangement for band-spreading is not shown in the circuit diagram, there is nothing to prevent the experimenter incorporating band-spread. In fact, it will prove advantageous to do so.

In conclusion, experiments with semi-tuned high-frequency stages, as outlined, will prove to be fully justified, and may be carried out at low cost. Careful attention to correct tapping, and a series of cut-and-try experiments, will enable the operator to obtain a satisfactory standard of efficiency on all bands, especially the amateur bands.

In the interests of calibration, and in order to avoid confusion, it is advisable to make a note of the tapping points in relation to the various bands covered, and the same applies to the individual coils if more than one is used.

Attention to the above details will enable the experimenter to log the various transmissions heard and tune for them at any time with some degree of certainty so far as his receiver calibration is concerned.

LEAVES FROM A SHORT-WAVE LOG

San José on 25-metre Band

TIPG, *La Voz de la Victor*, San José, Costa Rica, is testing out a new channel, namely, 11.96 mc/s (25.08 m.). If the frequency is found to be favourable regular transmissions will be made on it in the near future. In the meantime the radio programmes are broadcast daily from G.M.T. 18.00-20.00, and from 01.00-05.00 on 6.41 mc/s (46.8 m.). The studio occasionally calls itself *La Reine del Aire*, opens with a bugle call, uses as an interval signal 4 gongs in rapid succession (G, E, C, G), and closes down with Ted Lewis's *Good Night* song. Address: TIPG, Alma Nica, Apartado Postal, 800, San José, Costa Rica.

Proposed 50-kilowatter for Utah (U.S.A.)

The Federal Communications Commission is favourably considering an application received from the Church of the Latter Day Saints, of Salt Lake City (Utah), to erect in the vicinity of that Mormon centre a 50-kilowatt short-wave transmitter for the broadcast throughout the world of special programmes. The station would be equipped with a five-beam rhombic type directional aerial to work on 11.68 m. (25.675 mc/s); 19.78 m. (15.17 mc/s); 25.62 m. (11.71 mc/s); 31.55 m. (9.51 mc/s) and 49.83 m. (6.02 mc/s).

Development of German Broadcasts

On April 1 the German short-wave broadcasting service will celebrate its fifth anniversary. Originally transmitting on 4 kilowatts, the power was increased tenfold in 1936. From a daily service consisting of 1¾ hours in 1933, the broadcast has risen to 47 hours, spread over various transmitters, during the day and night. It is claimed that during 1937 the studio authorities at Berlin controlling the Zeesen stations received 45,252 letters from listeners abroad.

Rome's Ultra-short-waver

The 2-kilowatt ultra-short-wave station opened on December 2nd, 1937, at Monte Mario, overlooking the Italian capital, and which has been experimenting daily between G.M.T. 18.00-21.30 on 6.9 m. (43.5 mc/s), has now altered its wavelength to 7.4 m. (40.54 mc/s).

Brussels Tries out a New Channel

With the call: *Radio Belgique, Poste National, ORK2*, the Belgian short-wave transmitter at Ruysselede (near Bruges), may now be heard almost daily at G.M.T. 13.00 testing on 15.04 m. (19.947 mc/s).

Persia To Go on the Air

It is reported that the Iranian (Persian) Government has placed a contract with a German concern for the supply and installation of a 25-kW. short-wave station in the vicinity of Teheran. It is hoped to get it into working operation by 1939.

More Short-wave Channels for Boston

The Federal Communications Commission (U.S.A.) has allotted two Pan-American channels to the World Wide Broadcasting Foundation at Boston (Mass.). In future, W1XAL will be entitled to use 11.37 mc/s (26.39 m.) and 15.13 mc/s (19.83 m.).

Important Broadcasts of the Week

NATIONAL (261.1 m. and 1,500 m.)

Wednesday, March 30th.—Congress Dances, musical comedy programme.
Thursday, March 31st.—A Variety broadcast from the Holborn Empire.
Friday, April 1st.—Feature programme from Canada.
Saturday, April 2nd.—A commentary on the Oxford v. Cambridge Boat Race.

REGIONAL (342.1 m.)

Wednesday, March 30th.—Lillibulero, a diorama of the Great Siege of Londonderry (1688-89).
Thursday, March 31st.—Band programme.
Friday, April 1st.—Variety from the New Theatre, Northampton.
Saturday, April 2nd.—Television cabaret.

MIDLAND (296.2 m.)

Wednesday, March 30th.—Vocal recital.
Thursday, March 31st.—Orchestral concert, from the Town Hall, Birmingham.
Friday, April 1st.—Variety from the New Theatre, Northampton.
Saturday, April 2nd.—Steeplechasing at Crowle: a running commentary on the Worcestershire Hunt Point-to-Point Race for Lady Dudley's Cup (recorded).

NORTHERN (449.1 m.)

Wednesday, March 30th.—Concert Party programme, from the Royalty Theatre, Chester.
Thursday, March 31st.—The Doncaster Schools Musical Festival, from the Corn Exchange, Doncaster.
Friday, April 1st.—Variety from the Theatre Royal, Stockport.
Saturday, April 2nd.—Orchestral concert.

WEST OF ENGLAND (285.7 m.)

Wednesday, March 30th.—A variety programme from the Hippodrome, Southampton.
Thursday, March 31st.—Bath Music Festival: British Light Music, from the Pavilion, Bath.
Friday, April 1st.—A Folk Song Almanack: April.
Saturday, April 2nd.—A La Carte: A mixed menu of light fare.

WELSH (373.1 m.)

Wednesday, March 30th.—Orchestral concert.
Thursday, March 31st.—Orchestral concert, from the Town Hall, Llandudno.
Friday, April 1st.—Dr. Abernethy: translated into Welsh by Mary Hughes, from the play, Doctor My Book, by Alicia Ramsey and Rudolph de Cordova.
Saturday, April 2nd.— A Recital of songs by Beckett Williams.

SCOTTISH (391.1 m.)

Wednesday, March 30th.—A Ceilidh Evening in Dingwall: songs and instrumental music.
Thursday, March 31st.—Fan Fare: The story of the Scottish Cup.
Friday, April 1st.—The Scottish Country: The Land of Seaforth, an impression of the life of the district.
Saturday, April 2nd.—The Laird of Udny's Fool: Scenes from the life of Jamie Fleeman (Circa, 1713-1778).

NORTHERN IRELAND (307.1 m.)

Wednesday, March 30th.—Lillibulero, a diorama of the Great Siege of Londonderry (1688-89).
Thursday, March 31st.—A Hymn recital from Duncairn Presbyterian Church, Belfast.
Friday, April 1st.—Concert from the Ulster Hall, Belfast.
Saturday, April 2nd.—Orchestral concert.

ON YOUR WAVELENGTH

By Thermion

The Ray Again

ONCE again I find it necessary to allay the fears of the general public whose withers have been wrung by statements in a Sunday newspaper that someone has invented a ray, or rather discovered a ray, which will cause whole armies to lay down their arms and surrender to the enemy. Now I am aware that there are dozens of ignorant people styling themselves "scientists" who are able to catch the ear of some bright reporter who may not be scientifically knowledgeable. Even so, I cannot understand how this sort of nonsense ever gets into print. I think I know most of the ray fanatics in this country, as well as the really scientific people who have investigated the claims. The latter all agree with me that a ray cannot stop a motor-car, or an aeroplane, or affect a human being in any way. You will remember a few years ago some silly experiments which were conducted with short-wave apparatus in an aeroplane by some youths who could know but little about wireless, and obviously knew nothing about science. I want my readers to tell their friends to take no notice of this rubbish about rays, and to accept the word of Thermion that most of it is merely an effort to gain personal publicity.

My Quality Receiver Again

I MENTIONED that you cannot have quality at low price, and a reader in agreeing says: "If we cannot afford to build your design we shall, nevertheless, mentally build it. We shall also seize eagerly on any unorthodox features and incorporate them in our own box of tricks. Some of us will sort out the box of junk, rub the mildew off the selected bits, and make up your £60 job for nix. The result might be satisfactory to us, or it may be a ghastly failure. We shall not do this in ignorance, and shall derive a lot of pleasure from our efforts. Our failure will not condemn your design. As you say, there is little doubt your circuit will come in for lots of criticism, and I would love to read some of them when they arrive; and if your draughtsman puts a wire in the wrong place, I can see your journal coming out with a black border on the cover. Think of all the people vou soaked in your articles. Can't you see them eagerly awaiting the publication of your circuit? If the set doesn't zip up to 25,000 cycles and zoom down to 12 cycles without the decibels jumping about you will hear of it. If there is more than plus or minus quarter per cent. of harmonic distortion at 20 watts—'struth! You're for it. You'll have all the technical wallahs gibbering at you with equations. The design of Thermion must be like unto Cæsar's wife—beyond reproach." This letter is, I suppose, intended to put the wind up me. However, I will take a chance.

These Diplomats

I AM invited by M. W., of Harrow, to find out what all these diplomats are doing in Egypt. He tells me that they seem to have altered the wavelength of Radio Normandie, and spoilt his beautiful station-named dial. He also asks me when the law making interference an offence is going to be passed. I don't know. His den apparently is over an electric motor which is time controlled for ten minutes of action and three minutes of inaction throughout the day, so that he gets only three minutes' listening out of ten. I would recommend M. W. to report the facts to the Headmaster or the local post-office.

Those Appendages

A GLASGOW reader, who is engaged in a band, is all superhet-up concerning my paragraph on page 703 of our March 12th issue. He thinks that I am prejudiced against dance music. I am sure that anyone who has read my notes regularly will know that I am 100 per cent. in favour of it, er—being abolished altogether. It would seem from the tone of this reader's letter that my remarks are more than justified. He tells me that he works about seven or eight hours every day, apart from three hours hanging about with nothing to do waiting for his call. He can earn from £3 to £3 15s. a week, and has to pay all his own expenses except travelling. He must rise early every Sunday morning to catch an early train, and travel all day Sunday. He leaves the theatre at nearly midnight every night, and must attend a rehearsal next morning at 9 o'clock. If the work is so arduous and so painful, and musicians "are fed up with the sight of a line of music, and with grinding it out with aching fingers and sore lips," I wonder so many of them remain in it. I like my reader's reference to "grinding it out," it seems so apt; and why so much rehearsal?

Non-stop Television

THE Ideal Home Exhibition, which opens on April 5th, will house one of the largest television displays yet given. The B.B.C. and a number of manufacturers will co-operate, and the main item of attraction will be a glass-walled studio built to B.B.C. specification, and which will be used for a number of television broadcasts. A film talents competition will run throughout the Exhibition and entrants who perform in the studio will be seen on the television screen. Judging will be by well-known producers, and the winner will be offered a part in a film.

Bigger Demand for Battery Sets

UNDER the Air Raid Precautions Scheme it is suggested that at least one room in a house should be made gas proof, and the suggestion has been made that this room should contain a battery-operated receiver in case the mains fail. It is thought that this will result in an increased demand for battery receivers. This does not strike me as being a sound argument. Of course, all sorts of other things apart from the mains may fail also. The water supply may become polluted, the gas mains fail, the local grocer's shop may be blown up, but that does not mean that we should all run our own farm, sink our own wells, and revert to medieval systems of room lighting.

The Scots Protest

I LEARN that it is proposed to present to the B.B.C. a petition from dissatisfied Scots who are objecting to the indifferent programmes radiated from the Scottish National Transmitter. The scheme, of course, has the full support of all the Scottish M.P.s, whether they represent Scotland or not. Now does this petition mean that the sets used in Scotland will not receive any other station? Are all the Scots using crystal sets? I ask these questions because if the Scots are dissatisfied with programmes designed by the B.B.C., which is, after all, governed by a member of their own race, they could easily change over to some other station. It is believed that a deputation all the way from Dundee will present the petition to Sir Stephen Tallents, Public Relations Officer of the B.B.C. I understand that many Scottish radio manufacturers are supporting the petition. My only comment is that when an Englishman is dissatisfied he switches over to the Continent.

Television at Worthing

TELEVISION in Worthing is a qualified success. Although over 60 miles from Alexandra Palace signals on both sound and vision channels give excellent results. They do not suffer from fading to any marked degree. The sound channel only fades slightly and the vision signal is remarkably steady.

There is no loss of synchronisation. The signal strength here, measured at aerial input, is in the neighbourhood of 60 micro-volts, which compares very favourably with many other towns outside the service area.

It would appear that the main difficulty to overcome is static produced from I.C. engines. Cars are bad if one is near a main road, but low flying aircraft, with which Worthing abounds, make reception impossible during flying hours, i.e., during the afternoon session.

Mr. Spicer, of Barnes and Spicer, the dealers who brought television to the town, told me: "We think that television in Worthing will be a great success. We have already booked a number of demonstrations in customers' own homes."

Chain Letters

W. H. B. (Birmingham) writes: "Your remarks about the 'Chain Letter' interested me greatly, and to pass a few idle moments away I found that if the conditions of the 'Letter' had been carried out, the total number of recipients of the letter this week would have been 7,656 followed by 13,377 noughts. The present population of the world is 19 followed by eight noughts."

Notes from the Test Bench

Testing All-wave Sets

WHEN poor results are obtained with an all-wave set, it will often prove of value to disconnect all coils except one, testing the set on that particular range in order to judge of the performance. This suggestion is made as it is often found that the general results given by the set are below standard due to a fault in a component or a valve which is not up to efficiency, and considerable time may be wasted in trying coil connections and the switch assembly. The set should be tried with the medium-wave coil only, as results will more easily be judged on that band. If satisfactory, the short-wave coil should be wired into position and the performance checked in this respect. By proceeding in this manner the efficiency of the coil switching and the various coils may more easily be tested.

Testing Audio Circuits

THE majority of amateurs are unable to afford a cathode-ray oscillograph for testing the audio response of the various receivers which they build up, but it should be remembered that very accurate tests may be carried out by means of special gramophone records. It is possible to obtain not only constant-frequency records, but also records of the individual instruments mentioned in an orchestra, and by making a careful selection of these you can check for such details as high-frequency response, bass response, instability, etc. For all normal purposes a check with these records will be found adequate.

Cellulose Cement

EVERY experimenter should make a point of keeping a bottle of cellulose cement of one kind or another in his workshop. The uses of this material are endless, as it may be used for repairing loudspeakers, fixing coil windings in position, repairing broken bakelite components, etc. There are various forms of this material now on the market and it is exceedingly easy to handle and use. Short-wave components may be cleaned and polished, and then coated with the cement to reduce losses due to dirty surfaces and resultant increase in H.F. resistance.

The Engineer's Guide to Success

THE present year sees the coming of age of The Technological Institute of Great Britain. Founded in 1917, the Institute has enabled upwards of 25,000 men to embark upon careers in Engineering through the medium of correspondence training, and the tutorial service of the T.I.G.B. embraces the various branches of Engineering and Allied Sciences. These are covered very thoroughly, and there are over 200 courses—the widest choice of engineering courses in the world

The courses fall into two categories, (a) Engineering Educational Courses, known as the Diploma Courses, and (b) Courses covering the Examination Syllabuses of the various Professional Institutions, Government Departments, and other Bodies.

The T.I.G.B. conducts the training of students in all parts of the world, and in order to ensure that a student shall study only for an examination for which he is eligible to sit, the regulations governing admission are clearly set out in "The Engineer's Guide to Success," a handbook which gives full details of the various courses. The headquarters of the Technological Institute of Great Britain are at Temple Bar House, London, E.C.4.

All-Fools' Day

TELEVISION set owners will be given a rather unusual programme on April 1st. Following the amusement caused by his Crazy Cabaret last year, in which the compère was seen throughout in his bath, Cecil Madden is once more devising a presentation which he is calling "Nice Work," an even crazier programme, which follows a general theme, but I am sorry that I cannot divulge further details. I can tell you, however, that Joan Miller will be seen as Cleopatra in a skit on the producers' 100 per cent. Broadway programme, with Guy Glover as Hyman Kaplan Anthony in a new sketch, "You Can't Take Your Needle with You, Cleo!" specially authored for the occasion by Shakespeare and the producer.

There will also be burlesques on aspects of television programmes from American Travelogue films to Talks, in which Charles Heslop and Cyril Fletcher will appear. People in high places will be seen in still higher places as Acrobats, and others taking part will be the Bashful Boys, the Three Pirates, the Three Romps, and the Narkover Gang, Campbell Rogerson, George and Frank Dormonde.

Keying, and Further Details of the 10-watt Transmitter are Discussed in this Sixth Article of the Series by L. Ormond Sparks

THE circuit shown in Fig. 1 is that of a simple triode valve used as a crystal-controlled oscillator. It will be noted that the circuit is the T.P.T.G. mentioned previously, but, as we are now concerned with crystal-controlled arrangements, the normal tuned-grid combination of coil and condenser has been replaced by a suitable crystal which maintains the grid at a fixed frequency response.

While triodes are quite popular, pentode valves receive more support by many

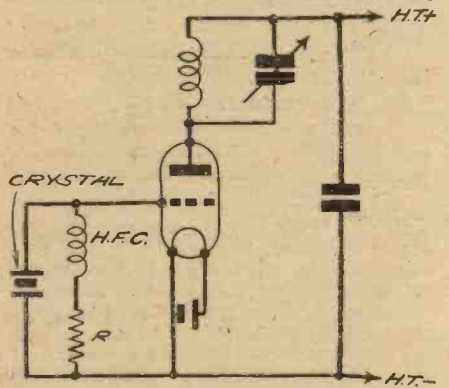


Fig. 1.—A simple triode crystal-controlled oscillator.

amateurs as they possess many desirable features which help to overcome some of the snags encountered with triode circuits. It will be remembered that a crystal has certain safe working limits; it must not be subjected to excessive strains or currents, thus the power output obtainable is usually low compared to that so often desired.

With a pentode, however, it is possible to generate greater power for a *given input* than with a triode without imposing harmful operating conditions on the crystal. Secondly, owing to the reduction of inter-electrode capacities of a pentode, due to its construction and characteristics, less feed-back voltage is present, and, therefore, much higher anode voltages can be applied. The fundamental pentode circuit is shown in Fig. 2, the modulating arrangements being omitted.

While only one circuit of each type of valve is shown, it must be appreciated that there are many different arrangements, each of which appears to receive support according to individual opinions.

Keying

The sole object of any transmitter is to radiate intelligence in one form or another, the two most common methods being by a system of code signals which makes use of the Morse Code, and by telephony, which allows speech and other sounds to be transmitted.

We are concerned with both, but before proceeding with telephony it is necessary to obtain a working knowledge of the code method. The Morse Code consists of sounds of long and short duration, the letters of the alphabet and numbers being represented by short and long periods of sound, i.e., dots and dashes, or by a combination of both.

Reverting to the oscillators again, it must be appreciated that they act purely as a generator of oscillations and, if such oscillations are depicted graphically, a series of waves as shown in Fig. 3 will be produced. If the graph is examined, it will be seen that the curves are symmetrical about the horizontal line, indicating that the oscillations are maintained at a constant

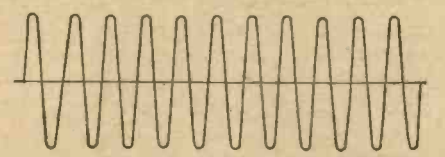


Fig. 3.—Graphical representation of continuous oscillations.

frequency, and at a constant amplitude or strength. It is not difficult to see that a continuous train of oscillations or waves are being produced, in fact, such signals or generations are known as "continuous waves" or, more briefly, as C.W.

If a receiver is operating under certain conditions, and it is tuned to a C.W. transmission, a continuous note or sound will be heard, so, if intelligence in the form of Morse Code signals is to be transmitted it is obvious that some arrangements must be made whereby the continuous note can be broken up into notes of long and short duration.

To enable this to be done, a switch, more usually referred to as a Morse "key," is inserted in the oscillator circuit so that the generation of oscillations can be controlled at the will of the operator. This may sound quite a simple matter, but, as we shall see as we progress, there are certain items which have to be considered.

The oscillations can be stopped and started by simply opening and closing the H.T. supply, the filament circuit, or by varying the bias applied to the oscillator as indicated by the diagrams shown in Figs. 4 and 5, which show the various methods applied to battery and mains-operated valves.

When considering keying arrangements it is advisable to remember that if the key is placed in the H.T. supply it is possible to obtain a shock across the contacts or between key and earth, therefore it is not usual to use that method if high power or voltages are in use. Generally speaking, the cathode, filament or bias arrangements are the most satisfactory, though each system has individual characteristics and applications according to the type of oscillator circuit in use.

The 10-watter

I have had several requests for information concerning the total cost of this transmitter and, while I fully appreciate the object prompting such requests, I am afraid that it would be very misleading if I gave the cost as that of the complete rig

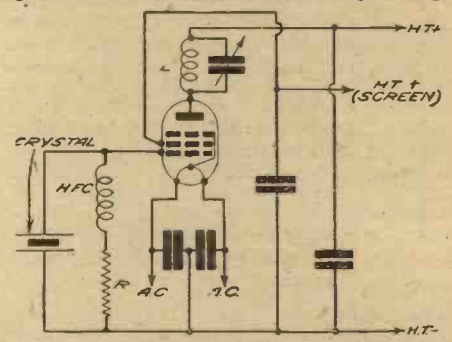


Fig. 2.—The fundamental circuit of a pentode C.O.

using *brand new* components, as I am not tying down the actual makes of components or valves, and I am sure that many constructors will have quite a good amount of the gear on hand. However, I will endeavour to get out an overall price selecting, so far as possible, average prices.

(Continued overleaf)

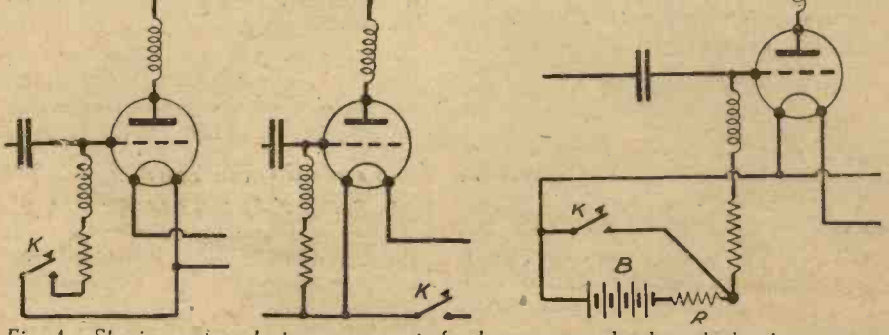


Fig. 4.—Showing various keying arrangements for battery-operated valves, the key being at safe potential.

TRANSMITTING TOPICS

(*Continued from previous page*)

The Power Pack

The theoretical circuit of this is shown in Fig. 6. It is quite orthodox excepting the small L.T. transformer for the American-type valves, which will be used in the actual transmitting section.

There is only one serious item to watch, and that is the smoothing arrangements. The choke I am using happens to be very efficient, and serves the purpose quite well, but if a spare choke should be on hand—capable, of course, of carrying the total current—then it can be inserted as indicated by the small sketch to obtain better smoothing, and more even regulation. Regarding the wiring, use, say, 18 S.W.G. wire with good sleeving, and solder all connections where possible, all A.C. leads being run in twisted pairs.

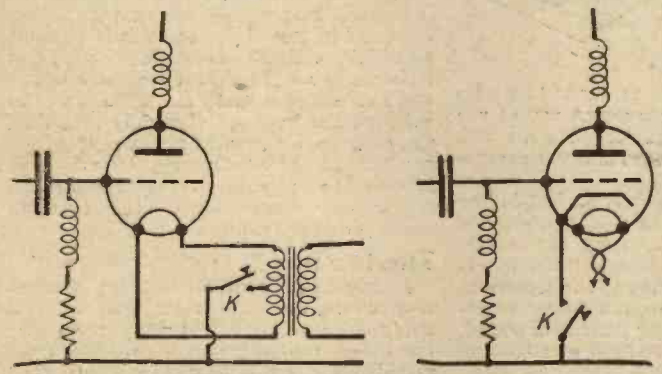


Fig. 5 (Above).—Cathode and filament keying for mains valves.

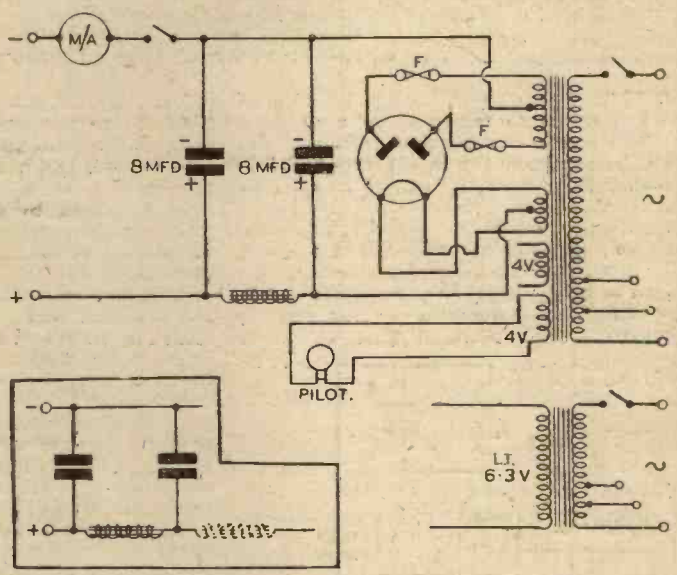


Fig. 6.—The power pack described in a previous article.

The three switches must be of the Q.M.B. type, and of a good make. I would suggest Bulgin, and this firm can also supply a very neat pilot light bracket and lamp holder, the lamp being wired across one of the 4-volt supplies of the Varley transformer, thus allowing it to indicate when the main supply is switched on, and when the rectifiers heater is alive.

It is essential to see that the sides of the rack are covered in, as shown by the design, as one cannot be too careful about keeping all apparatus—especially the power pack—protected, for very obvious reasons.

The Third Shelf

This shelf is intended to carry the modulator section, which consists of an L.F. amplifier designed to give distortion-free output from a microphone or P.U. input.

The thought of this section immediately raises the question: "How many valves?" As the total amplification required naturally depends on the strength of the input, one has either to tie down all factors or allow sufficient latitude in the design to cover extreme cases, therefore, the latter method has been adopted and three valves used in the circuit.

This arrangement allows a low output microphone to be used; in fact, the first stage might be looked upon as a "head" amplifier and other inputs, such as high output pick-ups, being connected to the second stage.

The shelf, so far as construction is concerned, is identical to the fourth with following exception:

To avoid any possible interference from the power pack it is advisable to cover the baseboard with stout copper foil or thin sheet aluminium, this being cut to shape and then held in position by small screws or drawing pins.

All stages are resistance capacity coupled, the valves being two triodes and one of the new output tetrodes, although a power pentode can be used if so desired.

As suppressor-grid modulation is being used it will be necessary to embody a suitable transformer in the anode circuit of the output valve. One having a ratio of 1 : 1 or 2 : 1 being quite satisfactory. A transformer which is quite good for this position is a well-made Class B input model.

The mention of suppressor/grid modulation will, undoubtedly, cause comments from some constructors but, bearing in mind all considerations, it is the most satisfactory for the job in hand.

Co-operation Circle

Well, the circle is gradually expanding, and the post bag getting heavier, so why not be one of the founders and send along your views or news?

2DFX, Leicester, hopes that the transmitter being described will give 10 watts and not, say, 7.5 watts, and asks me to bear in mind the cost of the P.A. valve when I reach that stage. He also asks for "anode modulation," but while I can satisfy his first two requirements, the third is right out of the question for the rig concerned. Still, many thanks, 2DFX.

G. H. A., also of Leicester, wants to know how the complete circuit will be shown, blueprint or theoretical. Well, I am sorry if I am going to dash his hopes for a blueprint but it might be arranged in a semi-pictorial form eventually.

R. V. asks if an existing A.C.-operated amplifier can be used as the modulating stage. Certainly it can, provided that it is capable of giving satisfactory output from a microphone input.

I. P., Herts, wishes to know if it is essential to be able to read Morse for one to obtain the A.A. licence. No, it is not essential, but everyone taking up transmitting should make a point of mastering the code and get up to a receiving speed of at least 12 words per minute, if they intend to apply for their full licence eventually.

A. N. W., of HUYTON, writes to query my statement regarding frequency doubling, in which I said that if the frequency is raised to the third harmonic the resultant wavelength would be a third of the fundamental. In spite of my warning about the beginner often being confused by this operation, A. N. W. made the mistake of multiplying the fundamental four times, i.e., doubled twice, instead of considering the tank circuit as being tuned to a frequency three times that of the original. If any others are in doubt about the matter, it is a simple procedure to check up one's figures by reference to a frequency/wavelength table.

Foreign Broadcasts During April

THE Foreign Department of the B.B.C. has for some time been awaiting the improvement of the lines between Lithuania and this country for broadcasting music. Recently these have been declared sufficiently serviceable to relay a programme of music from Kaunas.

LITHUANIAN EASTER FESTIVAL

Easter Festival music has been for generations a feature of Lithuania's customs. It is proposed, on April 17th, in the National programme, to broadcast for a period the varied music of Kaunas Easter Festival. The music consists of orchestral, choral by male and female mixed choirs, and national music for choir and orchestra. All the music, both orchestral and choral, will be by Lithuanian composers.

ORCHESTRAL MUSIC FROM BERLIN

A programme by the Berlin Philharmonic Orchestra is to be relayed from Stuttgart in the Regional programme on April 4th, the Beethoven Symphony No. 5 conducted by Furtwangler being the chief programme item. From America on Tuesdays the series entitled "America Speaks" will continue and, on Saturdays, Raymond Gram Swing's commentary on American life.

Theodor Loos will be heard on April 13th from Berlin, broadcasting on the National wavelength a reading from poetry of the seventeenth and eighteenth centuries.

AMERICAN HUMOUR

A programme of American humour will be relayed from New York on April 14th on the National wavelength. This programme will feature the type of humour with which listeners have become familiar in London evening papers.

Tea-time music will be broadcast to English listeners from Italy on April 19th, and from Czecholsovakia on April 26th.

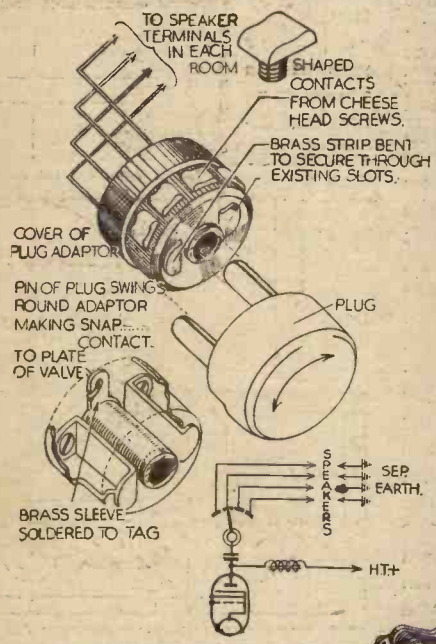
A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

A Multi-contact Plug Switch

THE accompanying sketches show a rather unusual type of extension speaker multi-contact plug switch I have recently made.

The type of socket used is of American pattern, having two slots for a flat-pin-type plug. By shaping two brass strips and fixing these to the panel, I was able to secure the socket—having previously removed the base and flat contact pieces—



An unusual multi-contact plug switch for extension speakers.

by passing these brass strips through the slots and bending over, as shown.

Four 2BA cheese-head brass screws were used for the contacts, these having been let into the socket moulding at equal distances from each other, and their heads filed to a slight groove. A two-pin standard type plug was then inserted, with one pin to the original centre fixing hole of the socket moulding, the other pin acting as a wiper contact, and obtaining sufficient resilience by virtue of its springiness. A short brass tube is let into this fixing hole providing the wiper contact: the plug pins must, of course, be short-circuited with a piece of wire. The output valve used is a pentode, and I employ choke-capacity filter. The inset theoretical circuit shows the method of wiring.—G. EMERY (Bath).

A Novel Condenser Tracking Device

WHEN carrying out some experiments recently on the sensitivity of certain tuning arrangements, I hit upon this rather novel idea for minutely, but effectively,

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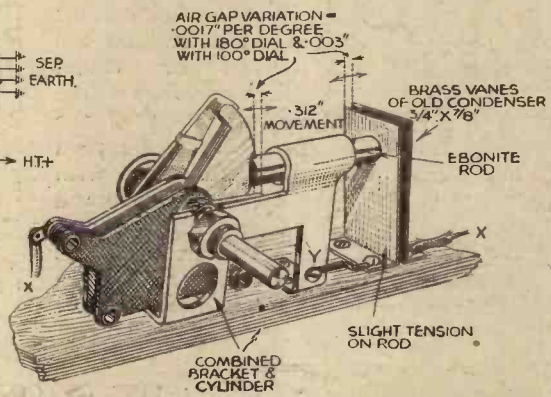
All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

altering the characteristics of the lower frequency end of the medium-wave band. Reference to the sketch will make it clear that by using this method in conjunction with the normal reaction, the required "extra" reaction on the above-mentioned end of the wave-band can be simply achieved without any alteration to the existing condenser.



A novel device for modifying the tracking of a condenser.

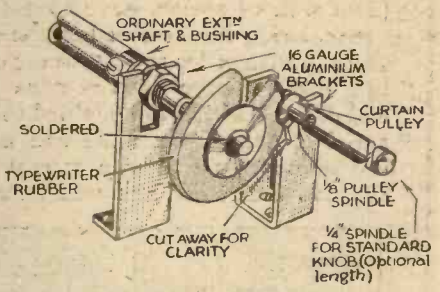
The two brass vanes, controlled by the ebonite rod, are acting simply as an additional capacity in the neighbourhood of .00005 mfd., and all that is necessary after construction is to connect a short length of bare copper (tinned) wire between the fixing screw of one vane, and a length of covered wire between the fixing screw of the other vane, and the fixed vanes of the reaction condenser; these connections being represented in the sketch by "X" and "Y."—E. J. LONGARTH (Wanstead).

An Efficient Makeshift Reduction Drive

BEING short of a slow-motion drive recently, I decided to make one up which would answer the purpose temporarily, and the accompanying sketch illustrates the result.

Firstly, I constructed two brackets out of aluminium, one of these was of the "U" type and the other an ordinary "L" bracket for the shaft and main drive.

For a reduction drive I used an old curtain pulley wheel, which was soldered to a length of ⅛in. diameter brass rod, as shown in the drawing, this being done

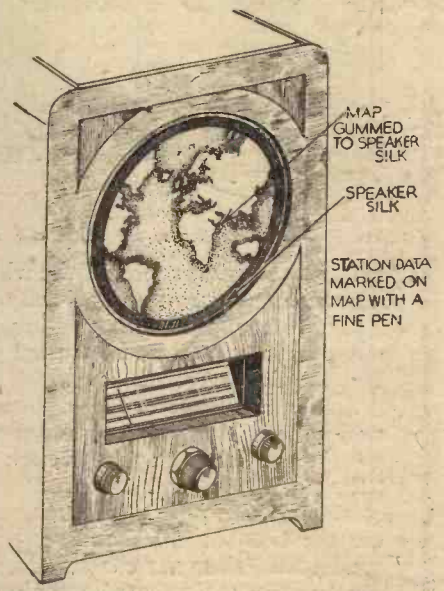


A simple but efficient makeshift reduction drive.

after fitting the rod through the "U" bracket. I then cut a length of ¼in. brass rod, drilled and tapped it to take the ⅛in. spindle, and finally carefully aligned the parts. Before fixing down to the baseboard I made sure that I had the correct tension for the drive.—T. G. JOHNSTONE (Margate).

A Speaker-fret Map

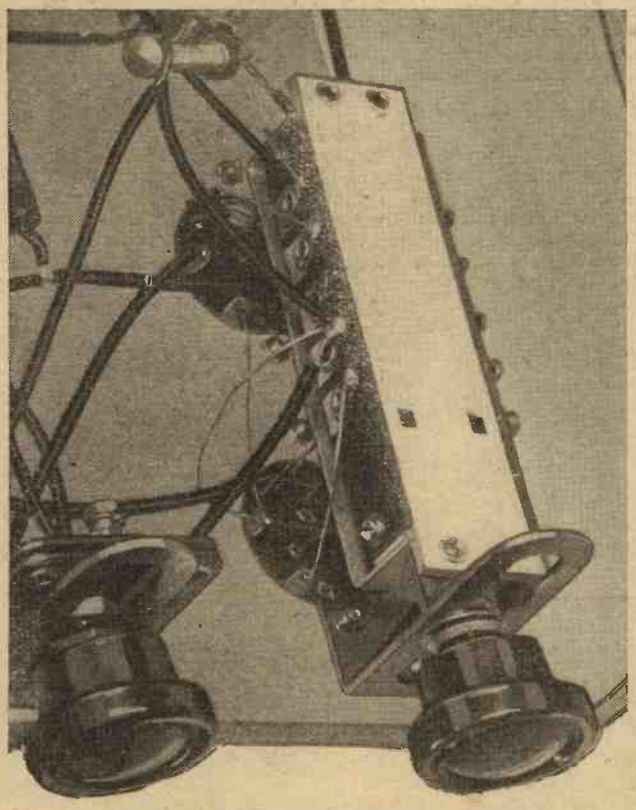
A MAP of the world is incorporated in my receiver by utilising the space covered by silk over the loudspeaker. The station data and wavelengths are indicated with a fine mapping pen prior to gumming the map in place in the centre of the silk. As my receiver dial is not marked with station names I find this a great asset, and in addition, it enhances the appearance of the set. The accompanying sketch illustrates the idea quite clearly.—A. DUNCAN (Pinner).



A method of incorporating a map of the world in a radio cabinet.

TUNING AN
THE "SPR
Completing the Construct
to Operate and Adjust i

WHEN mounting the coils take care not to touch the windings, or you will defeat the idea underlying the removing of the coils, which is to prevent the winding from being damaged or shifted. The coils are, of course, matched in production. You can see the position of the slots in the coil bases from the blueprint, and the two bases should be screwed down in the positions shown. Note that coil C6 is placed nearest the panel, and this is the coil with the red lead protruding through the bottom of the coil base. (You will, of course, have to cut off the soldering lug attached to the end of this lead in order to remove the coil, but this is quite in order as the end of the lead has to be joined to the aerial socket.) When the coil bases are in position you can mount the reaction condenser and volume control and commence some of the wiring. The filament circuit and several other leads can be placed into position, and the chassis can then be turned over and the fuse screwed down.



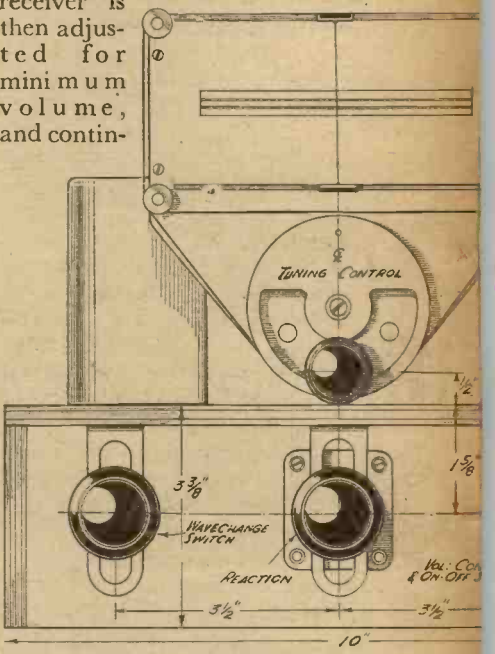
This illustration of the switch will assist you in wiring.

Solder two leads to the tags on the underside of the gang condenser and push these leads down through the holes in the chassis and screw the condenser in position. Remember to use the bolt for the rear foot of the condenser. Turn the chassis over and slip lengths of insulated sleeving up the two leads from the condenser, pushing the sleeving right through the holes in the chassis so that there will be no risk of the leads short-circuiting against the metal surface of the chassis.

Completing the Wiring

Now carefully tin each of the tags on the coils, being careful not to allow the solder to run down and obliterate the numbers embossed on the tags. Push the coils into position, and place the screens over them, turning the chassis over again and completing the wiring. Note that a number of leads will have to be attached to the coils before the switch is placed into position, as the coil contacts will be obscured when the switch is mounted. The blueprint indicates quite clearly where the various leads are attached, and the lettered or coded reference shown on the upper section of the print should be read in conjunction with the underside view and will make the matter quite clear. Complete the wiring, and attach the various battery leads, when the receiver is ready for test.

The H.T.— and L.T.— leads should be attached to the negative ends of the H.T. and L.T. batteries, whilst the G.B. positive plug should be inserted into the positive socket on the G.B. battery. G.B.—1 should be inserted into the 4.5-volt socket and G.B.—2 into the 9-volt socket. H.T. 1 should then be placed into the 60-volt socket, H.T. 2 into the 80-volt socket, and H.T. 3 into the 120-volt socket, when the receiver is ready for the preliminary tests. Switch on, by turning the right-hand control clockwise until a click is heard. The receiver is then adjusted for minimum volume, and continued movement of this control will build up the volume until maximum



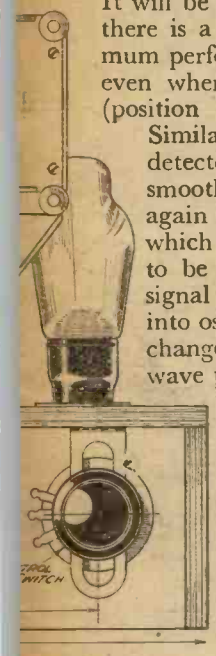
Dimensioned sketch for drilling a panel or c

LIST OF COMPONENTS FOR F. J. CAMM'S "SPRITE" THREE.

Two Screened Coils, types C6 and C7, Bulgin, 10s.
One 2-gang Bar Type Condenser .0005 mfd., Polar, 12s.
One Micro-Horizontal Dial, Polar, 9s. 6d.
Three chassis-type Valveholders: One 4-pin, one 5-pin, one 7-pin, Clix, 2s. 5d.
Two Socketstrips (A.E., L.S.), Clix, 1s.
One Microfuse and Holder, 1s. 6d.
Three Component-mounting Brackets, B.T.S., 1s.
One Switch, type S.121, Bulgin, 6s. 6d.
One Differential Reaction Condenser .0003-mfd., Polar, 3s.
One 50,000-ohm Potentiometer and 3pt. Switch, Erie, 5s.
Two 2-megohm Grid Leaks, Dubilier, 2s.
Two Tubular .0002-mfd. (type 300) Fixed Condensers, T.C.C., 2s.
One H.F. Choke, B.T.S., 3s.
One L.F. Transformer, ratio 4 to 1, B.T.S., 5s. 6d.
One Metallised Chassis 10in. by 8in. with 3-in. runners, Peto-Scott, 4s.
Wire, Flex and Screws.
Three Valves: 210 VPT (Metallised), 210 DET (Metallised), 220 OT, Cossor.
One 6-way Battery Cord, 2s.
One 120-volt H.T Battery
One 2-volt L.T. Accumulator
One 9-volt G.B. Battery.
One W.B. Stentorian Speaker (Type No. 38J).

D OPERATING ITE" THREE

on of this Receiver, and How t for Maximum Performance.



binet front.

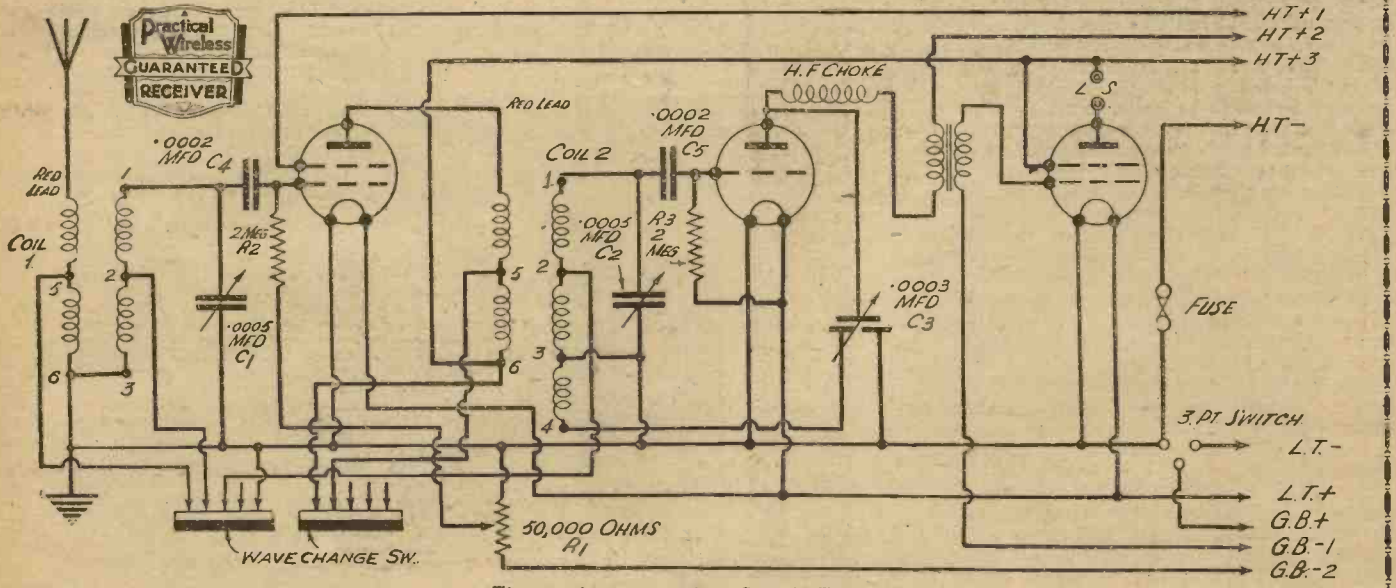
output is obtained. If the reaction control (centre bottom) is at minimum, no oscillation should occur when the volume control is at maximum, and if this should happen, the voltage at H.T.1 should be modified. It will be found with each valve that there is a voltage which gives maximum performance without instability even when the bias is at minimum (position of maximum volume).

Similarly, the voltage on the detector stage will control the smoothness of the reaction, and again a voltage should be selected which enables the reaction control to be turned up to build up a signal without a sudden bursting into oscillation. Turn the wave-change switch to the medium-wave position and then find the local station which should be very near to the name indication on the dial. It may not agree exactly when the receiver is first tested, but the position will give some idea where to search for the station. Having tuned in to the best volume, the trimmer on the front and rear section should be adjusted, and it will be found that apart from enabling volume to be brought to a maximum when both circuits are in tune, the setting of the trimmer will also control the position on the dial at which the station is received. Therefore, the two trimmers should be adjusted to bring the local at the correct point on the named dial, and also so that volume is at maximum, indicating that the two circuits are lined up.

This is the complete receiver ready for use

Economy Operation

If a slightly increased volume is desired this may be obtained, at the expense of more H.T. current of course, by modifying the bias on the output valve. When 4.5 volts are applied to this valve the anode current will be approximately 4.5 to 5 mA, but by reducing the bias to 3 volts the anode current will be increased to about 7.5 to 8.



Theoretical circuit of the "Sprite" Three.

The Cossor Superhet "Lowboy" Model 3952

COSSOR Model 3952 is a five-valve superhet that makes a distinct break-away from convention. The manufacturers have styled it a "Lowboy"; it may be described as a convertible armchair or table radio, two sets of domed feet being provided, wooden ones on the end so that it may be stood on the floor for use as an armchair receiver and rubber ones on the side, permitting it to stand horizontally on the table. The mains lead is some twenty feet in length, and has aerial and earth leads braided with it, thus avoiding loose wires when the receiver is used in the middle of the room.

Pre-selection Tuning

The novelty of this receiver is still further enhanced by a novel form of station pre-selection — Teledial — which has the appearance of an ordinary dial with ten holes each about the size of a shilling. Each of these holes exposes a button bearing the name of a station, black on gold for medium waves, red on gold for long waves. To tune in one of these stations, the finger is placed on the appropriate button and the whole dial turned until it stops, just like dialling the automatic telephone. No sound will be heard, however, until the finger is removed as pressure on any button mutes the receiver so that intervening stations are not audible when dialling. The most remarkable feature of the Teledial is its simplicity—there are no pre-set condensers, coils, or resistances, and there is no motor. It is a purely manually operated mechanical device which is so simple and robust in construction that it is inconceivable that anything could go wrong. When the receiver is despatched from the Cossor Works, only three buttons are set, giving a choice of four stations—the Nationals, Droitwich, London Regional and Luxembourg, the last-named two occupying one button as the receiver is so calibrated that these coincide. The remaining seven blank buttons are intended to be set on *any seven stations that the user may desire*, which are well received locally at good volume and free from interference; it is necessary, however, that the selected stations be fairly well distributed round the dial. The instruction leaflet given with the set describes with great clarity the procedure to be adopted to set the buttons on the selected stations, although it is expected that generally this adjustment will be done by the dealer who supplies the receiver. A sheet of gold paper with the names of over forty stations is provided for correctly marking each button, and clip-in celluloid covers are provided to protect each individual station name. A simple tool is also included with which the buttons are set up to whatever stations are selected.

Showing the Cossor Superhet Model 3952 used as a chair-side receiver.

Bandpass Circuit

The circuit comprises an inductively coupled band-pass pre-selector circuit that is specially designed to give sensibly level response over the whole of the medium and long-wave bands. The first valve is the frequency-changer (Cossor 41 MPG), which works in a quite conventional circuit, the modulator grid potential being controlled by the A.V.C. diode. The next stage is the I.F. amplifier using a Cossor MVS/Pen. the grid of which is also controlled by the A.V.C. diode. The output of the second I.F. transformer secondary is applied across the signal diode, while the A.V.C. diode is fed from the primary which prevents sideband shriek when tuning on to a station. The second detector is a double diode-triode—Cossor DDT, the circuit around which is quite conventional, excepting for the introduction of the muting device referred to above, which virtually short-circuits the grid of this valve to chassis when any Teledial button is depressed. The anode load of this valve is shunted by a fixed condenser in series with a variable resistance forming a tone control. The output valve is a directly heated triode—Cossor 4XP—which is capable of an output of nearly 3 watts, and works into a load consisting of a specially designed moving-coil loudspeaker which, although extremely sensitive, has an almost level response from 50—7,000 cycles.

The mains pack is designed around a Cossor 442 BU full-wave rectifier which is capable of handling more than double the required H.T. current; the smoothing system comprises the loudspeaker field in conjunction with two 8-mfd. electrolytic condensers.

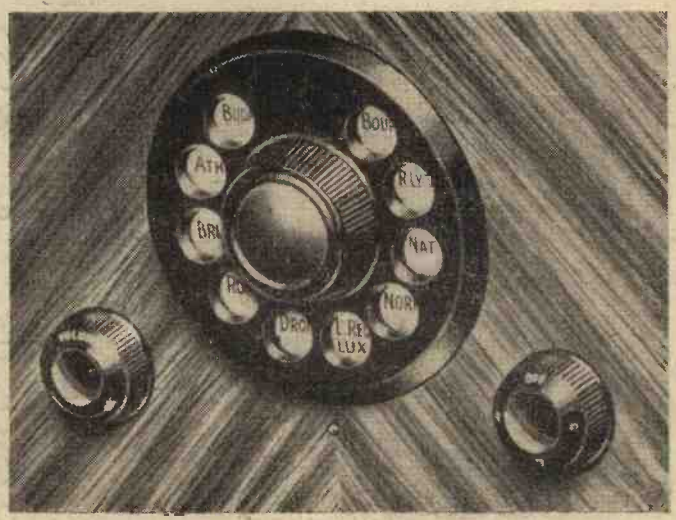
Controls

As would be expected, there are only two variable controls, the volume-control and Teledial, the third knob being combined wave-change, gram., on-off switch. The tone adjustment is situated at the rear of the chassis and is intended rather in the nature of a pre-set control to be adjusted to suit the particular taste of the user, though it is readily accessible should occasion arise. When it is not desired to select any station automatically by means of the Teledial, the latter may be treated as an ordinary dial and rotated in the normal manner. The scale is worthy of mention, being edge-lit by a very soft green light which throws up boldly the lettering and the travelling cursor. The cabinet is finished in attractively grained walnut, the speaker opening being covered by a modern woven material. It is interesting to note that when this receiver is used horizontally as a table model the speaker opening points upwards to the ceiling. Two slots are provided for convenience in carrying and being backed by perforated metal; they also assist with ventilation.

Test Report

On test we found that the sensitivity and selectivity were of a high order and well maintained at each end of both the medium

(Continued on page 79)



A close-up of the Cossor Teledial.

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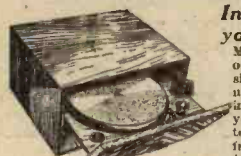

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A.C. BANDPASS S.G. FOUR CHASSIS. Excellent opportunity. 3-watts output. Provision for Pick-up. Engraved dial. 200-2,000 metres. Complete with 4 valves. Fully tested. 59/6 cash or 5/- down and 12 monthly payments of 6/-. With specially matched mains speaker, **£3/19/6** cash or 5/- down and 11 monthly payments of 8/3.

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BATTERY S.G.3 CHASSIS. Pentode output. Will give a wide choice of British and Continental stations. Engraved dial 200-2,000 metres Fully tested. 21/- cash or Complete with matched S.G. Det. and Pentode valves, 29/9 or 2/6 down and 11 monthly payments of 3/9.

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P.M. MOVING-COIL SPEAKERS. A few only. Rola, Magnavox and R. and A. 8in. Cone, for Power or Pentode output. *List value* 35/-. OUR PRICE 17/6 cash or 2/6 down and 7 monthly payments of 2/6.

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19-2,000 metres. For all electric supplies 100-250 volts (A.C. 40/60 c/s). Automatic volume control, large, easy-to-read station-name dial. Transportable, but provision for external aerial for distant stations. Brand New in sealed carton. Maker's Guarantee. *Present List Price* £13 2s. 6d. **OUR PRICE 8 gns., or 8/6 down and 18 monthly payments of 10/10.**

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Build now this amazing all-wave receiver tuning from Television —to 2,000 metres. Kit "A" comprising ALL parts less coils and valves, but with free station-name dial and full constructional details. 55/6 cash or C.O.D. *or 5/- down and 11 monthly payments of 5/3.*

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2 Type S.MW	(190 to 550 metres)	per pair	5/6
2 „ S.LW	(900 to 2,000 „)	„ „	6/6
2 „ S.S1	(9.5 to 27 „)	„ „	5/-
2 „ S.S2	(15 to 43 „)	„ „	5/-
2 „ S.S3	(24 to 70 „)	„ „	5/-
2 „ S.SO	(Television Sound)	„ „	5/6

S.T. 900 VALVES set of 5 as specified, 30/3 or 3/6 down and 11 monthly payments of 2/9.

S.T. 900 COMPLETE KIT. As Kit "A" but including all coils as detailed above. Station-name dial and full constructional details less valves. 75/6 cash or C.O.D. (*Four-sure* 7/-) or 8/- down and 12 monthly payments of 6/6.

KITS—SHORT WAVE. *Fully described with 7 other receivers in the Peto-Scott Short-Wave Experimenter Book sent free on request.*

4 VALVE S.W. RECEIVER. 8-97 metres. Amazingly efficient S.G. Pentode output circuit. Latest design. Complete Kit with 4 coils. *List value* £3/12/0. Special price less valves £2 15/0, or 5/- down and 11 monthly payments of 5/-.

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ALL-WAVE KITS

1 Valve All-Wave Kit. 18-2,000 metres. Employing efficient All-Wave Tuner, requiring 6 connections only. Provides world-wide headphone reception. Complete kit with valve and drawings. *List value* 33.3. Special Price 29/6 or 2/6 down and 11 monthly payments of 3/-.

All Wave S.G.3 Kit. 4 wavebands. 16-2,000 metres. Latest Tuner Unit and Station-name dial. Low H.T. consumption, complete with comprehensive instructions. *List value* £4 9s. 3d. Special Price £3 3s. 0d. Cash or 5s. down and 11 monthly payments of 5/9. 8 Valves, specially matched, 6G, Det. and Pentode type 21/- extra, or add 2/- to deposit and to each monthly payment.

All Wave Bandpass 4 Kit. 18-2,100 metres. Ganged condensers. High efficient circuit. Large Output, low H.T. consumption. Station-name dial. A Modern Super receiver, easy to build with instructions supplied. *List Price* £5 0s. 0d. Special price £3 19s. 6d or 5/- down and 11 monthly payments of 7/6. 4 specially matched valves 27/- extra or 8/9 down and 11 monthly payments of 8/9.

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VALVES. We have just made a special purchase and can offer you valves for all replacement purposes, British and American, at prices which defy competition. *Let us quote you next time.*

SPECIAL OFFER. Set of 3 matched 2-volt Philco Battery Types. Brand New, for replacement purposes. Also for 3-valve Broadcast, All-Wave, Short-Wave receivers or constructors' circuits Complete with 3 valveholders. *List* 37/6. Special offer 5/6 Post Free.

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PEZOLECTRIC Type Power Pick-up. Complete with Pick-up rest, lead and instructions for fixing 35/- or 2/6 down and 9 monthly payments of 4/-. Cosmocord latest high definition type Pick-up, complete with volume control. 17/6 or 2/6 down and 7 monthly payments of 2/6.

ALL-WAVE AERIAL. Absolutely essential for present-day good listening. Complete outfit for instant erection with all aerial and lead-in wire, transformer, insulators, and instructions. *List value* 37/6. Special Price 17/6 cash or 2/6 down and 7 monthly payments of 2/6.

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Automatic Frequency Control for Automatic Tuning Systems

A Simple Explanation of the Method of Bringing the Receiver into Exact Tune with the Transmission by Means of the Signal Itself

by The Experimenters

SYSTEMS of automatic tuning are rapidly gaining favour and represent one of the most important features of the latest commercial receivers. A general explanation of automatic tuning was given in these pages two weeks ago, and many readers have asked for additional information, particularly in respect of the method of obtaining automatic frequency control. This opens up an extremely interesting subject, although it is not as new as many readers appear to believe. It was first dealt with in the issue of PRACTICAL AND AMATEUR WIRELESS dated November 9th, 1935, soon after one or two systems had first been put into use in this country on a fairly wide scale.

Not New

It is significant that the methods now being used vary only in minor detail from those broadly described in the issue referred to. We remind readers of these facts in case they should be led to believe that automatic frequency control—or automatic tuning correction, as we should prefer to call it—is not something that has only just come into being.

If we go farther back than this we can point out that a system of automatic tuning very similar to that now being more extensively employed was described in these pages more than five years ago. But conditions have changed since then. At that time the superhet was not in general use as it is to-day, and the degree of selectivity required of a receiver was by no means as great as it is now. The system to which we now refer is that in which an electric motor is employed to rotate the spindle of the tuning condenser. Much more than five years ago the method of pre-tuning, or automatic tuning if you wish, consisting of the combination of a number of pre-set condensers with multiple switch to bring each into circuit as required, was known and used.

Motor-driven Condenser

It is not really difficult to design a gang-condenser-motor assembly in which the motor can be moved to any desired position by means of press-buttons that set the motor in operation, and stop it automatically when the required station is tuned in. But that is not the end of the story. It is not mechanically possible to adjust such a system so delicately that the condenser will stop in the correct spot, accurate to within a small fraction of a degree.

That introduces the difficulty which automatic frequency control overcomes. Broadly speaking, the object of the motor drive is to turn the spindle of the gang condenser to the approximately correct tuning point for the required station. After that, a final or vernier setting is necessary. So effective is the modern automatic frequency control that the necessary final setting can be effected even more accurately than is the case when using the normal manual method of tuning. Even this is not particularly surprising when it is borne in mind that the vernier adjustment is, in effect, performed by the signal itself.

Oscillator Frequency

The system is applied principally to the superhet; as this type of circuit is used almost exclusively in the largest and most sensitive receivers this is understandable. As most readers are aware, the most important tuning circuit in a superhet is that of the oscillator circuit. Intermediate-frequency transformers are accurately made and adjusted to respond only to one predetermined frequency, this being the difference between the tuning frequency of the input and oscillator circuits. Thus, if a signal is approximately tuned in on the input circuits, final tuning could be carried out by modifying the tuning of the oscillator circuit alone. In doing this, the object is to ensure that the intermediate frequency is precisely the same as the resonant frequency of the I.F. transformers. This is, of course, one of the most important aspects of superhet tuning, and is in large measure responsible for the unusually high degree of selectivity of this type of circuit.

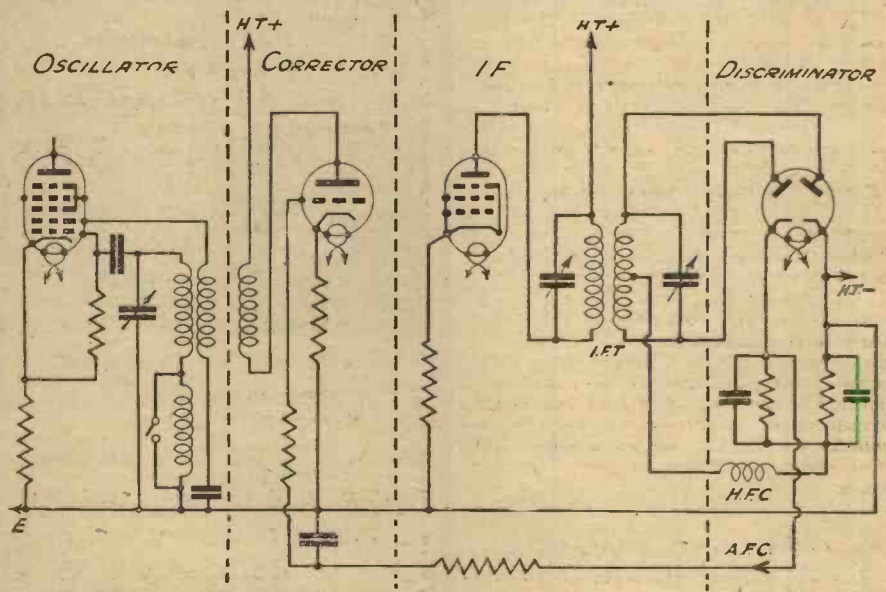
Discriminator and Corrector Valves

The usual method of obtaining A.F.C. is by using two additional valves, skeleton circuits of which are shown in the accompanying diagram. One valve is described as the discriminator and the other as the corrector. The first "decides" whether or not the frequency of the oscillator is too high or too low to produce the correct intermediate frequency; the second "corrects" or modifies the oscillator tuning.

A special double-diode valve serves as discriminator. It is similar to the normal double-diode except that it has two separate cathodes in addition to the two anodes. Part of the output from the last I.F. valve is applied to the two anodes, as shown in the diagram. For this purpose a centre-tapped I.F. transformer is shown. Two load resistances of equal value are included in the cathode circuits and the junction of these is connected to the centre tapping on the I.F. transformer through an H.F. choke.

Opposing Voltages

Now suppose that the intermediate frequency is slightly off tune. This means that the signal voltages applied to the two anodes of the double-diode are unequal. As a result, unequal voltages will be developed across the two load resistances. The voltages are in opposition and, therefore, the voltage at the point marked A.F.C. is different from that of the earth line. This voltage is applied to the grid of the corrector valve in the form of bias, which is additional to that provided by the normal bias resistance which is included in the cathode lead of the corrector.



This skeleton diagram illustrates the principles described, and shows how the discriminator and corrector valves are connected.

Correction

It is necessary now to turn to the correc-

tor valve, which in the diagram reproduced is a triode. There is a winding in its anode circuit which is coupled to the tuned winding of the oscillator coil. Varying bias voltages produce varying currents in the anode winding, the effect of which is to alter the tuning of the oscillator circuit. The principle can be understood more easily if it is considered as being similar to a form of permeability tuning. This analogy is permissible because the varying current has the effect of slightly modifying the inductance of the tuning coil.

When the intermediate frequency corresponds exactly with the resonant frequency of the I.F. transformer, the signal voltage applied to each diode anode is the same, since the two halves of the I.F. transformer secondary are in accurate "balance." In turn, the opposing voltages developed across the cathode load resistances are equal and thus cancel each other. In such circumstances the bias applied to the corrector valve is that provided by its own bias resistance.

It should be clear from the foregoing explanation that once the gang condenser is turned so that a signal is received, the automatic frequency controls align the tuning circuits and thus bring the receiver to exact resonance with the required transmission. The reader will appreciate that it is still essential that the electric motor should operate the gang condenser with fair accuracy in order that the signal can be received and applied to the final I.F. transformer; until this condition obtains the auto-frequency control circuits cannot operate.

Not for the Constructor—Yet

Let it be made perfectly clear that the diagram given is not intended to be complete, and that values could not be given to enable the constructor to use the A.F.C. device. The technical staff of PRACTICAL AND AMATEUR WIRELESS have been working for some time with a view to producing a practical A.F.C. unit, but at the moment that are too many technical difficulties in the way of the average constructor who might wish to build a receiver incorporating this interesting refinement. Actually, it is not apparent that readers have any desire to use the system, since the majority of constructors and experimenters prefer to tune the receiver manually. And when they do require a simple "automatic tuning" receiver for domestic use they are quite content to use the completely satisfactory arrangement of pre-set condensers and selector switch, full details of which have been given on previous occasions in these pages.

Alternative Corrector Circuits

In many commercial receivers a corrector circuit different from that illustrated is employed. The triode is replaced by an H.F. pentode which, along with a resistance-condenser network, is connected in parallel with the oscillator tuning circuit. The varying A.F.C. voltage has the effect of changing the impedance of the circuit, and this in turn modifies the inductance of the oscillator-tuning system. Otherwise the principle of operation is substantially the same as that briefly explained above, for the positive or negative A.F.C. voltage reduces or increases the "standing" grid-bias voltage, and thus alters the characteristics of the corrector-oscillator circuit until the intermediate frequency is exactly the same as that to which the I.F. transformers are designed to tune.

Practical Television

April 2nd, 1938. Vol. 3. No. 94.

A Good Sign

THE last few days have seen a remarkable analysis of the television position take place. First of all, Capt. Evans, in the House of Commons, sought a reply from the Postmaster-General to give reasons that can be assigned for the public response of television not being up to the standard expected. While the P.M.G. did not give a direct reply to this query, he dealt with the remarkable progress which has already been made in the service, coupled with the simplification and cheapening of the commercial receivers now on the market. More important still, however, he stated that a Sunday television service is to be introduced at the beginning of April, while the week-end hours are to be extended and every effort made to provide programmes of an interesting and attractive type. Yet another item which was welcomed by every manufacturer was the P.M.G.'s assurance, on the recommendation of the Television Advisory Committee, that the present technical standards of transmission from the Alexandra Palace station shall remain substantially unaltered for at least three years from January, 1938. This has removed at one stroke the fear in the public mind of early receiver obsolescence, and given to the manufacturer every incentive to plan his set production on ambitious lines in order to create a public demand at a reasonable cost.

Improving Performance

WHILE a gas-filled photo-electric cell is known to give a greater output than one of the vacuum type, the former is not able to respond to the rapid light fluctuations found in television work. One way of increasing the output of the vacuum cell is to use an electron multiplier in conjunction with it, as readers will know from the notes which have appeared in these pages. Another scheme is to use special shaping of the electrodes. Between the photo-electric cathode and the anode is interposed a bell-shaped glass section having a metallic deposit on its inside surface. When subjected to the influence of light the electrostatic field which is then made to exist between cathode and anode is said to draw the released electrons to the anode and so improve the total current collected by the anode for passing into the external circuit.

Activities Abroad

ALTHOUGH no other country in the world is as yet in a position to provide a regular daily television service as is now enjoyed by viewers within the signal range of Alexandra Palace, there is ample evidence that foreign activities are being directed towards this ideal. In Russia equipment has been bought for transmitting and receiving purposes, while apparatus has also been developed by Government scientists. In the next few weeks an experimental transmitting station erected near Moscow is to start working and data is to be collected through the medium of several receiving points chosen carefully to give a correct idea of the range covered by the signals, together with information concerning picture defects and synchronising difficulties. The standard of definition to be used in this case has not yet been made public, but no doubt it will show a marked improvement on the low-definition broadcasts which have been employed for such a long time in that country. In France the Government plan to erect a station at Lille, but the nature of the equipment used is contingent on the results of the protracted tests still being undertaken in Paris. Four separate and distinct systems are vying with one another in the capital for the honour of being chosen for the proposed French service, and until the investigation into their merits and demerits is complete, plans for extension must of necessity be very nebulous. From the very early days of low-definition television the Don Lee broadcasting station in Los Angeles has done pioneer television work through its station W6XAO. Instructions for building receiving sets to suit the standard of signals furnished by the station have been given readily by the authorities, and now it is proposed to transmit high-definition signals from a relatively low-powered ultra-short-wave radio transmitter. Due to the geographical position of the station the range covered should be very considerable, comparatively speaking, and with a licence to transmit daily it will be interesting to see how the work progresses.

A New Claim

WHENEVER it is stated that an entirely new method of television has been developed in the laboratories, a measure of scepticism always exists, it being felt that since established methods have, on the whole, proved satisfactory, new schemes would have to be outstanding in their accomplishments to displace them. In New Jersey, however, an experimental television licence from the Federal Communication Commission is being awaited by the Allen Du Mont laboratories to carry out field tests on a new method of transmission and reception, for which important claims have been made. One of the major differences between the Du Mont scheme and those already in use is that the radiated vision signal does not include the line and frame synchronising pulses. This automatically reduces the complexity of the type of modulated carrier now employed, for zero to 100 per cent. modulation is given over to the vision signals for the black to white range, instead of 30 per cent. to 100 per cent. as exists in this country. Another important claim for this system is that the band width required is reduced. In America sixty frames interlaced in the usual two-to-one formation to give thirty pictures per second is the standard, but in the new system the picture frequency is halved to fifteen per second. Under normal circumstances this would result in a picture having considerable flicker, but to counteract this the frame frequency is maintained at sixty, and the interlace ratio is doubled so as to give four to one. With the conventional method of incorporating synchronising pulses in the vision signal, an interlaced ratio of 4 to 1 is extremely hard to achieve. With the B.B.C. system, for example, a time accuracy of about a micro-second must be maintained in the receiver, by the time-base generator, if perfect interlacing is to result with the tripping or pulsing governed by signals embodied in the vision carrier. A higher interlace ratio than two to one is very liable to failure using this method, so with the Du Mont system the synchronising signals have been eliminated altogether.

(Continued on the facing page)

The Cambridge Crew watch intently the H.M.V. television receiver installed in their quarters at the Hurlingham Club whilst tests for the transmission of pictures from the river are going on.

Advantages Claimed

By halving the picture frequency the band width of the vision signal is also halved. This makes it possible to employ longer wavelengths than the present ultra shorts, with the consequent increase in the range over which the signals can be received with the desired service regularity. Of course, the amount of information radiated is really reduced, but, except in the case of the televising of scenes including some form of rapid motion, the effect seen is said to differ but little from the usual American 30 pictures per second. At the transmitting end only one generator is used for producing the horizontal and vertical sweep voltages, and it is the wave-forms of the scanning voltages which are used to modulate the sound carrier, instead of employing rectangular-shaped pulses injected into the vision carrier. When demodulated and amplified at the receiving end it is these wave-forms which are employed directly to bring about the horizontal and vertical scanning of the electron beam in the cathode-ray tube. In this way it is claimed that the receiver design is very materially simplified, for it does not contain its own sweep generator, which has to be time-tripped by synchronising pulses in order to keep in step with the transmitter. In place of this equipment is the detector and amplifier which passes on the received sweep wave-forms direct to the cathode-ray tube's deflection system. Yet another advantage is claimed for this system, namely, that any changes in the degree of definition will be carried out at the transmitting end, and this will automatically bring the receiver equipment into line without changing any components at all. It is said that the inclusion of the synchronising wave-forms in the sound-channel does not in any way upset aural reproduction, while the feature of versatility in so far as any scanning changes are concerned removes all fear of obsolences, and enables bigger production plans to be undertaken, with a consequent cheapening of receiver costs. According to reports, the results seen with this system using a wire link between transmitter and receiver have been most promising.

Going Ahead

Work in Germany as far as television is concerned is still going ahead, although outwardly the rate of progress is slow. This is due to the fact that the authorities in that country still look upon the transmissions as experimental, and the receivers in use are employed mainly for engineering test purposes, and also for the use of prominent citizens who are judging their value in connection with the special politicial television broadcasts which are often made. On the other hand, the public viewing booths in Berlin are nearly always full during the evening periods when programmes of a relatively simple character with little action are radiated. It must not be overlooked, however, that work is going ahead in building national transmitters in specially selected sites, so that when these are complete, the service area of the radiated signals will embrace a very wide field, which is sure to outstrip this country unless definite plans are formulated soon, to enable those residing in the Provinces to have the same facilities for looking-in as are now enjoyed regularly by residents in the Greater London area. It would be a matter for national regret if, after being the leading nation in the field of television for such a long time, we found it necessary to take second place to a country in which the first experimental broadcasts were undertaken in 1929.

Radio Clubs and Societies

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

THE CROYDON RADIO SOCIETY

LOCAL talent came to the fore at the Croydon Radio Society's meeting on Tuesday, March 15th, in St. Peter's Hall, Ledbury Road, S. Croydon. The occasion was a demonstration by Mr. R. P. Jonas (hon. librarian) of his Voigt loudspeaker and Quality amplifier. Before the demonstration, Mr. Jonas took his audience over a very thorough examination of his loudspeaker, and went backwards through the amplifier describing the important points until he came to the receiver, a carefully-chosen superheterodyne circuit. This was similarly dealt with in detail. Members themselves, by their questions, guided Mr. Jonas in the topics he discussed, such as the curing of A.C. hum and the operation of variable selectivity. In the demonstration minimum selectivity was used, hence high-note response was at a maximum, and, in fact, the apparatus gave a most impressive performance. Finally came some helpful comments from Mr. Voigt himself. He thought the amplifier was pretty well up to scratch, and the loudspeaker was giving results such as he expected this instrument to do. He agreed that even the purchase of a good loudspeaker was not finality in correct reproduction, as the next thing one had to do was to re-build the amplifier. The last meeting of the session is on Tuesday, April 5th. The occasion is a loudspeaker night, and the work of the session will be summed up in, it is hoped, some particularly good results in reproduction. PRACTICAL AND AMATEUR WIRELESS readers will be particularly welcome for this finale.

Hon. Pub. Sec.: E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

ROBERT BLAIR RADIO SOCIETY

ON Wednesday, the 2nd inst., a debate took place at our weekly meeting on the subject of "The Superheterodyne Circuit *versus* the Straight Circuit, T.R.F.," our technical adviser, Mr. E. W. A. de Kretser, summing up at the conclusion, bringing out the points missed by both sides.

The service group of the society are each evening working at full pressure, for the facilities offered to the members are taken full advantage of.

The morse class is going ahead fine, and are now at the stage of receiving at the speed of six words a minute in one group, the second group taking the dictation at ten words a minute.

The 10-watt transmitter, which is being built, is taking shape, and the society are anxiously awaiting the reply from the G.P.O. giving them authority to use the transmitter when completed.

On Thursday, the 31st inst., we are having a visit paid to the society by a lecturer from the Radio, Physical and Television Society, to lecture to the society on the subject "The Design, Construction, and Test of Transformers."

On Saturday, April 2nd, a party is to visit the B.B.C. transmitter at Brookmans Park.

A hearty invitation is extended to anyone to attend our meetings.

Hon. Sec.: A. R. Richardson, 24, Mercers Road, London, N.19.

RADIO, PHYSICAL AND TELEVISION SOCIETY

DURING the past few months membership of the above society has increased considerably. One of the reasons for the increase in membership is undoubtedly due to the fact that the Society now meets every Friday evening, and new members are welcome to come along any Friday at 8.15 without formality.

On Friday, March 18th, a lecture was delivered by Dr. C. G. Lemon, the subject being: "The Design of Antennæ for Radio Transmitters and Receivers." Dr. Lemon first explained that all aerials may be divided into three categories, all other antennæ being derivatives of either "The Marconi," "The Hertz," or "The Terminated Aerial." Altogether some thirty aerials and the well-known "Collins Coupler" were described. Perhaps, however, the most interesting part of the whole lecture was a description and demonstration of an antenna of the lecturer's own design which is uni-directional, and which is only half the usual size. Earlier in the evening members who had arrived early for the lecture were able to hear G2GL in contact with several VE and W stations using the new antenna.

The headquarters of the society is 72a, North End Road, West Kensington, London, S.W.14. Further particulars may be obtained by writing to the honorary secretary, Mr. C. W. Edmans, at the above address.

CARDIFF AND DISTRICT SHORT-WAVE SOCIETY

THE society has continued quite active throughout the winter session and a magazine has now been started. It is circulated to members of the Society and contains articles on both transmitting and receiving.

At a recent general meeting of the society it was decided to introduce an associate membership to persons living well out of reach of the local headquarters and those interested are circulated with the magazine —"The News-Reel."

The society has now established a series of lectures and the first entitled "56 M/cs.—General Inferences" will be given by G2JL, on March 31st. Others connecting short-wave reception with the transmission side will be given from time to time and the society will be giving demonstrations of the latest short-wave receivers.

The membership of the society will be co-operating with the Radio Society of Great Britain during National Field Day in June, and the location for the transmitters, which will be set up on the 20-metre band, has been fixed for Lavernock Point near Cardiff. Those members of the radio fraternity interested in short-wave transmission are cordially invited to attend. Full particulars as to membership, etc., may be obtained from the secretary, H. H. Phillips, 132, Clare Road, Cardiff, upon receipt of a stamped, addressed envelope.

EDGWARE SHORT-WAVE CLUB

AT the club's meeting on March 16th, Mr. L. Gregory of G2AI, gave a lecture on the best types of transmitting aerials for DX. This was followed by an enthusiastic discussion.

The lecturer has promised to join the club, and it is hoped that he will give another lecture at a later date.

A special general meeting was called before the lecture, when Mr. F. Bell kindly consented to take over the secretarial duties. Will all prospective members of the club either write direct to him at 118, Colin Crescent, Colindale, N.W.9, or come along to the Conservative Club, Edgware, at 8 o'clock any Wednesday eveuing or from 11 a.m. to 1 p.m. any Sunday.

Mr. R. Newland was also elected on to the committee and has accepted the position of librarian to the club.

Future activities include a visit to a large Power Station, lectures to be given by Mr. K. Jowers and Messrs. Erie Resistors, and a Junk Sale on April 6th.

THE EAST DORSET AND WEST HANTS RADIO CLUB

THE next meeting will be on April 5th, when Mr. Jackson of Messrs. Belling Lee will give a lecture on "Interference Suppression." A morse class will be held on this and every ensuing club night at 7.30, at 111, Wimborne Road, Poole, under G5OH.

THE COSSOR SUPERHET

(*Continued from page 74*)

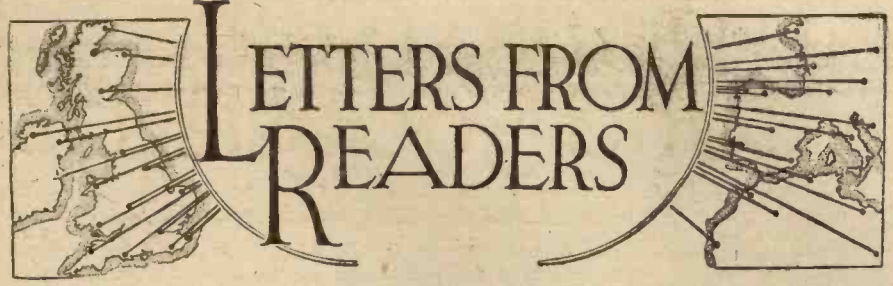
and long-wave bands; tested in a London suburb, no difficulty was experienced in receiving at good volume all the 40-odd Continental stations listed on the dial; it took us just 17 minutes to select the seven stations, adjust the seven blank buttons (a simple matter with the special gadget provided), cut out the station names, and fit them in place with their celluloid covers.

The Teledial in action is simple and practical in use, and will prove a boon in households where members have difficulty in *correctly* tuning an ordinary receiver.

The A.V.C. action of this receiver is remarkable; it is able to hold stations that many receivers with similar valve combination would lose.

Specification

Five valves, including power triode output. Ten-station Teledial, which also acts as normal single-knob tuning; edge-illuminated wavelength scale with station names. Volume control and tone adjustment; two wavebands, 200-550 metres, and 800-2,000 metres. Provision for pick-up and extension speaker. Station names and setting tool for Teledial. For A.C. mains only, 200-250 volts adjustable, 40/100 cycles. List price, 10 guineas, or on hire-purchase terms, viz: 15s. deposit and 12 monthly payments of 18s. 4d., or the same deposit and 18 monthly payments of 12s. 8d.



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).

One of Our Oldest Readers !

SIR,—I am an old telegraphist, and I daresay one of the oldest wireless fans reading your journal, being in my 70th year. I possess three sets: SG2-v-3 (including push-pull), a short-waver (SG1-v-2), and I also use a portable (SG-v-2) for outdoors and night duty. Naturally, morse—the bugbear of the ordinary listener—gives me the greatest pleasure and interest. I've logged all the beacons, lightships and lighthouses as far north as the Orkneys and the west coast of Ireland. I hold QSL cards for Australia and South America on the short-waves.—"ETHERWATER" (London, S.W.).

An Interesting Log

SIR,—As I have not seen a log from my district, I thought it might be of interest to other readers to see my log of 14 mc/s stations received here on a mains 1-v-2 during the week 9th to 16th March. Of special interest I think is the new station on Pitcairn Island, which I have received here at about 07.39 with a strength of R7-8. The call used is VR6A. 111 W stations, including W5FSS, W6LMG, BAW, ITH, IDX, IDV, MZD, also YV1AP, 4AA, 5AC, 5ABY; PY3KS, CO2UG; 3HY; CE3CO, FT4AH, CN8AL, FA3XC, I1LI, VO6D, VO1X, VR6A, VQ4KTB, VK3NP, SU1KG, 1SD, 1RH, 1RD, 2GP; CT2AB, HA5O, SV1NG, and 15 VE stations, including VE3QL, GK, KL, BY, AFD, and many local European stations.

Difficulty was found in logging stations outside the American 'phone band owing to the CW contest being on, and causing terrible QRM.

Thanking you for the very interesting articles in your paper, which I have been reading for the last fifteen months.—I. W. K. SMITH (New Malden, Surrey).

Station VP3THE

SIR,—Regarding reader Bradbury, of Burton-on-Trent, and the report that he sent to station VP3THE, I also sent a report to that station, and the verification I have received is as follows:

"This card will verify your reception of station VP3THE, operated by the Terry-Holden Expedition, now located near the Brazilian border in British Guiana.

"This station does not transmit on a regular fixed schedule, but from time to time its programmes are broadcast exclusively over the Red and Blue Networks of the National Broadcasting Co.

"This card came from the National Broadcasting Co., 30, Rockefeller Plaza, N.Y. City."

The address the report was sent to, as requested by the operator of VP3THE, was as follows: W. Hungerford, Esq., N.B.C., RCA Buildings, Rockefeller Centre, N.Y., U.S.A.

I hope this information will be of interest to reader Bradbury and others.—J. KING (Cricklewood).

From a Canadian Reader: Correspondent Wanted

SIR,—I was very interested in the article about a "straight" set in a recent issue of PRACTICAL AND AMATEUR WIRELESS. I have at present a seven-tube straight set made by a well-known Canadian radio manufacturer in 1929. It has two stages of R.F. amplification, a detector, one stage of L.F., and an output stage to a dynamic speaker. This set still has the same tubes in it as when it was bought in 1929 and it will rival any superhet on medium waves (200-550 metres). I am 16 years of age, and am willing to correspond with anyone. I also have a 1-v-1 home-made receiver with only 90v. on the anodes, and with which I can hear a great many European broadcasting and amateur stations.—ROBERT F. DUSTON, St. Stephen, New Brunswick, Canada.

Radiation Interference

SIR,—In reference to my query of about a fortnight ago, I should like to thank the correspondents who suggested solutions to my problem, but I'm afraid that, although the solution may have been quite likely in their cases, it is an impossibility in mine, as, although my postal address is Wigan, I reside almost five miles away, right in the country, and the nearest relay service wires are at least four miles away. Also, the nearest telegraph wires five hundred yards away. There is only one aerial running parallel with mine, and they had their sets off at the time.—JAMES WILSON (Wigan, Lancs).

CUT THIS OUT EACH WEEK.

Do you know

—THAT an earth lead should be insulated throughout, and only bared where it comes into contact with the earth plate.

—THAT stranded aerial wire is more efficient if each strand is separately insulated, either by enamel or some other covering.

—THAT if a lightning arrester is fitted in the aerial circuit, it should be short-circuited from time to time to remove static charges which might give rise to various troubles.

—THAT three coils may be used in an unscreened condition without interaction, but when more than three are used some form of screening is essential.

—THAT low-voltage valve rectifiers are now available for battery-charging and similar purposes.

—THAT when fitting a visual-tuning meter indicator, it should preferably be of the moving-coil type.

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 Newnes, 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.

"Down to Earth"

SIR,—I was much interested in the letter "Down to Earth," from D'Arcy Ford (Exeter), in which he gives his experience with a 100ft. length of aerial laid along the ground.

It would seem that the fact of getting reception with this depends on the type of receiver used. About two years ago I had a well-known three-valve commercial receiver (supplied as a kit set for home assembly). I did not have this in my possession very long before I discovered I could get quite good reception from Droitwich and a few of the other more powerful stations without either aerial or earth.

On one occasion, when using it in a room without any aerial or earth arrangement, but with about 12ft. of wire lying out through the door and hung across a shrub by the wall, I tuned in Rome with the lady announcer giving the English news (about 6 p.m.) clear and distinct, and with no earth at all.

At the present time I have an identical set in every respect (lying by as a spare), but I can get no reception at all without an aerial. It will, however, give good reception by using the earth wire as an aerial, and with no earth.—WM. J. HILL (Rathdrum, Co. Wicklow).

An Enthusiastic D.X.er: Correspondent Wanted

SIR,—I have been taking PRACTICAL AND AMATEUR WIRELESS since No. 1, and PRACTICAL WIRELESS for about six months before you incorporated *Amateur Wireless* with your journal, and must congratulate you on producing such a fine paper. The most interesting items to me are the transmitting articles and Short-wave Section. I have also read with interest the various letters from readers, and think that a brief description of my receiving apparatus might be of some interest to others.

The receiver, which was built about three months ago, replacing an o-v-1 which was sold, and a 1-v-2 which was scrapped, is an 0-v-1 using a variable-mu H.F. pentode for the detector valve and a Mullard P.M.2 for the output valve. The detector stage consists of six pin coils in conjunction with bandspread, and band-set condenser. The bandspread condenser is operated by means of an Eddystone 100-1 slow-motion dial, and is an Eddystone .0001 condenser which has been cut down until the 20-metre amateur band covers from 10° to 170° on the dial. The detector stage is coupled to the output valve by means of a well-decoupled R.C.C. stage. Another feature of the set is automatic grid bias.

I should be pleased to correspond with any reader anywhere who is interested in general short-wave topics, and should be only too pleased to send the circuit of my receiver to anyone interested.

Wishing the PRACTICAL AND AMATEUR WIRELESS every success.—R. Q. MARRIS (2BZQ), 80, Wyberton West Road, Boston, Lincs.

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.

S. B. (E.). Either the controls are not connected to earth or your earth connection is inefficient.

H. L. T. (Buckingham). A faulty grid circuit can give rise to the trouble you mention.

G. B. (S. Shields). You have fitted the grid condenser between the coil and the condenser. It should be placed between the junction of the tuning coil and condenser and the grid of the detector valve. This is the only fault in the circuit.

P. R. W. (N.17). You could not use the same valves in the Universal receiver, but will have to obtain the special A.C./D.C. valves which we specified.

B. C. U. (St. Kitts, B.W.I.). We have not published a circuit which would give you the desired results. We are at present experimenting with receivers which might eventually be of use to you.

F. R. J. (Wellington). There may be several reasons for your trouble: an inefficient choke, wrong values of reaction condenser or reaction winding, inefficient earth, wrong value of grid leak or insufficient H.T. An ordinary milliammeter may be used in the detector stage for measurement.

R. G. (Weybridge). If only used for record amplification no licence is necessary. Theoretically you are required to take down your aerial.

C. S. B. (Minster). Are you using the coils in the circuit recommended by the makers? Your tuning dial must be designed for use with coils and condensers of definite values.

J. D. (Halifax). You should write direct to the makers of the receiver as it may be unsuitable for use with a pickup.

C. O'C. (Co. Donegal). The amplifier should be quite suitable for your purpose.

D. P. M. (Renfrew). An artificial centre-tap may be provided by connecting a 30 or 50 ohm. resistance across the winding, and using the centre-tap of the resistance. Special components of this type—known as "hum-dingers" are readily available.

E. J. B. (Ashby-de-la-Zouch). The components are interchangeable.

N. W. M. (Liverpool, 13). A minimum bias should be left on the valves and you may therefore have to use two switches ganged in the A.V.C. circuit.

E. B. S. (Uxbridge). We meant that the aerial must be placed so that it is clear from the apparatus causing the interference. Therefore you have first got to find what causes it. The trolley buses may be responsible, and you should try one or two experiments in this connection. The issue in question is still available, price 4d.

D. S. (Wotton-under-Edge). We do not recommend the modification mentioned in your letter.

F. D. (N.W.10). The total cost would be about 30s. The one-valver would be of much greater use and would form the nucleus of a larger set.

J. C. C. (Brighton). We think you will find that the speaker is only intended for a 100 volt supply, and thus you are over-running it.

A. F. G. (Castlerea). We regret that we cannot identify the sketch and it does not appear to be one of our receivers.

D. O'D. (E.17). Write to the Rothermel Company at Rothermel House, Canterbury Road, N.W.6.

B.T.S. TROPHY RECEIVERS

MESSRS. British Television Supplies, Ltd., have advised us that a statement made in connection with their Trophy 3 receivers on page 51 of March 26th issue, is inclined to be misleading to interested readers. The B.T.S. Trophy 2 circuit conforms in every respect to that of the designer's with which he secured the American Trophy for short-wave logging, but the Trophy 3 models have been developed subsequently, employing in different circuits, special features which permit of simplified tuning and loud-speaker results; the Trophy 2, of course, was designed mainly for use with headphones.

BOUND VOLUMES OF P. & A. W.

WE have a small supply of bound volumes of Vols. 1, 2 and 3 of "Practical and Amateur Wireless," which we are prepared to supply at 7s. 6d. each whilst the stock lasts.

These volumes are neatly bound in blue cloth in stout boards, are fully indexed, and are rare. Most of the separate issues are out of print. If you desire to obtain one of these whilst the stock lasts, you should order at once from the Publisher, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Practical and Amateur Wireless
BLUEPRINT SERVICE

PRACTICAL WIRELESS	Date of Issue.	No. of Blueprint.
CRYSTAL SET.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
All-wave Unipen (Pentode)	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	—	PW36B
The Signet Two (D & LF)	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	—	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
F. J. Camm's "Sprite" Three HF Pen, D, Tet)	26.3.38	PW87
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW46
Fury Four (2SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12 2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	—	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW33
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four	6.11.37	PW81

These Blueprints are drawn full size.

Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless	4d.	Post Paid
Amateur Wireless	4d.	,, ,,
Practical Mechanics	7½d.	,, ,,
Wireless Magazine	1/3	,, ,,

The index letters which precede the Blueprint Number indicate the periodical in which the description appears : thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, P.M. to *Practical Mechanics*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprints, 1s. each.		
Featherweight Portable Four (SG, D, LF, Cl.B)	15.5.37	PW12
"Imp" Portable 4 (D, LF, LF, Pen)	19.3.38	PW86

QUERIES and ENQUIRIES

Acme Output Stage

"I am going to build your Acme receiver, but as I already have a good loudspeaker there is one point which puzzles me. You have fitted the set with three output terminals marked L.S., but my speaker has only two terminals. Perhaps you could tell me which pair I have to use in the set in order to get the best results from my speaker. This is energised and has its own power pack."—B. F. S. (Gainsborough).

THE output stage of this receiver is a Class B arrangement, and thus a centre-tapped output transformer has to be used to couple the speaker to the set. In the speaker specified a centre-tap is provided and thus it is a simple matter to couple the speaker and set. As your speaker has only two terminals it will be necessary to fit a special Class B output transformer between the set and your speaker, or to fit a centre-tapped output choke between the two. As it is important to remove as much iron as possible (to avoid distortion) you would probably find best results would be obtained by purchasing a low-ratio Class B transformer, and removing the transformer now fitted to your speaker. The speech coil should then be connected to the secondary terminals of the transformer and the primary should be joined to the three terminals on the receiver in the usual way.

Auto-bias

"I am building a mains set with three indirectly-heated A.C. valves and a directly-heated output valve. I have found a circuit, but this shows an indirectly-heated output valve and I am rather puzzled regarding the bias arrangement. There is no cathode on my valve and I should be glad to know how to arrange the auto-bias for it. I know the value of the resistance as this is on the maker's data sheet."—E. P. (Romford).

YOU may find it difficult to arrange for bias, but we cannot say for certain in the absence of complete details of the circuit and apparatus in use. For instance, it is desirable that the output valve should be fed from a separate heater winding on the mains transformer, when all that is necessary is to include the bias resistance in the centre-tap lead to that winding. If, however, you only have a single heater winding for all of the valves it might still be possible to fit the bias resistance in the centre tap, but in some circuits this may result in troubles from various reasons.

Wiring Difficulties

"I should like to design my own set for all-wave reception, but there are several snags which occur to me after reading various articles in your pages on set design. The most important is the reduction of wiring lengths between components, especially as the set is to be used, if possible, to tune down to 5 metres. Are there any special components you would recommend, or can you refer me to any article giving layout details?"—K.E. (S.W.9).

AS you intend the receiver to tune from 5 to 2,000 metres you will certainly have to spend considerable thought and perhaps experiment, in obtaining a suitable layout. Modern components are available which will enable you to arrive at a satisfactory scheme and we suggest that you obtain one of the J.B. or Polar Bar-type ganged condensers on which a connecting lug will be found at the bottom of each section. By mounting your coils and switch gear immediately underneath the chassis you can drop the connecting wires straight down from the condenser and thus use only an inch or so of wire with great increase in efficiency. The Wearite "P" type coils will enable you to arrange quite a useful all-wave tuner on these lines.

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 Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Corona 4 Modifications

"I am using your battery Corona receiver and although I am very satisfied with the results I should now like to try to 'hot up' the set. I realise that I am taking a liberty in doing so, but I find that the experiments which can be carried out with a set interest me far more than mere station logging, and I should therefore be grateful of any assistance you can give me in this connection."—R. A. C. (Birmingham).

WE do not recommend any modification in the wiring to the tuning circuits of this receiver, and probably the only manner of improving the performance of an individual receiver is to experiment to find the maximum voltage for each valve. Thus, you can cut out the decoupling resistance in the detector anode circuit, and fit a separate battery lead to resistance R4. This will then enable you to change the voltage on the anode of the H.F. valve and also on the detector stage, giving improved H.F. gain in the first stage and also enabling you to find a suitable voltage for the detector which will give smooth reaction and maximum gain. Beyond this alteration we are afraid there is no simple improvement other than changing valves, and this we do not recommend.

Lamp Resistances

"In building a trickle charger I understand a lamp may be used for dropping the voltage supply. Can you convert the wattage rating of the lamp into resistance or current so that it is a simple matter to find the type of lamp required for any required current or vice versa?"—G. R. (Harringay).

WATTAGE is the product of voltage and current, and therefore you can, from the voltage, ascertain the current which flows. The resistance is naturally dependent upon current and voltage and therefore to ascertain the resistance you can divide the voltage rating, squared, by the wattage rating and this will give you the resistance of the lamp in ohms. You will find, however, that the resistance will vary with the brilliance of the lamp.

Drilling Chassis

"I am going to use a thin steel chassis for my new set and wonder if an ordinary bit would do for drilling the large holes needed for coils and valveholders. Can you give me any hints on this subject?"—P. S. (Dublin).

YOU do not state the largest size of hole you require, but for valve-holders 1¼in. should be the maximum. For this you can use an ordinary wood centre-bit, provided that you only permit the tracing edge to come into contact with the metal. Cut through until the score shows on the reverse side, and then turn the chassis over and cut through from that side. In this way you will not seriously damage the wood bit as the cutting edge will not come into contact with the metal. For larger holes if you do not want to go to the expense of buying a washer cutter, you can drill round the outline with a small twist drill and knock out the piece, afterwards finishing the edge with a good half-round file. In some cases a large clearance hole is not essential, as small holes to accommodate the leads may be quite sufficient.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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shows dozens of New Short-wave Components. **1½D** *Post Free.*

RADIOMART

44, HOLLOWAY HEAD, BIRMINGHAM, 1

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

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25 ONLY FOR SALE.—3-valve kits with valves and diagram, 12/6; 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation. —Universal Radio Co., 221, City Road, London, E.C.1.

S.T.600 Battery Set: £3. Cost £9/12/6. 24in. Box Baffle Fitted Large Rola Speaker, £2/10/0. 5 gns. the two.—Banks, Penshurst, Kent.

COMMUNICATION receivers, the new 1938 Sky Challenger, Hallicrafters newest job with infinite image rejector, £23; with Crystal, £25.
NC80X, National Companies 1938 Production A.C. or D.C., operation any voltage, £25, or
NC81X. Covering only amateur bands. £25.
Note the list price of these two models has been increased by a considerable amount, and future supplies will sell at a considerably higher figure. Take advantage of this opportunity.
All other manufacturers at least, such as RME. Hallicrafter, National, Howard, available from stock.
All equipped with Radiographic's special power transformer.
Watch for opening date of our new London premises. Remember our guarantee of satisfaction or money refunded.
Radiographic, Ltd., 66, Osborne Street, Glasgow, C.1.

GUARANTEED Short-wave coils, 8.5 to 160 metres, 4 for 2/-; singles, 8d., post free.—Modern Radio, 439, High Road, Ilford, Essex.

ALL lines previously advertised still available.—Radio Clearance, 63, High Holborn, W.C.1. Phone, Holborn 4631.

OLIVERS offer Erie 1-watt colour-coded resistances 3½d. each, 3/- dozen, 2/6 dozen in 3 dozen lots.
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MAKING AN AUTO-DIAL STATION SELECTOR—See page 87.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

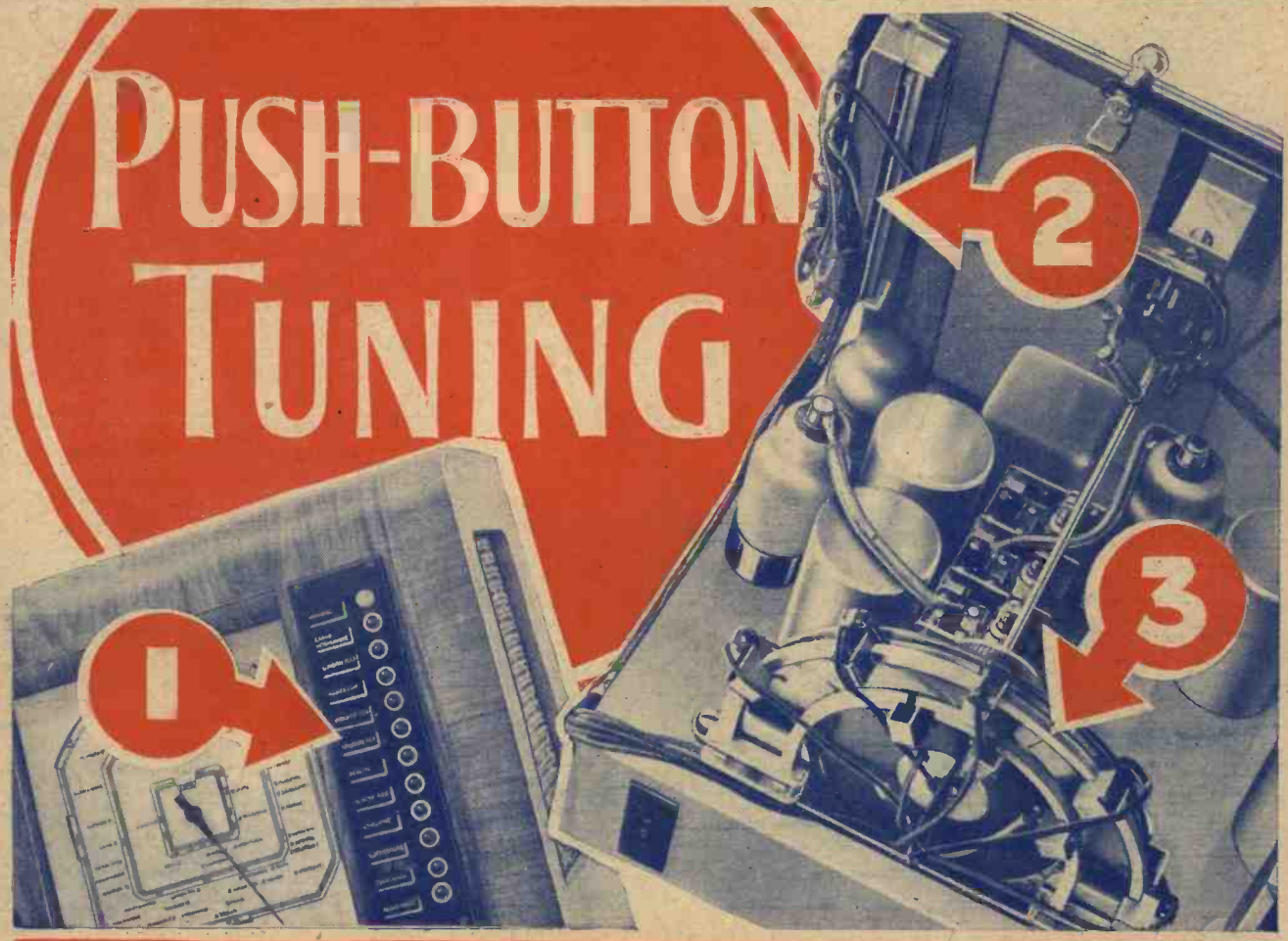
3D EVERY WEDNESDAY

Edited by F. J. CAMM

a GEORGE NEWNES Publication

Vol. 12. No. 290. April 9th, 1938.

PUSH-BUTTON TUNING



A SIMPLE SHORT-WAVE 1-VALVER—See page 93.

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. XII. No. 290. April 9th, 1938.

ROUND *the* WORLD *of* WIRELESS

Automatic Tuning

THE increasing popularity of automatic tuning is evident from the number of firms who are now developing apparatus for the purpose, or complete receivers in which the automatic-tuning device is incorporated. Details are slowly coming to hand from the various manufacturers showing how they are utilising the idea, and in this issue we add to the details which we have already published on the subject. There is an intensely interesting field of experiment opened up by this new development, and we have already given details for building apparatus in which the automatic tuning may be introduced. In this issue we give some more details of the commercial push-button or automatic tuning devices, and in addition we give constructional details of a simple device which may be fitted to any receiver to enable a number of stations to be tuned by means of a dial similar to the telephone dial now in common use. The apparatus is capable of modification to enable various forms of automatic tuning to be incorporated, and this, in conjunction with the other article on automatic tuning, will undoubtedly prove of interest to amateurs who are keen on trying out the latest form of tuning system.

Glasgow Exhibition

PLANS are being made to broadcast from the Glasgow Exhibition, and the broadcasts, it is hoped, will include microphone tours and feature programmes, some of which will be devised to indicate the growth of Radio both from a point of view of science and of home entertainment.

Bristol Radio Show

THE eighth consecutive Bristol Radio Exhibition will be held from September 7th to 17th. The venue is the Coliseum, Bristol, and full details concerning this show may be obtained from the assistant secretary of the exhibition, 69, Old Market Street, Bristol.

Television News Bulletins

FOLLOWING the recent appeal by the B.B.C. the majority of listeners appear to regard the news bulletins as of some importance, and accordingly the 9 o'clock news, normally radiated on the sound programmes of the B.B.C., is included at the end of the television programme. A "still" caption or picture is projected whilst the news is read, and important items received after the normal "third news" are added at the discretion of the television announcer.

Crystal Sets and A.R.P.

MANY firms are now specialising in small crystal sets suitable for use under air-raid conditions. The receivers are being known as "A.R.P." sets, and it is important to remember that these will enable news bulletins and other announcements to be heard in spite of the failure of other forms of communication, such as telephones, etc.

ON OTHER PAGES

Ideal Home Exhibition

THE wireless constructor, amateur engineer, motorist and handyman should see the continuous demonstrations of soldering with the Solon electric soldering iron, which form the chief attraction on Henley's stand (No. 223, Main Hall Gallery) at the Ideal Home Exhibition.

Solon resin cored solder is also exhibited, and the remainder of the display space is devoted to Solon electric wafflers.

Racing Broadcasts

FOR the first time, the Two Thousand Guineas, famous Newmarket Spring Classic for three-year-olds, will be broadcast on April 27th in the Regional programme. This race is a prelude to the Derby to be broadcast on June 1st.

Peak Day Broadcasts

APRIL 30th is regarded as a peak day from the outside broadcast point of view. On that day the B.B.C. will relay the Cup Final and the opening of the Cricket season, and in the evening a relay will be taken of the Royal Academy Banquet.

Band Queries

FOLLOWING some recent brass band broadcasts in the Midland programmes, listeners were asked to send in questions regarding the composition of brass bands, their training, conducting, and other details. The first batch of questions received will be answered on April 11th by Denis Wright, a well-known adjudicator and composer. Where illustrations are needed they will be furnished by Munn and Felton's band from Kettering.

Ecuador in the Log

HC2CW, Guayaquil (Ecuador), using the slogan: *Ondas del Pacifico*, has been recently logged on 35.71 m. (8.41 mc/s). The call, given by a woman announcer, is made in Spanish only, namely (phon:) *ah-hay say doss say dooble-way* and is followed by three chimes. Times of transmission would appear to be from G.M.T. 00.00-04.30 on weekdays, and on Sundays from 20.30-23.00. The studio opens and closes with the playing of the National Anthem (Sangre Ecuadoriana). Address: Casilla Postal, 1166, Guayaquil, Ecuador (South America).

W2XE, Wayne, Alters its Schedule

On 13.94 m. (21.52 mc/s) from G.M.T. 12.30-18.00; on 19.65 m. (15.27 mc/s) from 18.00-22.30. On Saturdays and Sundays, instead of 25.36 m. (11.83 mc/s) the 19.65 m. (15.27 mc/s) channel is used from G.M.T. 19.30-23.30 and from G.M.T. 04.00-05.00. W2XE now returns to its old frequency of 6.12 mc/s (49.02 m.).

ROUND the WORLD of WIRELESS (Continued)

France's National Transmitter

FRENCH papers report that the super-power station which is in course of being installed at Mehun-sur-Yevre, and destined to replace Radio Paris as the French National long-wave transmitter, will carry out its initial tests in June.

Increase in Indian Listeners

ACCORDING to a recent report in *The Indian Listener*, the number of wireless licences issued in India at the end of 1937 was 50,680, an increase of nearly 13,000 over the previous year. Considering India's huge population, this number is very small, and indicates that only about one person in 10,000 has a wireless receiver.

"Summer-Time" on the Continent

READERS should note that in France and Belgium, official Summer-Time this year began during the early hours of March 27th. Great Britain will not change over to Summer-Time till the early morning of April 10th.

Austrian Broadcasting

IT is reported that Radio Vienna is now a German Regional station, and is to be a branch of the Reichs-Rundfunk-Gesellschaft.

Grand National Broadcast in Arabic

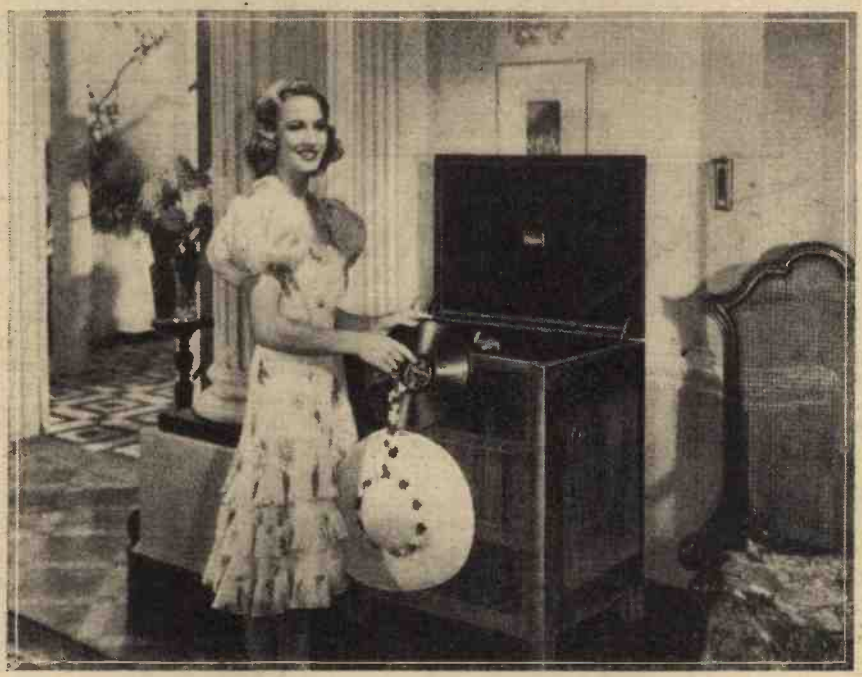
ARABS who tuned in to Daventry on Friday, March 25th, heard an eye-witness description of the Grand National given in their own language by Mr. Aziz Rifaat, a member of the Arabic staff of the B.B.C. Mr. Rifaat spoke from the Grand Stand, and his talk was electrically recorded for reproduction in the Arabic programme.

The connection between English racing and the Arab countries is not as remote as might be thought! Arab horses figure in the pedigree of the aristocracy of English racing stock, and fresh blood from Arabia has at various times been imported. Horse and camel races have been known in Arabia since the beginning of history, and the Arabic language has a number of picturesque words for horses "placed" in a race, instead of the colourless numerals used in this country.

U.S.A. All Out for Super-power Stations

IN view of the success achieved by the 500-kilowatt WLW, Cincinnati (Ohio), medium-wave broadcaster, it is now revealed in a report recently published by the Federal Communications Commission that 15 other stations have lodged applications to use the same power. They are: WZJ, Boundbrook (N.J.); WGY, Schenectady (N.Y.); WOR, Neward (N.J.); WHO, Des Moines (Iowa); WGN, Chicago (Ill.); KDKA, East Pittsburgh (Pa.); KSL, Salt Lake City (Utah); KFI and KNX, Los Angeles (Cal.); WSB, Atlanta (Ga.); WSM, Nashville (Tenn.); WJR, Detroit (Mich.); WOAI, San Antonio (Texas); WHAB, Louisville (Ken.); and WBZ, Boston (Mass.); in fact, most of the stations at present working on 50 kilowatts. If the new Boyle Bill, which is shortly to be presented to the Senate, becomes law, each of these transmitters will be liable to an annual tax of 1½ million dollars, an aggregate sum which would prove a welcome additional revenue to the U.S.A. Exchequer.

INTERESTING and TOPICAL NEWS and NOTES



Diana Churchill, the well-known film actress, tries out a new record on a Marconiphone radiogram, while resting from making "Lover's Knot," an Associated British Pictures film now being produced at Elstree.

Cabaret from Torquay

DANCE Cabaret from the Grand Hotel, Torquay, on April 16th, will include: Marriott Edgar, "in original Lancashire monologues"; Ernest Shannon, "Radio Diversions"; Sylvia Welling, "musical comedy star"; and dancing to Harry Evans and his Dance Band, with Reg. Mitchell and Freddie Noakes.

Swiss Television Appeal

A LEADING Swiss radio journal is appealing to all listeners in Switzerland to make donations to a fund for the construction of a Swiss television transmitter. The cost of building the transmitter is estimated to be approximately £6,000. It is hoped to have the equipment ready for operation at the Swiss National Exhibition of 1939.

A Paul Temple Thriller

THE second of the eight episodes in the serial thriller entitled "Send for Paul Temple" will be heard on April 14th, and will be repeated on April 16th in the lunch-hour. This thriller is by Francis Durbridge, the well-known Midland radio playwright, and deals with a series of jewel robberies in the Midlands which are solved by Paul Temple, detective. The title of episode two is "Room Seven."

"Let's Celebrate"

WITH the above title, a new 15-minute programme scheduled for thrice weekly, and featuring some of America's leading radio acts, will make its debut over WLW (428 m.) the Nation's Station, on Tuesday, April 26th. The programme will be heard at 6.30 p.m., EST, Tuesdays, Thursdays and Saturdays.

Booked for a run of six months, "Let's Celebrate" will present Martin Block, famed in New York for his gift of "ad. libbing," and for his spontaneity and sense of humour, as master of ceremonies. Such stars as the Pickens Sisters, the Royalists, the Eton Boys and the Melodeers Quartet will be heard from time to time.

Also scheduled as guests will be John Gart, accordionist, and Lee Sullivan, singing hit tunes; Joe Rines and his orchestra will furnish the musical background.

SOLVE THIS!

PROBLEM No. 290.

Smithies decided that he could obtain greater volume from his two-valve short-wave set by coupling it to his A.C. mains superhet (broadcast receiver). Accordingly, he connected the 'phone terminals on the short-wave set to the pick-up terminals of the superhet, but instead of obtaining greater volume he could get no signals of any kind. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 290 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, April 11th, 1938.

Solution to Problem No. 289.

When a simple autodyne converter is used all stations will be heard at two settings, corresponding to the difference in frequency both above and below the station setting. Thus Rodgers was wasting his time in endeavouring to cut out one of the stations.

The following three readers successfully solved Problem No. 288, and books have accordingly been forwarded to them: D. H. McAllister, 8, Percy Avenue, Cullercoats, Northumberland; R. J. Tossell, 3, High Grove, Sunbury Hill, Torquay; A. Forbes, Queensway Lambeg, Lisburn, N. Ireland.

An Auto-dial Selector

In this Article Constructional Details of an Interesting Unit are Given

THE mechanism herein described was designed for the control of six stations, which was considered a happy medium for the average receiver incorporating this type of movement. Superhets, and receivers with a number of tuned H.F. stages would, of course, require provisional contacting for each stage, including that of the oscillator section, but if so required, two sets of contacts, for example, could be made for automatically operating two tuned circuits, modification being arranged to permit the function under the one dial.

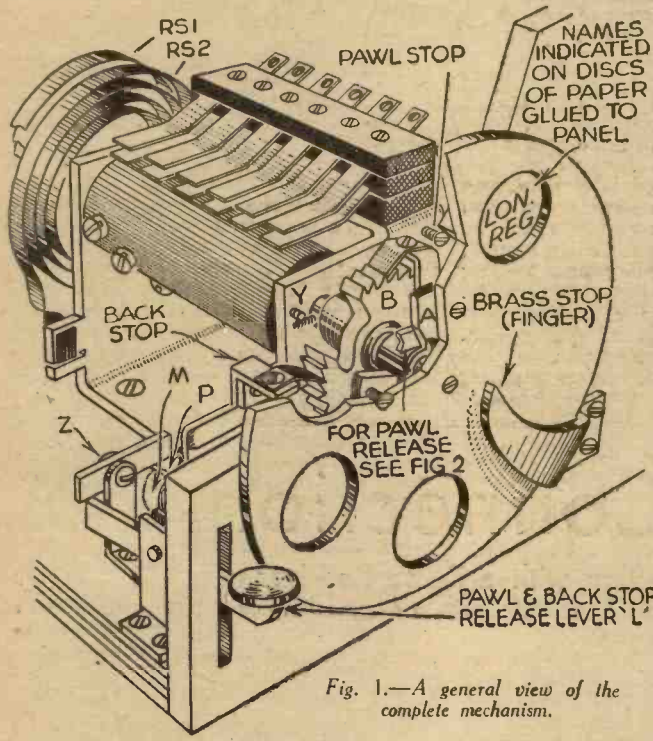


Fig. 1.—A general view of the complete mechanism.

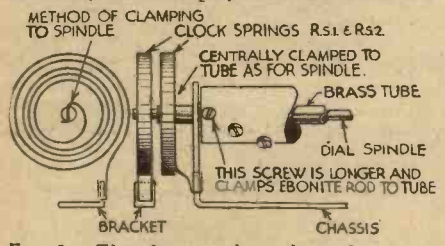


Fig. 2.—This diagram shows how the return spring is mounted on the spindle

Locator Mechanism

Referring to Fig. 1, it will be seen that a pawl and ratchet movement forms the locator mechanism, the restoration of both the dial and the cam being effected by two clock springs. The action of this movement will be detailed later. The choice of the individual pairs of contacts is arranged by utilising cheese headed screws so spaced on the ebonite cam that for each hole on the dial a screw head engages with the corresponding bottom spring of the required pair of contacts, causing these contacts to "make," thus completing a circuit for introducing that extra capacity across the normal tuning condenser for alteration of the wavelength.

The cam assembly is mounted on a brass tube through which passes the dial spindle; also on this tube is mounted the ratchet wheel, whilst the pawl and back stop springs are fixed to the aluminium lugs, provided for in the design of the complete movement.

The cam tube is cut sufficiently long to protrude through the end bracket piece to the extent of half an inch, thus allowing sufficient room for securing the restoring spring. The dial spindle is likewise extended half an inch beyond the end of the tube for cleating the end of the dial restoring spring, as illustrated in Fig. 2.

Chassis and Dial

The chassis and dial is constructed of 16 S.W.G. aluminium, and whilst it may be possible for the constructor to make use of various parts out of the "junk" box, a piece of aluminium measuring 4 square inches will, however, be required for the dial.

Reference to Fig. 4 will show the method of marking out the dial. With the aid of a pair of dividers, scribe a circle with a radius of 2ins., with the point of the dividers in the centre of the metal; then, with a hack-saw, the corners of the sheet should be cut away, and the remaining corners—shown dotted—filed down smoothly. Finally, use a piece of emery cloth for removing all burrs and to obtain a neat finish. The finger holes are formed as follows.

A circle 1¼in. radius should be made with the divider point centralised on the dial, then a straight edge should be placed across the exact centre, and a line marked with a scriber; next, and at right angles to the line, another line should be made intersecting at the centre, thus dividing the disc into four. With a protractor, angles of 45 degrees should be marked off with the scriber, as shown, and at the six points of intersection on the circumference, centre punch, drill, and then file the six ¾in. holes, finishing off smoothly with emery cloth, as these are the finger holes.

Depending on the size of the dial mounting disc "A" to be used, four holes will have to be provided in the centre of the dial, but these are not illustrated in Fig. 4; the approximate positioning can be seen on referring to Fig. 1. The exact radius of the fixing hole positions will, of course, have to be ascertained by checking the corresponding holes on the disc "A." A wheel from a well-known mechanical toy served in the model illustrated, but the reader may devise certain improvements to suit himself.

"Restoring" Springs

Referring again to Fig. 1, it will be seen that the ratchet "B" is fitted, as previously mentioned, on a length of brass tubing through which passes the spindle of the dial. Fig. 2 shows clearly the method of using two strong clock springs clamped to aluminium lugs and centrally secured to the brass tube and spindle respectively, this method meeting the requirements for the two restoring springs RS1 and RS2. Owing to the difficulty in drilling clock springs the ends had to be cleated by using the slotted lug principle, and this will be understood on referring to Fig. 2.

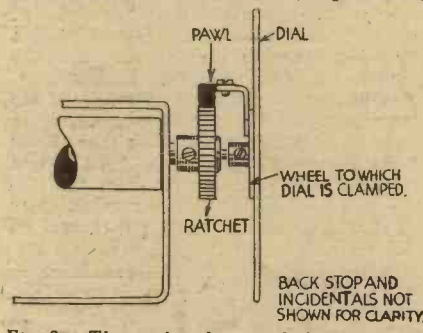


Fig. 3.—The ratchet device which provides the "locator."

A word or two on the operation of the dial will show the reason for the lever "L." When a certain station is required a finger

(Continued overleaf)

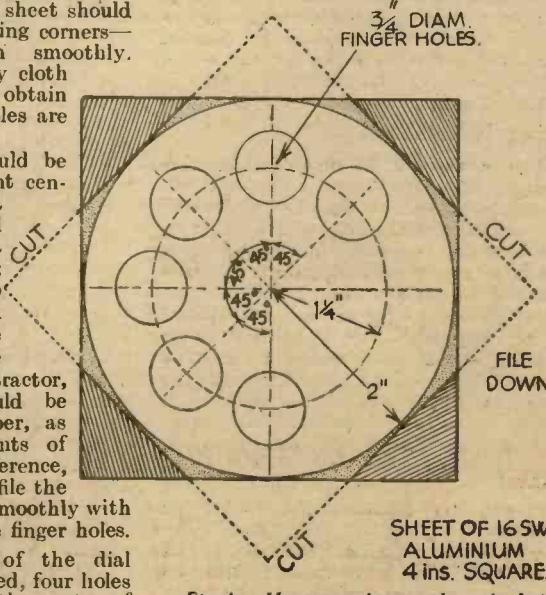


Fig. 4.—How to mark out and cut the dial.

AN AUTO-DIAL SELECTOR

(Continued from previous page)

is inserted in the required hole and the dial is brought round to the finger stop, in the same way as the operation of a telephone dial; when the finger is withdrawn, the dial returns, and the pawl engaging with the ratchet, turns the ebonite cam cylinder round, eventually causing the particular pair of contacts to engage, and completing the necessary circuit. When another station is required, the "pawl and back stop" release lever "L" must be depressed, and the ebonite cylinder restores to normal under the control of the spring RS2.

To ensure the restoration of the cylinder to normal, a 6B.A. screw "Y" was let into the side of the brass tube, and arranged to engage with a 6B.A. screw let into the side of the aluminium chassis, and the spring tension of RS2 was checked to see that not too violent a return is made.

Release Movement

The release lever movement is detailed in Fig. 5, and it will be apparent that a very simple action is necessary for the operation of both pawl and back stop.

Provisionary holes must be made in the front panel for letting in the dial clamp in disc "A," and for securing the lever release brackets "X1" and "X2." Old condenser vane spacing washers will do very well for keeping the movement away from the rear of the front panel, and in obtaining correct centering, although—for clarity—these are not shown in the illustration.

The movement "Z" (Fig. 1) was constructed entirely out of brass, and a spring "M" was provided for restoring the back stop after lever depression. This spring may be made from a strip of springy brass, then drilled and screwed to the baseboard or chassis, and finally bent over to engage with the under section of the arm "P."

The pawl and back stop springs may similarly be made from strip brass or phosphor-bronze.

Contact Strips

The contact nest is easily constructed, consisting only of three strips of ebonite drilled 6B.A. clearance for the contact fixing screws. These screws must be insulated from the contact pieces, and short lengths of ebonite bushing will be required here.

The chassis, in the model described, was made to provide two bent-over strips on to which the contact assembly could be secured by the two end fixing screws; this was done by drilling and tapping 6B.A. two holes in these bent-over portions. The contacts were made of phosphor-bronze and measure approximately 1¼in. by ⅛in. with ¼in. long solder tags.

The setting of the 4B.A. contact operating screws had to be accomplished after the whole assembly had been made up, and by marking the relative positions with a scribing tool, the holes were drilled and tapped in the ebonite, corresponding to each position given by the cam movement, when each finger hole was used.

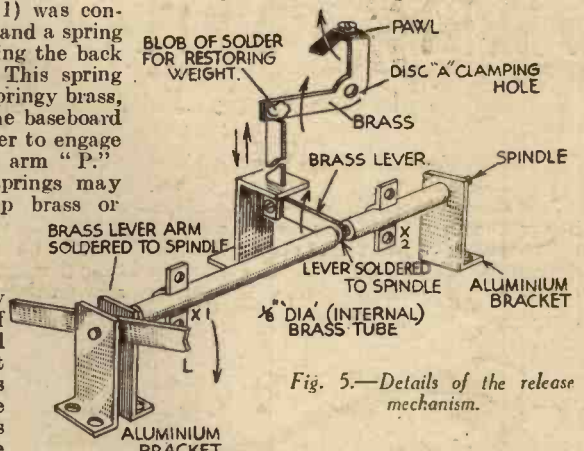


Fig. 5.—Details of the release mechanism.

The whole movement is secured to the baseboard of a receiver or in a separate unit box by fixing screws through the base of the "auto" chassis. After completion, it is advisable to lubricate the movement, and light sewing machine oil, or vaseline will be suitable for the purpose.

The Earth Connection

And How it Functions in Conjunction with a Radio Receiver

IN the early days of the crystal receiver it was both customary and necessary to connect one end of the apparatus to an aerial, and the other end to earth. In the course of time, aerials as they were then known have been dispensed with, but the importance of a good earth has recently come to the fore. The battery set is fast giving place to the mains set; unshielded coils set at critical angles have given place to screened coils, but the necessity of the earth connection has remained unchallenged, and in fact with the advent of more sensitive receivers the necessity of earthing mains, filters, chassis, loudspeakers, etc., has become more and more apparent.

Curing Instability

When a receiver is unstable, in nine cases out of ten it is cured by tying down something to earth. In the laboratory it is customary as a matter of routine to earth everything, as by this means interaction, instability, and most other troubles are killed before they arise.

The earth has become such an integral part of radio and everything to do with it, that it is doubtful if one in a thousand has ever bothered to consider how the connection of a piece of the apparatus to a poker stuck in a flower bed can bring about such a profound influence. It would almost seem as if the earth were some mystically-endowed, bottomless electrical void with an inherent greediness for electrons.

For the purpose of describing the "earth," it is necessary to split it into two headings: (A) the earth as part of the aerial/earth system for collecting radio waves, and (B) as a device for holding any contacting material in an electrically dead state. The function of this connection under the heading (A) is very easily dealt with by describing the earth as a connection to a body that is electrically different from the aerial. It will be appreciated that the initial step in the functioning of any normal wireless receiver is the high-frequency voltage existing across the aerial coil, and as the aerial is connected to one end, it is desirable that the other end should be connected to something electrically dissimilar, as any H.F. voltage pick-up at the end of the coil remote from the aerial would reduce the efficiency of the aerial.

Acting As a Counterpoise

Under the heading (B) the function of the earth connection can be most readily understood by regarding it as a means of making connection to a body of unlimited size and zero potential, that can take up or deliver any number of electrons required without altering its own potential. It is, in fact, a counterpoise without any characteristics. Alternatively, the idea of earthing, say, the chassis, may be looked upon as connecting together the chassis and a body so vast that the minute but troublesome currents in the former are completely lost, and no more harmful in their particular sphere. A useful analogy can be taken from a wineglass of water in which has been dissolved a fatal dose of arsenic. As long as the poison is isolated in the wineglass, it is a serious matter, but if the poison be shared between the wineglass and the Atlantic Ocean, its presence may be completely forgotten.

Hand Capacity

The use of earth connections as a means of avoiding hand-capacity is not as fully understood as it should be. Such a connection merely ensures that the object likely to be affected is at the same potential as the hand. The mere connection to earth does not in itself stop hand-capacity, but does so by virtue of the fact that the hand—and for that matter, the whole body—is also at earth potential; it also completely stops *capacity* coupling between the hand and the components, wires, etc., behind the screen.

Filters, and Details of the 10-watt Transmitter are Dealt with in this Article

By L. ORMOND SPARKS

IN the sixth article of this series, Fig. 3 showed the graphical representation of a train of continuous waves which, it was decided, had to be broken up into long and short trains to enable information to be conveyed by means of the Morse Code. Some simple keying arrangements were also shown, so let us see what happens to the continuous waves when the key is operated.

If the letter "B" is to be sent the train has to be interrupted so that a "dash" and two "dots" are radiated, and the best way to indicate this is as shown in Fig. 1. The wave-form is no longer symmetrical; it rises from the base line to maximum value and remains constant until the circuit is broken by the key being opened, when it dies down again to zero. The procedure is repeated for the "dot," but the period of maximum current is not of the same duration; in fact, it is, or should be, exactly one-third of that of a "dash."

The new wave-form is denoted by the dotted line which represents what is known as the "*modulation envelope*," and it is particularly important for the "envelope" to conform to certain standards if perfect transmission is to be obtained.

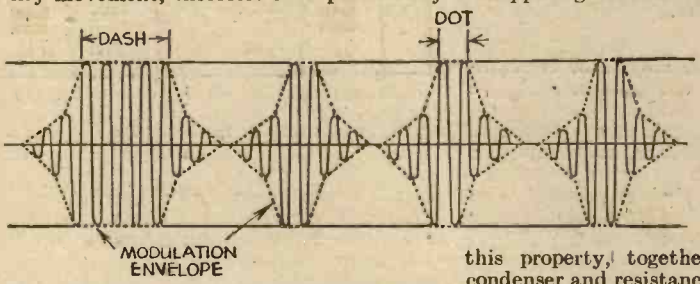


Fig. 1.—Showing the new formation of the wave-train when key is operated for letter "B."

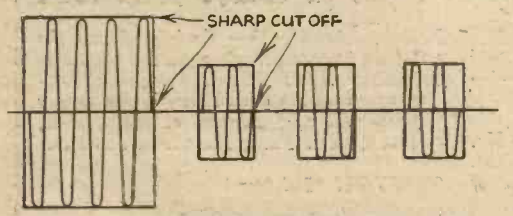


Fig. 2.—A distorted wave-form caused by sharp cut-off or sudden break in power circuit.

For example, it is possible, with certain operating conditions, for the current to rise and fall *too* quickly, with the result that the "envelope" will take up the shape shown in Fig. 2. With such transmissions it is highly possible that interference will be caused to any nearby listeners, even though their receivers might be tuned to a wavelength very remote from that of the Morse signals. The interference will take the form of clicks corresponding to the key movement, therefore it is particularly desirable to see that such conditions are not allowed to exist.

Another form of "envelope" distortion is shown in Fig. 3. It will be seen that in that example "peaks" are present each time the key is closed, and this is a condition which should also be avoided. It can be caused by poor regulation of the high-tension and unsatisfactory keying arrangements.

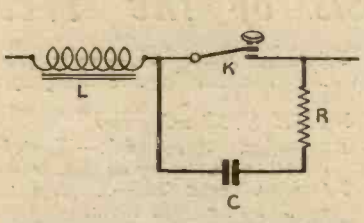


Fig. 4.—A simple form of filter to prevent keying clicks.

Filters

To eliminate wave-form distortion, it is usual to employ a simple circuit in conjunction with the key, which acts as a filter, and if correct values are selected, a high standard of transmission can be obtained, but even when such precautions are included it is still necessary to pay a good deal of attention to the complete keying system, as nothing is worse than bad morse transmission, ignoring for one moment bad 'phone modulation which we will deal with later.

One of the most simple filters is shown in Fig. 4, where L represents a good make of L.F. choke, R a resistance, C a fixed condenser, and K the key.

It is assumed that the key is inserted in the plate circuit, i.e., H.T. positive lead, as that is about one of the most troublesome arrangements so far as "click" generation and elimination is concerned. It will be appreciated that the higher the current across the key, the greater the possibility of trouble being experienced, therefore the keying circuits mentioned in the previous article have this point in their favour, apart from the question of safety.

The complete anode keying circuit is shown in Fig. 5, and it will be appreciated that if the key is opened and closed—without the filter circuit—violent surges are bound to be created, especially if reasonable power is being used, and, among other things, sparking at the key contracts will take place. An L.F. choke has the property of opposing sudden current changes, and this property, together with that of a condenser and resistance, is used to secure the desired keying effect by embodying it in the filter circuit.

When the key is closed, a certain amount of energy is stored in the inductance and the electro-magnetic field set up around the choke. This is not instantaneous, as a minute period of time is required to reach maximum. Now when the key is next opened, this stored energy will tend to kick back, so to speak, into the circuit, and if the current is of any reasonable value, it will try to jump the open key contacts or, in other words, it will cause sparking—one of the very things we are trying to prevent. Luckily this little snag is not so difficult to overcome if use is made of the characteristics of a condenser which, as shown, is connected across the contacts. The actual value is not too critical, and it is advisable to determine by experiment the one most suited to individual requirements.

When the key is closed C is short-circuited, but when the key is open the condenser will be in a position to receive a charge which, if allowed to discharge by closing the key, would in itself again cause sparking across the contacts. This little item has not been overlooked, likewise the inclusion of the

(*Continued on next page*)

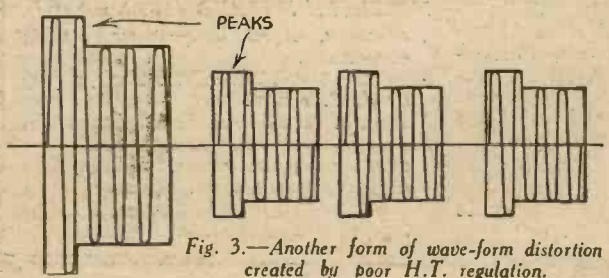


Fig. 3.—Another form of wave-form distortion created by poor H.T. regulation.

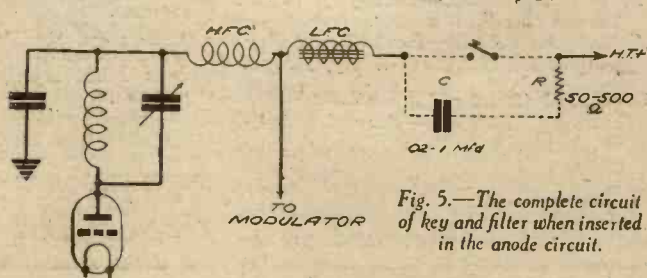


Fig. 5.—The complete circuit of key and filter when inserted in the anode circuit.

TRANSMITTING TOPICS

(*Continued from previous page*)

resistance "R," which will tend to absorb most of the energy so released.

While carrying out its operation, the condenser actually prevents a sharp cut-off of the power, and if reference is made to the sharp corners of the "envelope" of Fig. 2 it will be appreciated that these become nicely rounded off by virtue of the condenser.

With an A.A. rig and a suitable monitor, many interesting experiments can be carried out to determine the efficiency of keying and filter circuits.

The 10-watter

Considerable interest is being shown in this transmitter, and many points are being raised concerning the ultimate circuit. Several readers are inclined to think that it is a little too ambitious for an A.A. station, and would like to see something less costly. Well, I have tried to make it as flexible as possible, but I will not forget their remarks when considering future gear. If so desired, there is nothing to prevent a constructor stopping at the Tritet stage and cutting out the final P.A., as quite useful power can be obtained from the 6L6, providing anode modulation is used. The reason for this will be explained later.

The Modulator

The circuit of the modulator is shown in Fig. 6, where it will be seen that it is perfectly straightforward and not costly to construct. As mentioned before, it can be modified to use American valves if price has to be considered.

The point has already been raised: "Why the three stages, surely that is not necessary for suppressor-grid modulation?"

My answer to that is "adaptability."

I stressed that the first stage could be looked upon as a "head" amplifier for use with a microphone of low sensitivity. The input to the first and second stages can be controlled by the potentiometers shown; therefore, the actual input can be applied to either of these valves, and a control of the ultimate output maintained.

The reserve provided by the circuit shown can prove extremely useful if one contemplates carrying out any experiments with various forms of modulation.

The Layout

The actual layout is not really critical. Adopt the usual procedure of keeping grid, anode and cathode wires and components as remote—as regards interference—from each other as possible, consistent with short leads.

Solder all joints, use good components, particularly condensers, and see that all valves are operating under satisfactory conditions. I mean by that, check up all applied voltages and anode currents.

There is one point about which some constructors may not be sure, and that is the location of the microphone transformer.

Avoiding Hum

For compactness and convenience it would be ideal to house the transformer on the same shelf, but *don't do it*. Even if the component is well shrouded there is always the possibility of *hum* being introduced if it is anywhere within, say, four to five feet of the mains transformer. I always make a point of housing the transformer, together with its battery—using a transverse current type—in a neat metal container fitted with two terminal blocks and an "on-off" switch, thus allowing it to be placed in a remote position, using, of course, screened cable for the connections.

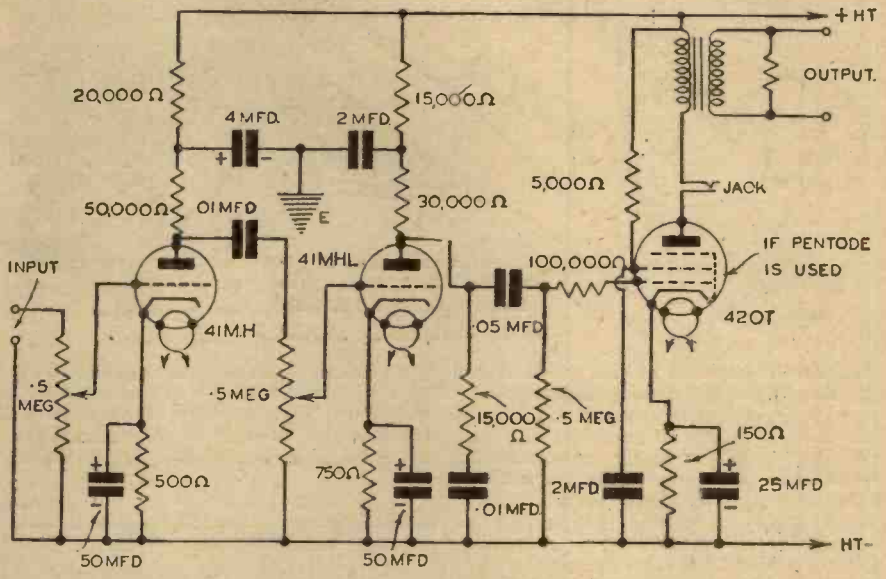


Fig. 6.—The circuit of the modulator stage, fixed tone control being applied and a jack inserted in the output anode circuit for current indication.

Important Broadcasts of the Week

***NATIONAL** (261.1 m. and 1,500 m.)*

Wednesday, April 6th.—A Symphony Concert.
Thursday, April 7th.—Concert Party programme.
Friday, April 8th.—Snooker: A commentary on the World Championship Final, from Thurston's Hall.
Saturday, April 9th.—Motor Racing: A commentary on the B.R.D.C.'s Empire Trophy Race, from Donington Park.

***REGIONAL** (342.1 m.)*

Wednesday, April 6th.—We are not alone, a play by James Hilton.
Thursday, April 7th.—Cotton, an account of how the country's greatest export industry is managed.
Friday, April 8th.—Variety from the Theatre Royal, Worcester.
Saturday, April 9th.—Perth Theatre Company in The Barretts of Wimpole Street.

***MIDLAND** (296.2 m.)*

Wednesday, April 6th.—A vocal recital.
Thursday, April 7th.—Military Band Concert.
Friday, April 8th.—Send for Paul Temple! A serial thriller in eight episodes. Episode 1.
Saturday, April 9th.—Songs from the American Songbag: choral programme.

***WELSH** (373.1 m.)*

Wednesday, April 6th.—Wanted—Mr. Stuart, a short play by Arthur Watkyn.
Thursday, April 7th.—A programme of music by Morfydd Owen.
Friday, April 8th.—The Tenth Annual Cardiff Schools Musical Festival, from the Drill Hall, Cardiff.
Saturday, April 9th.—Y Lein Fach: The Little Railway, a talks feature.

***WEST OF ENGLAND** (285.7 m.)*

Wednesday, April 6th.—Musical Mixture, light programme.
Thursday, April 7th.—Instrumental programme.
Friday, April 8th.—The Maiden Voyage of the Steamship Great Western, *Bristol-New York, April, 1838, feature programme.*
Saturday, April 9th.—Israel in Egypt (Handel), from the Colston Hall, Bristol.

***NORTHERN** (449.1 m.)*

Wednesday, April 6th.—Variety from the Argyle Theatre, Birkenhead.
Thursday, April 7th.—Cotton, an account of how the country's greatest export industry is managed.
Friday, April 8th.—Variety from the Palace Theatre, Huddersfield.
Saturday, April 9th.—A running commentary on the second half of the Rugby League Match, Barrow v. Warrington, from Craven Park, Barrow-in-Furness.

***SCOTTISH** (391.1 m.)*

Wednesday, April 6th.—Scottish Dance Music.
Thursday, April 7th.—Variety from the Theatre Royal, Edinburgh.
Friday, April 8th.—The Scottish Country: The Cromarty Firth, an impression of the life of the district.
Saturday, April 9th.—Perth Theatre Company in The Barretts of Wimpole Street, a comedy by Rudolf Besier.

***NORTHERN IRELAND** (307.1 m.)*

Wednesday, April 6th.—Ulster Variety programme.
Thursday, April 7th.—Dr. O'Toole, a play by J. B. Fagan.
Friday, April 8th.—A Ballad Concert.
Saturday, April 9th.—Point-to-Point: A running commentary on the Open Race at the Meeting of the County Down Stag Hounds, from the Course at Ballyhaft, near Newtownards.

ON YOUR WAVELENGTH

By Thermion

A Wise Reader

G.T., of Birmingham, who tells me that he is a genuine reader from No. 1, says that there seems to be many other "readers from No. 1" who have looked through all their back issues, and have never found what they require, although the information they seek has appeared only three or four weeks before. He also asks me what happened to the two Scottish readers who wrote an identical question some time back, but whose replies were returned marked "not known." He suspects, of course, that they are library readers, who wait until the librarian is out of the building and then steal the coupon. Regarding my Quality set, G. T. says that he cannot afford a big outfit, but if he does build it he will certainly adhere to the specification. He is not going to toy about with junk parts, and then blame the designer for bad results. Only the best or specified parts are of any use to him. One of his friends built the Signet Two with junk parts, bought for a few shillings secondhand. It worked just like any other dozen or so two-valve sets, but when he bought the specified tuning condenser and put that in, he found stations at the bottom and top of the dial that were not received before. He also tells me that in his works one of the young ladies, in looking down the situations vacant column of the morning newspaper, stated that she was going to apply for one of the jobs which she said was at a tinned-milk factory. Investigation showed that the advertisement had been inserted by a well-known firm of condenser makers.

A Return to the Attack!

A FEW issues ago I published a letter regarding a reader who wanted a Quality receiver for about £10. This reader returns to the attack as follows:

"Do you know that I am the bloke responsible for 'unknown reader's' return from unconsciousness?

"'Twas I who brought him back to the land of the living, and what thanks do I get for this kindly deed? Nix! He just falls over himself, grabbing the pen and ink, and proceeds to tell the world of the bloke who wants—and expects, mind you—a £15 tuner, £10 amplifier, and £5 speaker all for £10. I ask you! Having revived a corpse it turns round and dots you one. And this, fellow workers, is gratitude! I call it!—well, next week—if I have time to arrange the epithets in proper sequence. Anyway, as a diligent, enthusiastic and appreciative reader from No. 1 (Have you heard that one?), I feel myself above the necessary obligation of replying to such a base insinuation. Should I 'expect' £20 worth of radio for £10? Archibald, C.N.! As an aforesaid D.E.A. reader, do I 'want' £20 for £10?—well, ask me.

"Never again do I revive the unconscious.

"I propose swotting up a few old songs like 'Pal o' Mine,' 'Mate o' Mine,' 'Love Me for Ever,' etc., which I shall sing beneath Mr. X's window some night, accompanied on the accordion or jews' harp. Seeing I have no voice worth mentioning—at least, I'm told it's unmentionable—the effect should be O.K. at R9, provided he keeps off my D.X. work with old boots.

"Perhaps it would be better—for me—if I kept out of range and rigged up a super-quality amplifier of about '100 watts pure distorted,' using three sets of push-pull valves in cascade with 1-8 transformer coupling for each stage. Yes, '100 watts distorted' of 'Love Me for Ever' should go down well, especially if I couple up half a dozen old tin-horned speakers. The jangling effect of the tin horns could be mistaken for the joy-bells ringing. I think such a procedure would cause Mr. X. more anguish of soul than red-hot knives.

"You will note the further ingratitude of Mr. X. He has a fine bout of side-splitting laughter, offers to let you do a spot of side-splitting, and yet classes the cause of his mirth as an 'affliction.'

"Yes, I think on second thoughts it must be '200 watts distorted!'

"Ere this becomes a ream, I will to bed—conscious!"

The "Wireless Constructor's Encyclopædia"

THAT article in a recent issue on the Romance of a Famous Volume takes my mind back to the early days of this journal. I was not then serving it, but was well aware of the quakings which rumours of a new wireless weekly caused. The "Wireless Constructor's Encyclopædia," you will remember, was published at the same time as No. 1 of PRACTICAL WIRELESS and I obtained one of the first editions. I was amazed at the fact that in so short a time (the Editor of P.W. wrote the book in six weeks!) such a very complete treatise on wireless arranged in alphabetical order could be produced. There is no other book to compare with The "Wireless Constructor's Encyclopædia." It not only tells you how to make, how to test, but also it explains its own terminology; with an ordinary text book you may come across a word which the book itself does not explain, and which is probably too new to be in the current dictionaries, but the Encyclopædia, however, explains all of the terms. Thus, if in consulting the section on mains receivers you come across the term "voltage doubler" for the first time in your life, you merely have to look up the term "voltage doubler" under the letter *V*. The latest edition which I have before me contains a complete list of wireless clubs, a list of the wireless anniversaries and important dates, international call-signs, complete list of broadcasting stations, short, medium and long; sections on making coils, chokes and transformers, tables of copper wire data, wood-screw sizes, B.A. sizes, decimal equivalents, metric equivalents, accumulator charging data, series of circuits, making mains transformers, colour-code data, how to test receivers, and so on and so on. It is impossible to open a page without finding some valuable item

of interest. It is a work which you can consult, and one which you can read ; a book for the fireside hour in which you can browse among its 396 highly interesting pages, and have on your shelf ready to consult on almost every branch of radio. My copy of the 6th edition will not leave my possession. Copies of it have been sold in every country in the world. I advise you to obtain one, and to every youth who is considering entering the wireless trade may I say that the volume forms the most useful work which such a beginner could have.

In the Colonies

THE following extract from one of our Colonial readers needs no comment :

"I expect I will call down upon my head your wrath, when I say as far as literature for the constructor is concerned there are only a few English journals worth reading. Mind you I am not presuming to judge or express an opinion regarding how far this contention applies to the British Isles. I am satisfied that, taking into consideration conditions there, PRACTICAL AND AMATEUR WIRELESS, at least, is a journal of outstanding merit ; understand me, I am applying now wireless literature to our own peculiar conditions."

A Car Radio Year

I AM informed that car radio is due for a big spurt during the coming season. This is the definite belief of Philips Lamps, Limited, who have just launched a big campaign to popularise their MotoRadio. Their conviction is supported by some very interesting facts and figures, based on past experience, which tend to show that there are solid grounds for maintaining that car radio is now a practical and widely welcomed addition to the amenities of the modern motor-car.

In the early days of the car radio movement it may have been true that its appeal was limited to the wealthier class of car owner. The ordinary motorist, it was said, either does not want or cannot afford car radio. That the position to-day is very different is shown by the following analyses by horse-power and price of cars equipped during the last six months with Philips MotoRadio :

H.P.	%	Price	%
7 and 8	5.5	Up to £200	19
10 and 12	43	£200-£500	74
13 - 20	31	Over £500	7
21 and over	16.5		
Unspecified	4		100
	100		

The Britannia Joint

A QUERIST recently came across this term in connection with aerial design and asked what it meant. It is an electrical term for a form of joining bare copper wires which gives great strength with certainty of low resistance—two factors which are valuable in aerial design. The two ends of the wires being joined are thoroughly cleaned and laid side by side for a distance of two inches or so. The overlap is then wrapped with thin tinned copper (or bare) wire, taking the binding on to the single leads at each side of the joint. The joint is then smeared with flux and thoroughly soldered, giving a very efficient junction which will not give rise to trouble under all normal conditions.

The Lead-in

IT appears that many listeners pay rather too much attention to the design of the aerial and ignore the question of the lead-in. It is hopeless to spend considerable time and thought on the design of the aerial, only to destroy all the advantages by taking the lead-in through a hole in a metal window-frame and then to run the wire round a wall for a considerable distance. The set should be placed as close to the window as possible, the lead-in should be held rigidly at least 18 inches from the wall (so that it does not sway in the wind and give rise to erratic tuning effects) and when it enters the house a low-capacity to earth should be provided. Use a special lead-in tube with air-spacing between the wall and metallic portion, and remember that a capacity connection using the glass of the window as a dielectric will often prove desirable to avoid drilling a wall or window-frame.

Trimmers

IN making an all-wave receiver it is important to remember that the trimmers fitted to the ganged condensers (which are of standard type) are not needed, and if left on the condensers the additional parallel capacity included in the circuit may prevent the short-wave section from functioning properly. The makers of most all-wave units provide trimmers on the coils and, therefore, the trimmers on the gang condenser should be completely dismantled.

It is interesting to note that neither the size nor the age of a car is apparently any bar to the installation of car radio. Philips fitting stations have successfully installed MotoRadio in the smallest car on the road—a 500 c.c. Fiat, while the oldest car they have equipped was a 20 h.p. Daimler which was no less than nine years old !

Anyone Seen a Mermaid ?

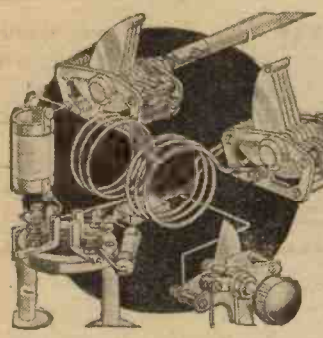
WHAT is the mermaid ? Is she fact or is she fiction ?

Evidence for and against these questions will be put forward in the programme which John Pudney will produce on the Regional wavelength on April 15th.

All through the ages evidence occurs of some kind or another in support of the elusive mermaid. Sometimes she is a voice on the spray, at others a dream of half-human, half-piscine loveliness rollicking in the brine. She has been seen, so they say, riding the foam with a mer-child at her breast, or sunning with burnished scales on wind-broken reefs. At one moment she is a monster of terror ; in the eyes of her next observer a siren of enchantment. The Argonauts were the first recorded travellers to see and escape the dreaded sirens. Columbus was called to his ship's side by an excited seaman who swore that he had seen a woman with a silver tail playing among the white horses, but the explorer, fearing alarm on the part of the crew, accounted for the phenomenon as the figure of a manatee or dugong, a sea mammal of slightly human appearance.

No mermaid in history was so universally acclaimed and recognised as that which, according to the chroniclers of old Holland, was caught in a fisherman's net at Edam and brought for examination before the worthy burgomaster of that town in the early fifteenth century. The mermaid was committed to the care of a townswoman until "she become both chaste and devout, showing a becoming reverence for the Cross and growing skilled in all womanly arts." Her sudden disappearance from the records is presumed to have been accounted for by her actual disappearance down some village waterway to the sea.

Sir Walter Raleigh testifies to having seen a sea-woman floundering in the shallows of a West Indian lagoon, and, in the programme, he has an argument with Ben Jonson and Will Shakespeare about it. Finally, this scaly cavalcade of marine enchantresses will come to an end with the strange tale of one William Beeworthy—an adventure so outstanding that it is best left to speak for itself.



Short Wave Section

A SIMPLE SHORT-WAVE SET

Practical Constructional Details of a Short-wave One-valve Set Which May Be Built at a Minimum of Expense, and Modified to Form a Most Efficient Receiver.

THE success which has attended the building of one or two simple short-wave sets which have been described in these pages has led to a demand for a receiver of a type which may be improved from time to time as funds and necessity permit, and for which a blueprint may be supplied to simplify construction. The receiver described in this article is shown in its simplest form, and the blueprint which is available for it shows only the bare necessities. In this condition, however, the receiver may be relied upon to furnish a most comprehensive log and under all normal conditions some really good D.X. work may be accomplished with it. After it has been in use for some time, however, it will be found that various little improvements may be added, and these are described in this article so that those who wish to build the set in a more advanced form may do so.

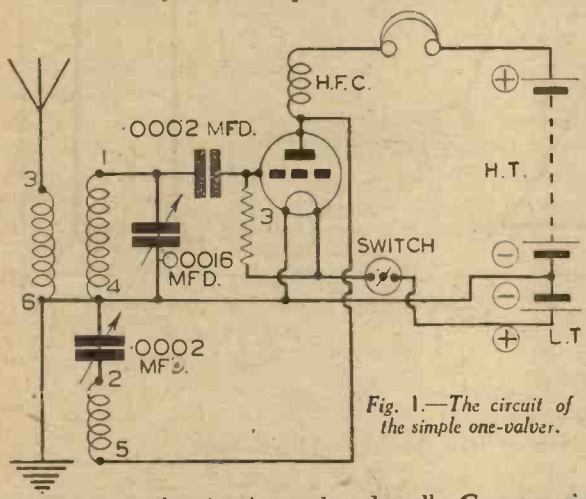


Fig. 1.—The circuit of the simple one-valver.

The circuit selected is the simplest reacting detector arrangement, rather than a special circuit utilising an S.G. or H.F. pentode valve. Although home-made coils may be used, a standard 6-pin plug-in coil is specified, but the constructor may build for himself a set of such coils, taking for his data the details given in our issue dated July 24th, 1937, or that which will be found in our latest book, "Coils, Chokes and Transformers." It should be noted that a 4-pin coil is not recommended, although it can be used. The reason is that the aerial has a marked effect upon the performance of the receiver, and a 6-pin coil permits of a loose-coupled aerial arrangement being employed with the result that the damping effect of the aerial is removed. A condenser may, of course, be connected between the aerial and the grid winding (thus omitting the aerial coupling coil), but the effect is not so good as when the coupling coil is employed.

The Circuit

Reaction is obtained by means of a standard reaction condenser and winding on the coil, and a capacity of .0002 mfd or .0003 mfd. should be employed. In most cases the larger value will be found of most use. A normal tubular or mica fixed condenser is connected in the grid circuit with a fixed grid leak of 3 megohms, but again this value may be modified and up to 5 megohms employed. The choke is most important and although it is possible to make a very efficient component at home it is recommended that a really reliable commercial article be employed. This will avoid difficulties due to "dead spots," erratic reaction, etc.

A simple baseboard form of construction is used, as there are only a few components and a chassis is not called for. A good quality coil-holder should be used, and although a metal panel is not a necessity it will be found very useful in assisting in the removal of hand-capacity effects. If desired, a wooden or ebonite panel may be employed and a thin sheet of metal or foil fitted behind the panel and connected to earth. It is preferable to cut holes in this so that it does not come into contact with any of the panel components, and then to connect a separate earth lead to it.

Construction

The terminals should preferably be mounted on separate mounts, well separated to avoid any loss which might be introduced by a leakage path between them through inferior ebonite or other material. The coil and valveholders should be firmly attached to the baseboard, and the panel components firmly locked to the panel. Remember that any looseness, either in the mounting or in the subsequent wiring will result in tuning difficulties and perhaps in erratic effects resembling fading. The wiring should be carried out with fairly stiff wire to avoid any subsequent movement, and bare wire may be used and all connections should preferably be soldered. The tuning condenser specified has a maximum capacity of .00016 mfd, but if desired you may use temporarily a .0005 mfd standard condenser with a .0003 mfd. fixed condenser in series with it. A .00025 mfd. condenser may of course be used but will give rather more difficult tuning due to the wider wave-range covered with that capacity. A set of coils may be bought or made and with these the receiver may be used to cover all wavelengths from 9 or 10 metres up to 2,000. It is not advisable to try to use a set of this type to tune below 10 metres, and therefore if it is desired to listen on wavelengths below 10 metres an ultra-short-wave set should be made up.

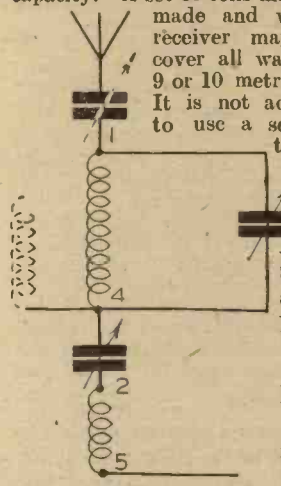


Fig. 3.—How a 4-pin coil may be used.

Refinements

The receiver is operated by means of a 66-volt battery and the voltage should be adjusted to give a smooth reaction control. By way of refinements the first improvement would be the fitting of a bandspreading condenser. This should consist of a small variable condenser having a maximum capacity of about 20 mmfds. and it may be mounted on the panel quite close to the tuning condenser. It is wired in parallel with that condenser—that is, the fixed and the moving vanes of each condenser are connected together as shown in Fig. 2. When this addition is made tuning will be very much simpler.

The main tuning condenser is simply advanced about one degree at a time, and at each setting the smaller condenser is turned throughout its range, thus spreading out the waveband which each adjustment of the main condenser covers. Good slow-motion dials will be found of the utmost value in a set of this nature, as they enable the smallest movement of the condensers to be made and many stations which would otherwise be missed will thereby be heard. This will be especially noticeable where two or more stations are found very close together on the main tuning condenser. A slight adjustment of this, and the band-spreading condenser will enable quite a large movement to be made with the dial

(Continued on page 94).

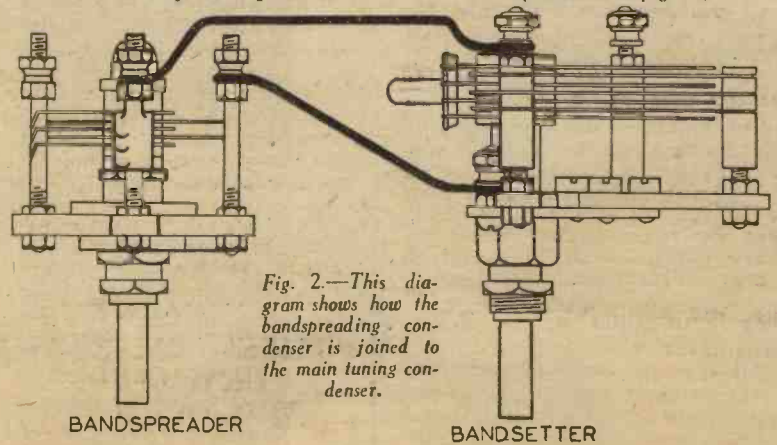


Fig. 2.—This diagram shows how the bandspreading condenser is joined to the main tuning condenser.

(*Continued from previous page*)

to separate these stations and overlap will be avoided.

Coil Ranges

In the Eddystone range there are 9 coils of the 6-pin type which may be used, and to enable the constructor to obtain some idea of the ranges covered the following are the type numbers and the bands which are covered with a .00016 mfd. condenser :—

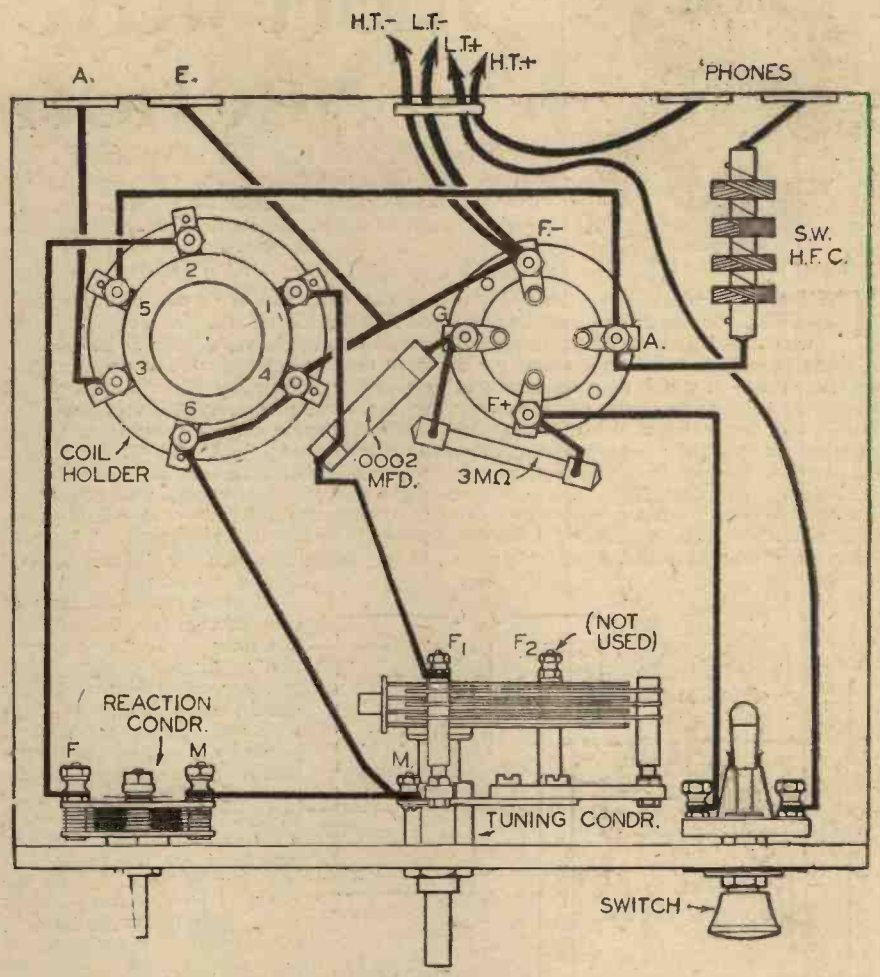
6BB	9-14	6P	150-325
6LB	12-26	6G	260-510
6Y	22-47	6BR	490-1,000
6R	41-94	6GY	1,000-2,000
6W	76-170		

If a .00025 mfd. condenser is used, or if the .0005 standard condenser with series fixed condenser scheme is adopted, the tuning range will be slightly greater than the above figures, and this will obviously be accompanied by the tuning difficulty already mentioned. It is desirable in a short-wave set to provide as small a tuning band-width as possible, so that difficulties in tuning due to the close proximity of different stations are removed. Another important point regarding tuning concerns the minimum wavelength to which each coil may be tuned. This is dependent upon the minimum capacity of the tuning condenser and an inferior condenser will obviously tune to a higher minimum wavelength.

LIST OF COMPONENTS

One .00016 mfd. tuning condenser (type 922) (Eddystone).
One .0003 mfd. reaction condenser (Polar).
One 6-pin coil-holder (type 969) (Eddystone).
One 4-pin valveholder (B.T.S.).
One H.F. choke (type 1010) (Eddystone).
One .0002 mfd. fixed condenser (tubular type) (T.C.C.).
One 3-megohm grid leak (Dubilier).
One on/off switch (Bulgin).
Four terminals (Clix).
One wooden baseboard 8in. by 7in.
One ebonite panel (see text) 8in. by 8in.
Flex, connecting wire, screws.

WIRING DIAGRAM



Leaves from a Short-wave Log

Addis Ababa Again Heard

[UC, Addis Ababa (Ethiopia) on 25.09 m. (11.955 mc/s), of which the power has been increased to 10 kilowatts, may be heard working radio-telephony with Rome (Italy) on most days towards G.M.T. 20.00. Occasionally, earlier in the evening, entertainments provided by native musicians or by Italian Military bands are relayed through this channel to the E.I.A.R. network, and re-broadcast through the Rome, Milan, and Florence medium-wave stations.

Harmonics of Fécamp

The Louvetot high-power transmitter of Radio Normandy having reduced its wavelength to 212.6 m. (1411 kc/s) a fourth harmonic of the basic transmission may now be picked up on 53.15 m. (5.644 mc/s). Listeners also report having logged the programme faintly on 26.575 m. (11.29 mc/s), or eighth harmonic.

Another Transmitter of the Rome Broadcasts

In addition to the stations working on 25.4 m. (11.811 mc/s), and 31.13 m. (9.635 mc/s) respectively, the E.I.A.R. has brought into operation for the late evening and night broadcasts the Rome-Torrenova 25 kW. commercial transmitter IRF, on 30.52 m. (9.83 mc/s).

Lisbon Now Works Three Channels

Programmes from Portugal have been recently logged on three separate frequencies, namely, CSW4, 25.34 m. (11.84 mcs.), from G.M.T. 17.00-18.10 ; CSW2, on 27.17 m. (11.04 mc/s) from 19.00-23.00, and CSW3, 30.18 m. (9.94 mc/s) from G.M.T. 23.00-01.00. "Trial trips" are also made at odd times.

India's new Short-wave Channels

Although many tests have been carried out on various channels, it is stated that the following frequencies are those which will be probably definitely adopted by the new short-wave stations in British India. Bombay, 31.4 m. (9.55 mc/s) and 49.3 m. (6.085 mc/s) for day broadcasts, and 90.63 m. (3.31 mc/s) in the later evening hours ; Calcutta, 49.1 m. (6.11 mc/s) for both services ; Delhi, 31.28 m. (9.59 mc/s) by day and 86.46 m. (3.47 mc/s) by night; Mysore, 49.59 m. (6.05 mc/s) ; Madras, 49.36 m. (6.077 mc/s) ; and Colombo, 49.06 m. (6.11 mc/s). Experimental transmissions, however, on other channels are still being carried out.

Another Ultra-short-waver

W2XOY is the call-sign of the 150 watts ultra-short-wave transmitter installed by the General Electric Company (Schenectady, N.Y.) on the top of the State Office Building at Albany (N.Y.). Experimental broadcasts are being made on 41.04 mc/s or 7.31 metres.

Colombians Move to 60 m. Band

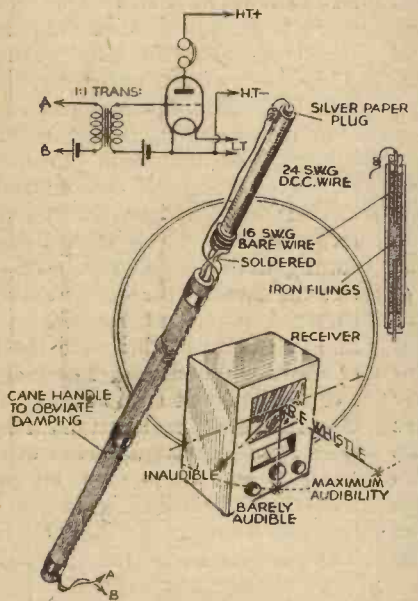
Many of the Colombian transmitters, having deserted the usual broadcasting channels, are endeavouring to settle themselves on frequencies in the 4 megacycle band. HJ3ABH, Bogota, *La Voz de la Victor*, of which the interval signal so closely copies the three N.B.C. chimes, may be heard on 61.22 m. (4.9 mc/s). HJ4ABP, Medellin, *Emissora Philco*, is working on 61.48 m. (4.88 mc/s), and HJ1ABE, Cartagena, *La Voz de los Laboratories Fuentes*, which habitually broadcasts a Sousa March to mark the end of every hour, is now logged on 61.72 m. (4.86 mc/s). Slightly above on 61.9 m. (4.84 mc/s) you should find Colombia Broadcasting emanating from HJ3ABD, Bogota, with the call punctuated by three loud chimes. HJ2ABC, Cucuta, previously on 31.34 m. (9.572 mc/s) is also said to be working on 62.63 m. (4.799 mc/s). Here five chimes are used (C, D, E, F, C). HJ1ABB, *La Voz de Barranquilla*, has been logged on 62.75 m. (4.78 mc/s). HJ6ABC, Ibague, reported by U.S.A. listeners to have moved to 63.29 m. (4.74 mc/s) does not appear to have been heard so far in the British Isles.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

A Resonance and Quality Output Detector Unit

ON a number of occasions I have been told that my receiver gives an unpleasant high-frequency whistle which is only audible in certain positions in the room,



A novel tester rod for detecting resonance.

and as I am a trifle deaf I thought that possibly my receiver was on a little too loud. However, it occurred to me that as the use of headphones might facilitate my finding a solution to this problem, I experimented with various (and I must say, in some cases weird) devices, eventually succeeding in constructing a tester rod, which proved to me that the "note" referred to was only audible when in more or less an exact line with the speaker.

The accompanying sketch shows the tester rod, which is made as follows:

A thin glass tube containing iron filings and with two electrodes let in at both ends as shown, formed the "pick-up" unit, this being connected to a small amplifier in the same manner as an ordinary microphone button, using a 1 : 1 ratio transformer in the circuit. By moving this detector rod about in the vicinity of the room and speaker, it was quite interesting to note the effects obtained, although the receiver was not tuned to a station.

H.F. instability was the trouble, and I think that this idea could very well be improved upon and made use of for other experiments in speaker or receiver reproduction.—H. E. WATTS (Blackburn).

An Automatic Morse Transmitter

THE simple automatic transmitter shown in the sketch may be of interest to other readers, as it provides a

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SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

medium for attaining speed in reading. It will be seen that a paper tape, painted in stripes with Indian ink, is passed beneath two contacts; the ink being to a certain extent conductive, completes the circuit *via* the microphone transformer secondary and headphones. Although the buzzer operates continuously, the sound is only heard when an inked section of the tape passes under the contacts. The take-up reel can be rotated by hand, but it is more convenient to drive it by means of a small electric motor geared down, as the speed can then be varied to individual requirements. The reels are made by nailing plywood discs to the ends of cotton reels, and the contacts are cut from thin sheet brass. No sizes are given, as these will vary according to the material to hand. It should be noted that the volume can be controlled to a certain extent by moving the contacts in or out.—D. BESSANT (Morden).

An Interference Analyser

HAVING experienced great inconvenience with interference carried along the mains, I devised and constructed the unit shown in the accompanying diagrams.

Most of the components used were found in the junk box, with the exception of the condensers which were purchased from a reputable firm.

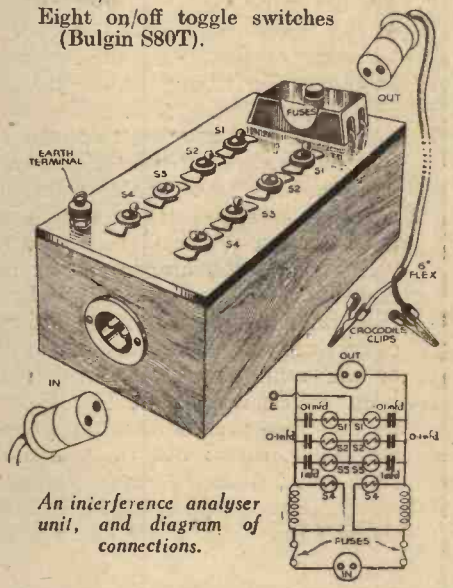
The components required are as follows:

Two condensers .01 mfd. (high voltage test).

Two condensers 0.1 mfd. (high voltage test).

Two condensers 1.0 mfd. (high voltage test).

Eight on/off toggle switches (Bulgin S80T).



An interference analyser unit, and diagram of connections.

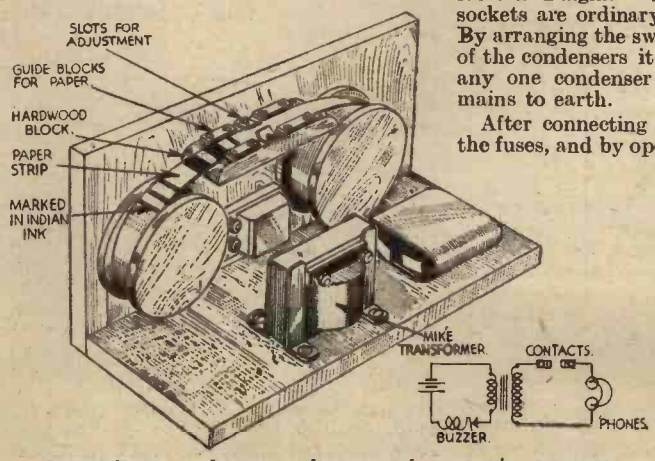
Two insulated crocodile clips.

One double fuse-holder (enclosed type, Bulgin F14).

One H.F. 11 Bulgin dual-mains choke.

The chokes could be made, but it will be better to fit the ones manufactured by Messrs. Bulgin. The input and output sockets are ordinary 5-amp. mains sockets. By arranging the switches on the earth side of the condensers it is possible to connect any one condenser from one side of the mains to earth.

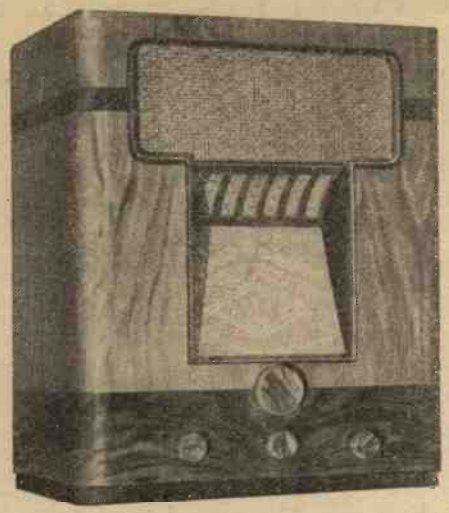
After connecting up the analyser, draw the fuses, and by operating the switches the best combination of condensers can be found for cutting down the interference. It will be noticed that switches are across the chokes, as it will not always be necessary to have mains chokes in circuit. The pictorial sketch shows the finished unit, the connections being given in the inset diagram.—G. LEES (North Shields).



Pictorial view and circuit diagram of a simple automatic Morse transmitter.

PUSH-BUTT

Further Details of the Latest De with Special Reference to the E



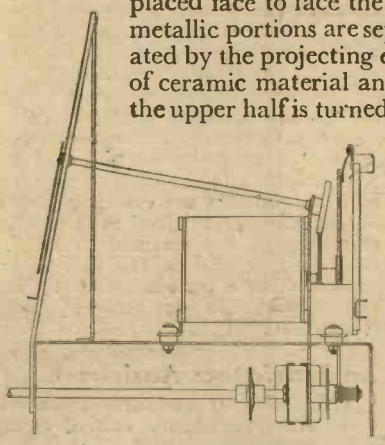
The Invicta receiver, showing the large dial with the auto-station indications.

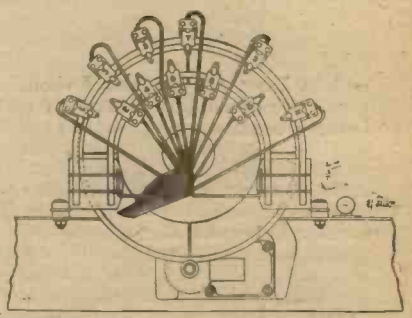
IN our issue dated March 5th last we gave preliminary details of some of the latest developments in automatic tuning, and explained how the present systems utilise either pre-set condensers switched into circuit by means of a selector device, or a motor was energised to rotate the tuning condenser. It was explained that the pre-set condenser arrangement has the advantage that it may easily be fitted up and adjusted by an inexperienced person, and any type of receiver may be so arranged. One of the main drawbacks which has been experienced with this type of selector, however, is that the pre-sets are liable to go out of adjustment from many various causes. Temperature, vibration and humidity are only three of the things which can upset an adjustment to ordinary types of pre-set condenser, and accordingly steps have to be taken to prevent tuning shift due to these things. In the Decca receivers a special type of pre-set condenser has been developed and it is claimed that this is of such a nature that it may be placed in extremes of temperature without modification in the capacity and a novel locking device ensures that it will not be thrown out of adjustment due to vibration.

Invariable Pre-set

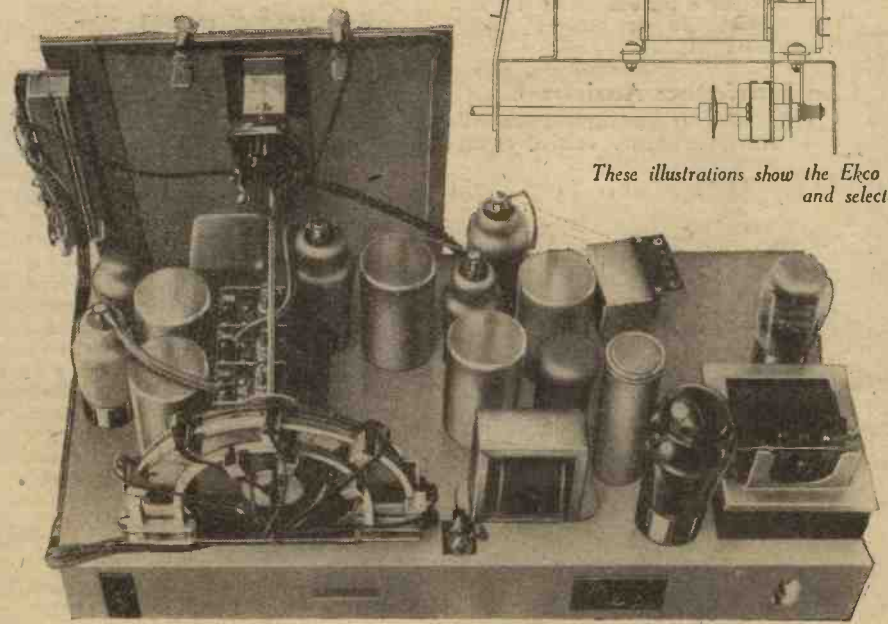
The body of this particular condenser is made from a ceramic material and is circular in shape. It is slightly recessed and a centre hole is provided and has a number of serrations round its edge. One half of the recessed portion is provided with a metallic deposit, and a similar section of the material is similarly treated. When the two halves are placed face to face the two metallic portions are separated by the projecting edge of ceramic material and as the upper half is turned the two metallic portions are varied in regard to their overlap. Consequently, by providing a central bush in the form of an adjusting screw the capacity may be varied, and when the screw is locked up the serrations will ensure that the two halves cannot shift. There are two pre-sets to each station adjustment in the Decca receivers, one for the aerial circuit and one for the oscillator, and there are eight push-buttons on the receiver.

In the Invicta receiver, which is seen at the top left-hand corner of this page there are no push-buttons, but the selection of the pre-arranged stations is carried out by turning the large selector knob seen below the tuning dial. This knob also carries out the normal tuning operation and the makers claim that this arrangement is to be preferred to the fitting of additional controls. There are only five pre-selected stations, two tuning circuits being adjusted by standard type pre-set condensers of high-quality, and these may be seen in the special chassis illustration shown in the bottom right-hand corner. The pre-sets are of the sprayed mica





These illustrations show the Ekco mechanism and the arrangement of the motor and selector clips.

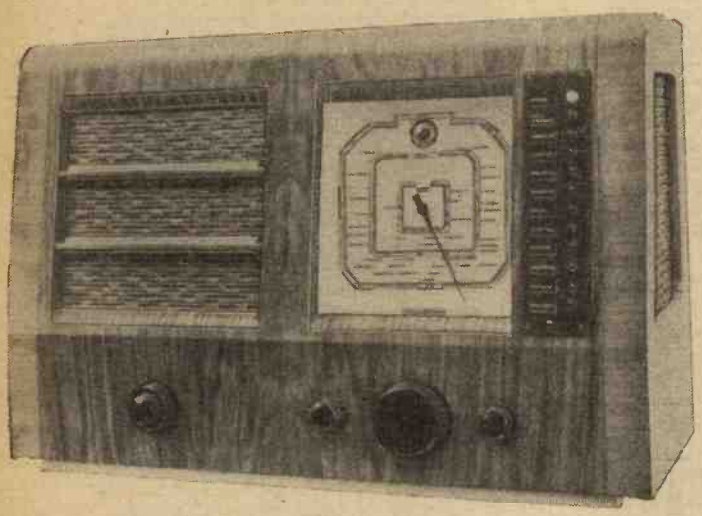


type which cannot possibly shift, and an additional smaller capacity of 15 or 20 mmfd. is connected in parallel and adjusted in the usual way. A special locking device is provided on this additional trimmer so that the resultant tuning is sound both mechanically and electrically. As supplied by the manufacturers this receiver is adjusted for the London and Home Counties area, but when the receiver is supplied to other districts pairs of condensers ready adjusted for the required stations may be obtained from the makers and are

ON TUNING

evelopments in Automatic Tuning
kco, Invicta and Decca Systems

simply substituted for those already in the receiver which do not provide sufficient volume from the station to which they are adjusted. It is interesting to note that this particular receiver has the same sprayed-mica type of trimmer fitted to the I.F. transformers to ensure reliability under all conditions.



The Ekco receiver, which embodies the motor tuner.

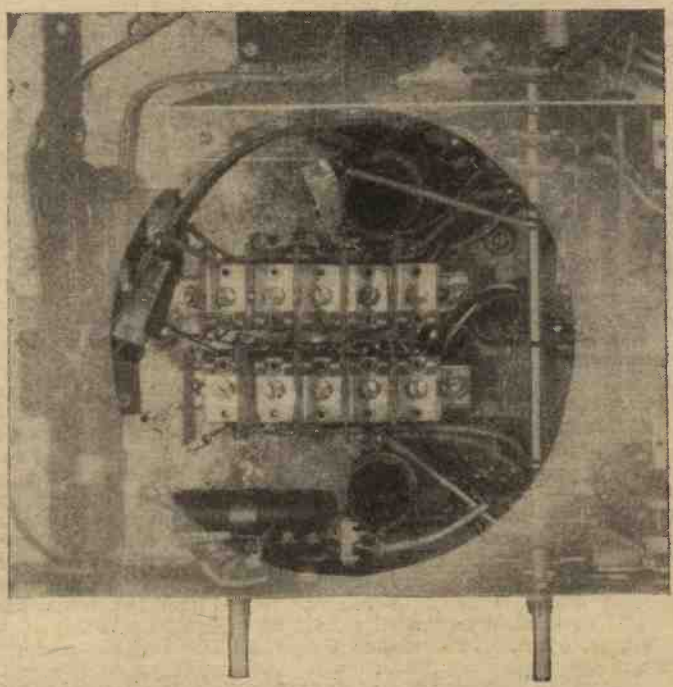
The Ekco System

At the moment the Ekco receiver is the only one on the English market to be fitted with a motor-driven tuning system, and the lower left-hand illustration shows the chassis and also a diagrammatic illustration of the manner in which this operates. As many as eleven stations are obtainable with this system, in which the condenser is driven through a belt drive from a small motor situated beneath the chassis. The position at which the motor stops is governed by the small metal clips seen round the edge of the semi-circular unit mounted on the upper part of the chassis. These clips are numbered to correspond with the push-buttons on the cabinet front, and it is a very simple matter to re-arrange the clips at any desired point in the following manner. A station is tuned in the ordinary way by means of the ordinary tuning knob and when correctly adjusted a button is selected for that station. The number is noted, and the clip corresponding to that number is simply moved round the rail until a small pilot lamp goes out and that indicates that the correct position has been located for the clip. When the button is pushed at any future occasion the motor will turn the condenser until the clip interrupts the circuit and the condenser will stop at that point. Obviously, with this system the critical adjustment necessary in a sharply-tuned superhet circuit may not be exactly found, and to compensate for this an A.F.C. or automatic-frequency control circuit is provided, and the method upon which this operates was described last week.

The motor movement is fairly rapid, the maximum movement of the tuning pointer from one end of the scale to the other taking about eight seconds. This means that to tune from the London National to the London Regional (or *vice versa*) takes approximately three seconds. It should also be noted that the pointer travels directly, backwards or forwards, to the name of the station selected. In some of the American models the motor continues to travel in the direction in which it last moved, and should the required station be in the opposite direction the pointer continues until it comes to the end of its travel when the motor automatically reverses and the pointer travels back until it comes to the selected station.

The Cossor System

Unlike either of the previous systems the Cossor mechanism does not employ motors or pre-set condensers, the tuning being carried out by turning the gang condenser exactly as when manual tuning is employed. A large circular plate has a slot cut in it, and the button which is depressed when the finger is inserted into a hole in the dial fitted to the receiver, carries a small projecting pin. The dial is pulled round. This turns the condenser spindle until arrested by the projecting pin dropping into the slot in the plate, when the station should be heard correctly tuned in. Each button is mounted on a webbed disc provided with slots and the button is locked at a suitable position in the slot by means of a special key provided by the makers. It may be repeated again that all systems which operate by moving the ganged tuning condenser require some muting device so that the various stations which are passed as the condenser moves round to the desired setting are not heard, whereas the pre-set selector condenser arrangement provides an instantaneous jump from one station to another and no muting device is needed. This obviously is the better scheme for the constructor who wishes to make up auto-tune devices.



This illustration shows the pre-set condenser assembly in the Invicta receiver shown at the top left-hand corner.

Tracing Modulation Hum

An Account of Some Tests That Were Made with an A.C./D.C. All-wave Receiver. Many Useful Hints are Given for the Short-wave Experimenter. By FRANK PRESTON

MAINS hum is rarely troublesome nowadays, even with the most sensitive type of receiver, but modulation hum is sometimes encountered; when it is, a cure is often difficult to devise. This fact was emphasised recently while testing a home-made A.C./D.C. three-valve all-wave receiver. It was of a comparatively standard type and was intended principally for short-wave reception, although using a well-known make of all-wave coils. The circuit was of the general type shown in skeleton form in the accompanying diagram.

From this it may be seen that there is an H.F. pentode coupled to a leaky-grid detector through a tuned-grid coil, the detector being transformer coupled to the output pentode. A half-wave valve rectifier is included in the mains circuit for H.T. supply and a barretter limits the heater voltage.

Bad Lay-out

This circuit is of such a usual type that the constructor would scarcely expect to have any difficulty in obtaining satisfactory reception, even if the design were not too carefully planned. The builder of the set in question had been of that opinion; thus he had taken more liberties with the lay-out than a more experienced amateur would consider prudent. The components had been assembled on a baseboard that was small, because it was intended to fit into an existing cabinet. Despite the fact that the constructor had placed the parts very approximately in their "circuit" positions, he had obviously been more concerned with finishing the set than with studying the most suitable arrangement.

As a result, reception was in many respects disappointing. A fair number of stations could be received on each of the three wavebands covered, but there was a steady, if subdued, background hum. That would not have been so very serious had it not been accompanied by a far more pronounced hum when a strong signal was being received. When Zeesen or Rome was tuned in, for example, reception was practically drowned by a fairly high-pitched hum—almost a howl. The same thing happened when receiving the National or Regional transmissions, but the background was reasonably quiet when listening to "W" stations or when receiving many amateur transmissions. It was perfectly clear that the main trouble was due to modulation, or tuning, hum.

The obvious procedure would have been to remake the set, taking greater care with the positioning of the smoothing choke, L.F. transformer, coils and H.F. choke, but, as an interesting experiment, it was decided not to remodel the set. Instead, it was thought that a good deal of interesting experimental work could be carried out if an attempt were made to overcome the troubles without making any major modifications. If it had been realised at first how much difficulty would be entailed, perhaps a different decision would have been made!

Moving the L.F. Transformer

It was argued that the first step should be to dispose of the general background hum, dealing with the more pernicious modulation hum later; or possibly both forms of trouble would be cured at the same time. The L.F. transformer was detached from the baseboard and rotated to different positions, making tests at each movement. This had only a slight effect, but the best position was found and the transformer again screwed down. Next it was thought that the smoothing choke might not be "pulling its weight," so it was short-circuited. That simply increased the hum level to an unbearable extent. Another choke was tried, without noticeable effect, and then additional smoothing condensers were connected in parallel with those originally fitted. Again the result was practically nil.

Resonant Smoothing Circuit

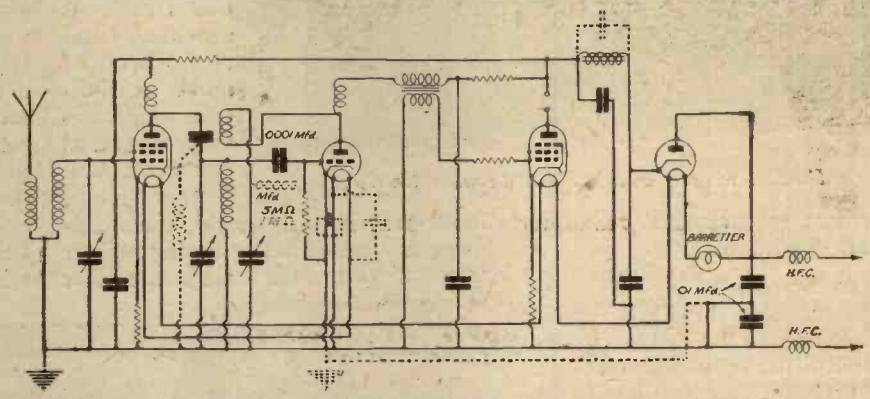
Another idea that came to mind was that it might be possible to "tune" the smoothing choke, so a few condensers of capacities between .005 mfd. and .1mfd. were connected in parallel with it. A value of .05 mfd. proved most effective when the set was operated from D.C., as it was throughout the tests. (On A.C. the hum was far less pronounced.) A hint that is worth remembering in connection with "tuning" the smoothing choke is that a resonant frequency of 100 cycles—which is generally what is wanted when using a full-wave rectifier from 50-cycle mains—is obtained when the product of choke inductance in henries and the parallel condenser capacity in mfds. is equal to 2.5. On D.C. the hum frequency can vary within wide limits, so it is usually best to try several alternative capacities.

However, the parallel condenser was effective in considerably reducing the background hum, but the modulation hum was little changed. At this stage the earth lead came under suspicion, but when another good one was tried there was no appreciable change. The effect of increasing the capacity of the condenser in the earth lead, and even of short-circuiting it, was tried without result.

L.F. and Detector Changes

With the object of discovering whether the trouble arose in the L.F. or H.F. circuits, additional decoupling was tried for the detector valve, and choke-capacity coupling of the speaker was experimented with. Neither made any difference, so it seemed probable that the H.F. portion of the receiver was at the root of the trouble. A higher-resistance anode decoupling resistor was tried for the H.F. pentode, whilst condensers of both higher and lower capacity than the original were tested in the anode-resistor by-pass circuit. It was found that a 20,000-ohm anode resistor with a .01 mfd. by-pass condenser reduced the modulation hum to such an extent that it was troublesome only on the most powerful signals.

Attention was then turned to the detector valve. The .0001 mfd. grid condenser was changed for one of half the value, and the 5-megohm leak was replaced by a 1-megohm component. This certainly made an improvement, and by this time background hum was audible only when the set was completely off tune.



Skeleton diagram of the A.C./D.C. set with which various experiments were carried out with a view to preventing modulation and background hum. Broken lines and figures show the principal changes that proved to be most successful.

The H.F. Coupling

It was decided to replace the tuned-grid coil between the first and second valves by an H.F. transformer with tuned secondary. That produced a greater improvement than any one previous alteration, but modulation hum still persisted. Quite by accident a large screened-cap connector was tried for the H.F. valve, and that produced such good effect that it was decided to fit a screen over the complete valve, despite the fact that it was of the metallised type. Complete screening was no more effective than the screening of the unmetallised top of the valve by the cap connector.

Up to this point it had not occurred that the valves might be receiving an incorrect heater voltage, because it was known that the range of the barretter was amply wide for the valves in use. Nevertheless, the voltage between the heater terminals of each valveholder was checked, and was found to be slightly too low. That led to

(Continued on page 104)

Practical Television

April 9th, 1938. Vol. 3. No. 95.

Welcome Extensions

NOW that the B.B.C. has received its additional grant of approximately £300,000 for television, work has already been put in hand in connection with the plans for providing the much-needed extension to the studios, etc., at Alexandra Palace. It is learned that nearly 25,000 square feet of space is to be taken up for studios and dressing rooms. Incidentally, this will mean the conversion of the old A.P. theatre, which up to the present has been used almost entirely as a useful annexe by the department responsible for providing the scenery now used so extensively in many of the television productions. It is probable that this theatre will be reconstructed on multiple studio lines somewhat resembling those employed by the leading film companies. Producers and control engineers will then be accommodated in a central tower to enable them to have complete jurisdiction over the sets erected in all the studios. Obviously, the experience gained during the past eighteen months that the television service has been in operation will be embodied in this new and permanent structure, and no doubt once the space question is eased the present studios will be re-designed so that they can be employed on more efficient lines. The demolition of the theatre stage will bring to light an interesting relic in the form of a gas control unit which was designed for stage and footlight illumination when the old Palace was built just sixty years ago. It is hoped that no time will be lost in completing the work which has been contemplated for a long time, for this will enable the B.B.C.'s ambitious programme plans to be put in hand and so give viewers a wider variety of material, coupled with a welcome extension in the time that the programmes are available for using the television receiving sets.

Television Recording

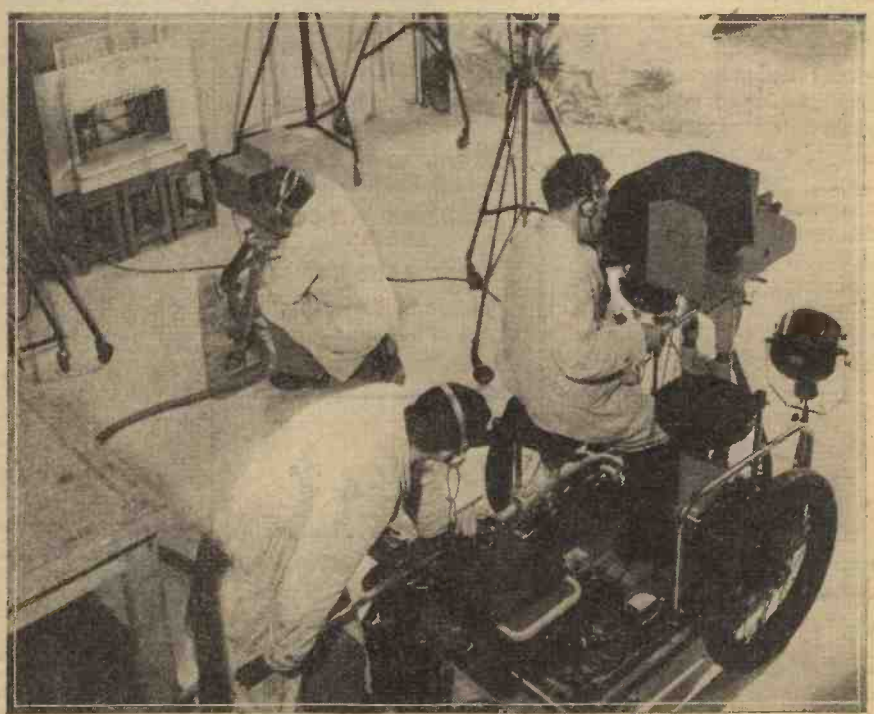
THE advantages associated with the recording of sound on either disc or film have long been appreciated, not only for their entertainment value but also for historical and industrial purposes. It has long been the aim of inventors to record vision signals in a form suitable for reproduction at any subsequent period that desire may dictate. In 1928, when low-definition signals were being employed, Baird succeeded in recording on standard gramophone discs both vision and sound signals and called his scheme "phono-vision." With the advent of high-definition television, however, and the enormously increased modulation frequencies associated with it, wholly satisfactory methods of vision recording have been difficult to develop. One very obvious scheme has been intermediate film television where the vision signals have been passed through a standard television receiving set and then photographically recorded on film as a series of intensity modulated lines resembling in miniature an ordinary television picture. Naturally, this is expensive, but strangely enough has found considerable favour in Germany both for transmitting and receiving. It is now stated, however, that a Lancashire inventor working in secret in a Surrey laboratory has succeeded in devising a method for recording and reproducing television signals through the medium of a wax record. No details of the method have yet been made available, as it is the inventor's intention to perfect his idea before making known any technical data. It will be amazing if ultra-high-frequency recording can be undertaken in this way, and a measure of controversy is bound to exist as to whether such an idea is technically possible. On the other hand, the history of every scientific invention is bound up with the scepticism of "authorities" who have proved, to their own satisfaction at least, that certain ideas were technically impossible, only to find their ideas exploded by the practical man who had the courage to pursue his investigations in the face of apparent ridicule. That television has proved no exception to this rule is by now common knowledge, and it behoves every theorist to temper his dogmatism with a measure of credulity, for in this scientific age even the wild schemes of Jules Verne have become a commonplace occurrence.

In Holland

DURING the course of the trade fair at Utrecht, in Holland, the Dutch people were introduced to their first high-definition television demonstrations. These were undertaken by Philips of Eindhoven, who employed an electron camera based on the iconoscope principles. This was used as a portable transmitter a short distance from where the receiving sets were accommodated. For a long time experimental broadcasts have been carried out from Eindhoven, but the general public have not participated as so far no standards of transmission have been settled. It is known, however, that the Dutch authorities are keenly interested in television and are already undertaking a searching investigation with a view to inaugurating a service in that country at the first opportunity.

Making Progress

ALTHOUGH the Germans decided last year to use a 441-line definition for their television service there has up to the moment not been any public transmissions with this degree of picture dissection. It is now stated that a new television studio has been opened in Berlin a short distance from Broadcasting House in readiness for the 441-line inauguration, which it is hoped to start in May of this year. The studio is said to have a sloping floor so as to keep the heads of the artists in focus as they approach the "camera" for a close-up. Surely it would have been a better plan to relieve the artist of the responsibility and make all questions of focusing a camera operator's responsibility? On the other hand, if a spot-light scanner is being used with this studio, then the plan adopted is a reasonable one, for the equipment naturally lacks that degree of flexibility associated with electronic scanning devices. The German authorities have been a very long time acquiring the right programme technique from the point of view of entertainment production. The bulk of their work has been undertaken on a 180-line standard and, since the picture quality has been so far below the scheduled 441-line, it has no doubt misled the producers and given them an entirely wrong impression of the nature of the items which are capable of providing sustained entertainment value. It will, therefore, be interesting to see what changes take place in programme quality when the new television picture service is put on the air.



This illustration shows how the television cameras are used to relay both the actual artists and small models which are 'mixed' to provide most realistic effects. The small model provides the proscenium and the raising of the curtain before the artists appear.

The British Long-Distance Listeners' Club

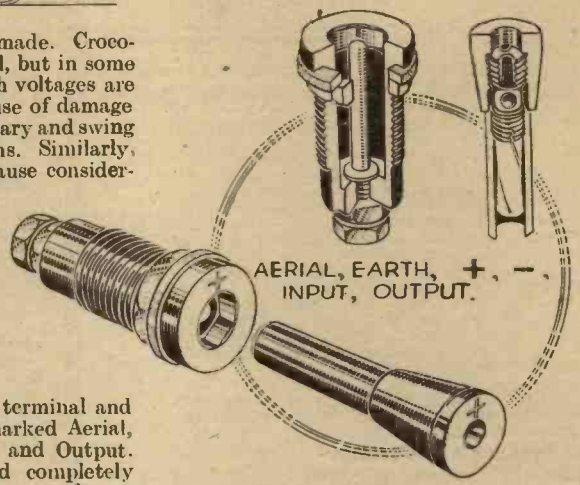
Methods of Rectification

AT one time there was considerabe argument concerning the best method of rectification for standard receivers, but in recent years the grid-leak scheme has been exclusively employed. The method of anode-bend rectification has, however, a number of merits which still appeal to certain listeners, although, of course, the diode rectifier will give just as good quality.

The main point concerns the volume which is fed into the valve and the amount of H.T. at the disposal of the user, and for the benefit of those who are anxious to try out this form of rectification the following details are given. No drastic alteration to the circuit will have to be made, and although the grid leak could be disconnected from the L.T. positive line and joined to a grid bias battery (in the same manner as when applying bias to an H.F. valve), the presence of the grid condenser may be thought inadvisable. Therefore, the grid condenser should be short-circuited simply by twisting some bare wire across the two terminals on the condenser, and the grid leak should be disconnected from the L.T. positive line. It may, of course, be left connected to the grid terminal. The lower end of the tuning coil should then be disconnected from the earth line and connected to the grid-biasing condenser at a suitable voltage tapping dependent upon the valve in use. It may be found in some cases desirable to include a 50,000-ohm resistance in the biasing lead and to by-pass this to earth through a non-inductive .1 mfd. condenser, and these two components are shown in broken lines in the accompanying illustration. Many experimenters fit a change-over switch so that anode-bend may be employed for the near-by local station, and grid-leak when reaching out, and this is certainly a good scheme and enables good quality to be obtained from the local station.

Terminal Connections

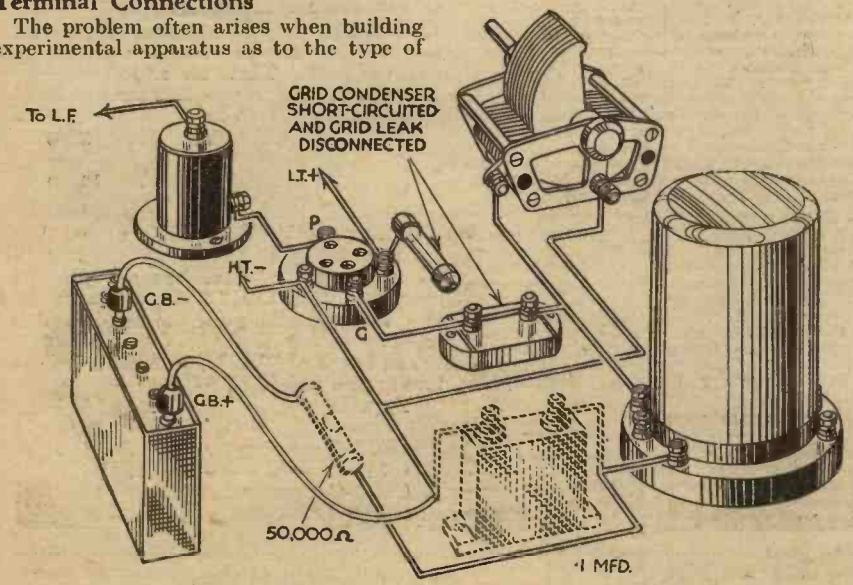
The problem often arises when building experimental apparatus as to the type of connection which should be made. Crocodile clips are extremely useful, but in some circuits, especially where high voltages are present, they may be the cause of damage as they will not remain stationary and swing about under certain conditions. Similarly, simple terminals can often cause considerable trouble due to shocks or short-circuits, and experimenters should therefore bear in mind that there is a very valuable terminal now available which is insulated and shock-proof and at the same time offers perfect contact under all conditions. This terminal is known as the Clix "All-in" terminal and is available at the moment marked Aerial, Earth, + and —, and Input and Output. It is extremely sturdy and completely shrouded and should find great favour among keen experimenters. The price of this item is 6d.



The Clix "All-in" terminal.

Deaf-aid Equipment

We are continually receiving applications from members for details of construction of deaf-aid amplifiers. We have carried out considerable experiments with this type of amplifier, but have found that each individual requires some special device which renders it exceedingly difficult to design a "general purpose" amplifier which will suit everyone. One person needs only one stage of amplification, for instance, whilst another may need two stages. One needs considerable high-note amplification, whilst another needs high-note cut-off, and so on. It is therefore, necessary when building this type of apparatus to take a standard L.F. amplifying circuit and to find by experiment just how many stages are needed, and then to experiment to find whether high-note cut or high-note emphasis is needed. In this connection the use of the special midget Osram valves should not be overlooked. These are designed for use with a 2-volt supply and consume .06 amps., the overall height including the pins being only 75 mm. They will give quite a good degree of amplification with only 30 volts H.T., although they may be used with up to 60 volts on the anode. The anode current is very small, being only 2.2 mA. at 60 volts and .95 mA. at 30 volts, so that a small H.T. battery will give very long life. These valves cost 15s. each.



How to convert a standard detector circuit for anode-bend rectification.

1938 BROADCASTER RADIO ANNUAL

PRACTICALLY every aspect of the Radio Industry is covered by the 1938 "Broadcaster Radio Annual" just published by the "Wireless Retailer and Broadcaster," of 29, Bedford Street, Strand, London, W.C.2. It is colour-coded into four parts: Statistical, Technical, Legal and Commercial, and Directory; and these are printed on white, yellow, white, and green paper sections respectively for easy reference.

Amongst the varied contents there is a "first-aid" Quick Test data for nearly 100 best-selling sets; characteristics and prices of 2,500 different valves; a 30-page Service Section; a directory of the electricity voltages in 8,000 towns; the officials and details of the 50 radio Associations; and "Who's Who" entries for 250 radio personalities. In the Directory Section is given the full address of every radio manufacturer, wholesaler and agent in the country.

If you want to know whether you are in the television reception area, there is a map giving exact details of where the Alexandra Palace broadcasts are being received; a special Television Section showing how an installation should be carried out, and giving a special transmitter-to-home explanation of how television works.

Statistics of the Radio Market, which together are available in no other publication, form the opening pages of the Annual. The information includes quarterly licence figures for 500 districts, covering the whole country, a survey of the electrified homes in 1,000 areas in the British Isles, radio export and import trade, and the success of the Radio Industry's Annual Exhibition—in figures.

The 1938 "Broadcaster Radio Annual" is an encyclopædic publication which everyone with a radio interest should obtain. The price is 5s. 0d., post paid.

Radio Clubs and Societies

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

THE EXETER AND DISTRICT WIRELESS SOCIETY

AT the meeting of the above society, held on Monday, March 21st, Mr. W. S. Pyrah lectured on "Industrial Rectification." Mr. Pyrah illustrated his talk with some very excellent slides, and finished with a movie of the E.C.C. Works, and this latter item was made more interesting because it illustrated the actual manufacture of some of the large rectifying valves which had been described by the speaker.

Mr. Pyrah gave a very lucid and detailed description of modern power transmission, and at question time many varied points were raised and answered very clearly. This was the first time that Mr. Pyrah had lectured to the E.D.W.S., but the members were unanimous in their request for another talk from such an able speaker.

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. Ching, 9, Sivell Place, Heavitree, Exeter.

THE CROYDON RADIO SOCIETY

"PROGRESS in Commercial Set Design" was the topic discussed by Mr. Marks at the Croydon Radio Society's meeting on Tuesday, March 22nd, in St. Peter's Hall, Ledbury Road, S. Croydon. He recalled the "boom" of the early days when manufacturers introduced gadgets in receivers wherewith to create interest, but ignored the vital feature of service, and to-day the retailer was the sufferer. Mr. Marks went on to dwell upon the day when only the qualified engineer would be employed by the manufacturer, and explained at length that sets at nine guineas were far too cheap, as the knowledge involved was not saleable at that figure. Nor were the defects of mass production ignored, and a well-known radio-gramophone was chosen as an example. It arrived from the factory with five correct passes from various departments, but no loudspeaker! Mr. Marks wondered why all-wave reception was considered as so vital to our listening. Did we all really want to be thrilled by morse and static from all over the world? He admitted, of course, that a receiver properly designed for short waves was of value for a wider scope of programme. In the practical demonstration, receivers with fluid light tuning, self tuning, and high-quality radio-gramophones were typical of current practice. Questioned on the public's taste, Mr. Marks said it definitely preferred music to jazz! Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

LONDON TRANSMITTING SOCIETY

ON Thursday, March 24th, a representative number of our members visited the Golders Green Radio and Scientific Society at the Regal Cinema, Golders Green, where a lecture by Mr. Blake was given. The lecturer gave a most interesting talk and went very fully into his subject. The proceedings terminated with many questions. We have now coat badges for our members (blue ground and gold lettering), who now number over fifty. All members must possess an A.A. or full transmitting licence, and membership of the society is free. All applications for membership should be addressed to the Hon. Sec., G. Yale, 40, Raeburn Road, Edgware, who will be pleased to supply fixture cards of 5-metre field days, etc.

RADIO, PHYSICAL AND TELEVISION SOCIETY

THE above society invites any reader who is a keen radio enthusiast to attend our meetings, which are held every Friday evening at 8.15 at 72a, North End Road, West Kensington, W.14.

On Friday, March 25th, an interesting lecture was delivered by a representative of The Telegraph Condenser Co., Ltd. Although the properties of paper and mica condensers were touched upon, the main part of the lecture dealt with the manufacture and uses of electrolytic condensers. One extremely interesting point in connection with electrolytics that was explained was the fact that roughening the surface of the anode approximately doubles the condenser's capacity. Another interesting fact not known to many people is that there exists electrolytic condensers which may be connected to a D.C. supply without regard being paid to polarity. Such condensers were produced in fairly large quantities by the T.C.C. until a few years ago. They were used mainly for D.C. radio receiving sets. Interesting particulars were also given of special low-voltage condensers of tremendous capacities that are now being manufactured for use in telephone exchanges and which, in spite of their very large capacities, occupy only a few cubic inches of space.

The society caters mainly for the wireless amateur, although many subjects of scientific interest are dealt with at our weekly meetings. Forthcoming lectures include "The Optics of Photography," by Mr. E. W. Selwyn, B.Sc., F.Inst.P., F.R.P.S., of Messrs. Kodak Ltd., on Friday, April 8th; and "The Rubber Plantation Industry," by Mr. E. R. Corbett, of Messrs. Thomson, Alston and Co., Ltd., on Friday, April 29th.

BRENTWOOD AMATEUR RADIO SOCIETY (G8HV)

A MEETING of the above society was held on March 11th, 1938. Messrs. Warrick, of the M.P.R. Electrical Co., of Romford, kindly gave a lecture on, and demonstrated their 7-watt amplifier, which succeeded in blowing a 14-watt lamp! The quality was excellent when the amplifier was delivering 12 watts. A new microphone giving high sensitivity and negligible feed-back was also shown, and caused great interest.

At the moment the society is very active. G8KM is doing good work on 7 mc., using 'phone and C.W. He uses an RK23 driven by a 59 and employs suppressor-grid modulation for 'phone. He hopes to be active on 1.7 mc. shortly. G3CQ, of Ilford, has worked W on 'phone using a very small input on 14 mc. He, too, is going to try the top band. 2CIH has built a dual-band Jones Exciter, using a 6L6G as crystal oscillator. 2DJB uses a crystal wavemeter for frequency measurement. He is building a super artificial aerial for his Hartley. 2CRJ has completed construction of his regen. CO, and uses a DET5 in the final.

A very ambitious programme has been arranged for the coming spring, and all interested readers requiring further information about society matters should get in touch with the Hon. Sec., J. R. Deane Sainsbury, Esq. (2CYW), "Brunook," Crossways, Shenfield, Essex.

KINGSTON AND DISTRICT AMATEUR RADIO SOCIETY

ON Wednesday, March 16th, Mr. J. F. Stuart-Williams (G5JW) gave a most interesting lecture on his oscilloscope, which he demonstrated in conjunction with his H.R.O. receiver. Modulation patterns of many amateurs and C broadcasting stations were watched with interest by the members.

The 56mc. group are making headway, and at present are busy building a portable transmitter and receiver for field day use. It is hoped that this transmitter will be on the air every evening testing with fixed stations. We hope to publish a schedule of transmissions from stations in this group in the near future. An interesting lecture has been arranged for Wednesday, April 13th, at the "Three Fishes" Hotel, Richmond Road, Kingston, when Mr. Dedman (G2NH), of The Quartz Crystal Co., will lecture on "Quartz Crystals." Visitors are sure of a welcome, and the lecture starts at 8 p.m. Hon. Sec., D. N. Biggs (G6BI), 44, Pooley Green Road, Egham, Surrey.

WORTHING AND DISTRICT SHORT-WAVE CLUB

THE first meeting of this club was held on Wednesday, March 23rd, and the following officers were elected. Mr. J. Bowers, Alpine Nurseries, Durrington Lane, Worthing, as President, and Mr. G. Lambourne, 16, Angola Road, Worthing, as hon. secretary.

It was decided that meetings should be held every week on Wednesday evenings at 7 o'clock, at the President's house. New members are urgently needed, and any really enthusiastic short-wave experimenter would be gladly welcomed. All requests for membership should be addressed to the secretary, but if any intending member likes to call direct at the club on meeting night he is sure to have a hearty welcome.

Arrangements have been made for members to have morse instruction, and an ex-Army signaller has kindly agreed to come along and conduct this class.

Programmes are in the course of preparation, and each member's interests will be studied before any programme is finally agreed upon.

WEST HERTS RADIO CLUB

ANY S.W. enthusiasts living in Herts who wish to get into touch with fellow fans, are invited to join the West Herts Radio Club, which has its monthly meetings at Berkhamsted. All who are interested in S.W. D.X. work are welcome, whether they own an 0-v-1 or a transmitting rig. Further details of the club can be obtained from Colin Peck, 3, Queen Street, Tring, or from the address given below, to which any reader living in the district is invited to call.—Hon. Sec., D. A. Steward, 9, Weymouth Street, Apsley, Herts.

NEWCASTLE RADIO SOCIETY

READERS residing in Northumberland and Durham County are reminded that there are other readers in those districts who have the same interests, and who would like to air their views on radio matters in general. Such readers are invited to join the above society, where membership is free, and meetings are held every month. Beginners can avail themselves of the help of experienced constructors. Full particulars can be obtained by enclosing a stamped, addressed envelope to the Hon. Sec., G. C. Castle, 28, Sandringham Road South, Gosforth, Newcastle-on-Tyne, 3.

TRADE TOPICS

Use a Fuse

IN our issue dated March 19th we published an article under the above heading and included the following illustration. Unfortunately the wrong manufacturers were mentioned in connection with one of these components, which is, of course, from the well-known Belling-Lee range. It will be seen that the upper

These are the Belling-Lee and Bulgin fuse units referred to in these notes.

component possesses the advantage that the mains leads are protected and the removal of the lid which contains the fuses in clips still permits the live leads to be protected so that the nser cannot receive a shock.

Halford Phantom XV

A NEW receiver shortly to be produced by Halford Radio possesses a number of novel features. This is of the combined straight and superhet type, acting as a 2 H.F. for quality reception and superhet with 6 to 15 kc/s separation for long-distance reception. It is interesting to note that the speaker supplied with this set is a 16in. super-cinema model, weighing between 60 and 70lbs. and having over six miles of wire in the field winding. The receiver tunes from 4 to 2,100 metres.

Exide Price Reductions

SEVERAL important price reductions are announced by Exide in the Hycap range of cells. These are as follows:—

Type	*New List Price*
	s. d.
OCG3–C, OCG3	8 6
GFG4–C, GFG4	10 0
GKG5–C	12 0

At the same time Exide advise us that they are now fitting their famous indicator to all cells in their "CZG" range, with the exception of the CZG2 and CZG8, at prices at present obtaining for the non-indicator range.

The range of "CZG" cells with indicators is now priced as follows:—

Type	*New List Price*
	s. d.
CZG3–C	11 0
CZG4–C	12 9
CZG5–C	14 3
CZG6–C	16 0

Non-indicator cells are still available but there is no price advantage to customers ordering CZG cells without indicators.

(Continued on facing page)

TRADE TOPICS

Service Equipment

WE recently commented on the novel and useful scratch remover supplied by Messrs. Holiday and Hemmerdinger. This firm also supplies many other useful accessories for the service engineer and those readers wishing to get into touch with the firm should note that they have now moved to larger premises. The new address is Holmer Works, 74-78, Hardman Street, Deansgate, Manchester, 3.

Tungsram Automobile Valves

THE type number of all the 6.3 volt auto. valves supplied by Messrs. Tungsram have now been altered and the range extended. The following details should therefore be noted :—

New Type No.	Old Type No.	New Type No.	Old Type No.
EAB1	New Type	EK2	VO6s
EB4	DD6ds	EK3	New Type
EBC3	DDT6s	EL2	PP6As
EBF2	New Type	EL3	PP6Bs
EBL1	DDPP6Bs	EL5	PP6Es
EF5	VP6s	EL6	New Type
EF6	SP6s	ELL1	New Type
EF8	New Type	EZ2	PVA6s
EF9	New Type	EZ3	PVB6s
EH2	VX6s	EZ4	PVC6s

Trix Change of Address

THE Trix Electrical Company, Ltd., manufacturers of Trix Quality Sound Equipment, and established for over 14 years in Clerkenwell Green, announce that, owing to steadily increasing demand for their products, the business was transferred on March 25th, 1938, to :—
218, Great Portland Street, W.1.
Entrance : 65, Bolsover Street, W.1.
Telephone Nos. : EUSton 5471/2.

C.R. TUBE SCREENS

WITH cathode-ray tubes increasing daily in their importance in so far as their application to television is concerned, questions associated with the tube screen loom large in the problems which have to be solved satisfactorily by the manufacturers. The exact "mechanism" of luminescence is difficult to understand, but it is known that in the cathode-ray tube there is a specially prepared surface which becomes luminescent under the stimulus of the fast-moving electrons at the point of impact. The colour which is produced is dependent on a number of chemical factors associated with the constituents used in making the final powder, the method of production, presence of impurities, etc. Even one part in a million of impurity can alter the final screen colour to a marked extent, so that the work of preparation is a specialist's job. For a long time—indeed in America the change has only very recently taken place—green was the predominating screen colour because of its brightness. This was built up from a zinc or cadmium base, but a combination of zinc silicate and cadmium tungstate has produced the bluish-white screen which is now so popular.

When writing to Advertisers, please mention "Practical and Amateur Wireless."

TRACING MODULATION HUM

(Continued from page 98)

the discovery of a bad contact between one of the detector valve pins and the holder, which was overcome by cleaning the pin with emery cloth.

Detector Heater-Cathode Circuit

There was still a final trace of modulation hum, and this had become really exasperating by now. A .01 mfd. fixed condenser was connected between one side of the detector heater and the cathode of the same valve—slight additional improvement. This was replaced by a pair of .005 mfd. condensers in series across the heater, with the centre tapping connected to the cathode and earth line; that was no better than the single condenser. Other values down to .0005 mfd. were tried without any appreciable difference being noted, although it seemed that capacities in excess of .002 mfd. were best.

The Cure

At this stage the bright idea occurred of connecting the earth lead—with series condenser in circuit—directly to the cathode terminal of the detector. Surprising though it may seem, that completely overcame the whole trouble; immediately the set behaved as it should have done at first. The reason was not very clear, because there was no question of high resistance between the earth terminal and the cathode of the valve. Tests with an ohmmeter showed this to be negligible—at least, it would normally have been considered negligible!

In order to re-check the conclusions that had been drawn, most of the alterations that had previously been made were discarded. Many of them were thus proved to have been unnecessary. Among them were: change to tuned-transformer coupling; increased decoupling of H.F. pentode (which had slightly reduced efficiency); "tuning" of the smoothing choke. Changes that were still worth while were: reduction of grid-condenser capacity; reduction of grid-leak resistance; condenser across detector heater; condenser from one side of heater to cathode.

A.C. Sets

It must not be inferred from the above that the changes made would be helpful in every instance, and it should be remembered that the design of the set in question was not good. At the same time, the complete description of the tests that were made will probably be of assistance to readers who experience similar troubles. Many of the changes are equally applicable to A.C., D.C. or A.C./D.C. sets, but in the case of A.C. receivers there are a few other items that should receive attention. For example, the connection of a condenser between each anode of the rectifier valve and H.T.+ is often helpful; condensers should have a capacity up to about .01 mfd. and should be rated at twice the normal H.T. voltage. Then again, trouble might be due to incorrect centre-tapping of the heater winding of the transformer. This can be checked by taking the cathode lead to the centre of a "humdinger."

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.

B. H. S. (N.W.1). 250,000 ohms is the same as .25 megohms. All of the parts may be obtained from Messrs. Peto-Scott.

E. D. A. (Birmingham). We regret that we cannot supply a blueprint of the type of set referred to.

J. R. M. (Kew). We regret that we have no details now available of the unit in question and suggest that you write direct to Messrs. Mullard who sponsored the unit and who may still be able to let you have some data concerning it.

J. C. B. (Warrington). The firm in question made dozens of different types of coil and it would be essential to know the type number before connections could be given.

T. B. M. (Sowerby Bridge). Messrs Peto-Scott can supply the material in question.

K. E. S. (S.W.11). We regret that we cannot supply the details you require without more comprehensive information. We have published several forms of calibrated oscillator which should be suitable.

C. E. H. (Salford 5). We cannot supply a blueprint of the set in question, which was originally published by "Popular Wireless."

D. R. W. (Redland). We do not know of any form of handle of the type mentioned, but you should be able to make up such an arrangement from an ordinary length of strap. Messrs. Peto-Scott may be able to supply you with a proper carrying handle which would be of sufficient length to serve your purpose.

T. H. A. (Billinge). Messrs. Peto-Scott can supply the formers and also the wire if you need it.

J. S. (S.W.7). Although the theoretical diagram does not show 7 connections, this particular valve is supplied both as a 5-pin and a 7-pin component. In the latter the metallised surface is connected to one pin and one pin is left blank. We regret that we cannot identify your coil which is apparently an old model.

W. R. T. (Burton-on-Trent). The aerial is joined to No. 4, earth to Nos. 5 and 3, and reaction condenser to No. 6. The tuning condenser (fixed vanes) is joined to terminal 1 and the grid condenser to terminal 7. If the coil is used in an H.F. stage the grid could be joined to terminal 1, ignoring No. 7.

S. J. H. (Dronfield). We regret that the blueprint is no longer available.

S. S. (Sheffield). The trouble may be due to the fact that the speaker cone is distorted and the speech coil fouls the pole piece. On the other hand the noise may easily be caused by an overloaded output valve. You may be able to readjust the tuning dial if all of the readings are out. There are special screws for this purpose.

A. G. S. (Edinburgh). There is no such chart available. A transverse current microphone would be most suitable.

G. H. (Cork). A simple L.F. stage may be added. We have described such a stage frequently, and you will find details of a suitable unit in our issue dated February 6th, 1937.

C. C. B. (Cowley). The set described in our short-wave section this week should meet your requirements.

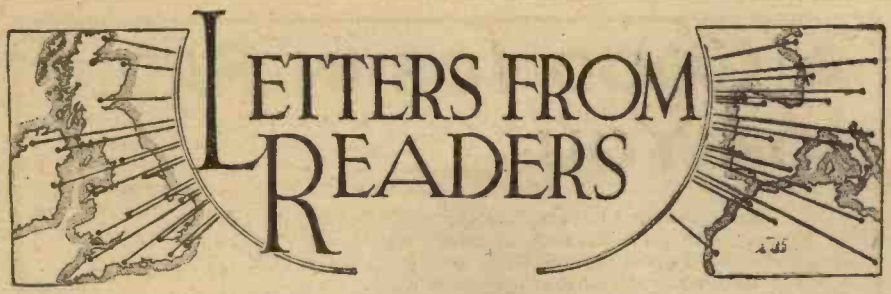
S.W. NEWS

Longer Broadcasts from Japan

Transmissions in foreign languages destined to Europe from JVP and JZI, Tokio, on 39.95 m. (7.51 mc/s) and 31.46 m. (9.535 mc/s) have been extended; they are broadcast simultaneously from both stations daily from G.M.T. 19.30-21.00.

News of Ultra-short-Wavers

W3XEY, Baltimore, 31.6 mc/s (9.494 m.), 100 watts, is on the air from G.M.T. 21.00-05.00; W1XEQ, New Bedford (Mass.), on the same channel, works from G.M.T. 19.00-23.00. W1XER, Mount Washington (Mass.), is carrying out tests with a directional aerial on 41.90 mc/s (7.133 m.). W8XH, Buffalo (N.Y.), on this frequency, operates daily from G.M.T. 18.00-22.00, and from 22.45-02.00 W2XHG, New York, sharing this channel, can be heard relaying an N.B.C. programme between G.M.T. 14.00-05.00. W3XES, Baltimore, which has been using 25.6 mc/s (11.70 m.), is reported to be changing over to 38.6 mc/s (7.78 m.) on May 1st. Finally, another station giving the call-sign W2XQO, and situated at Flushing (N.Y.), has been heard testing on 26.55 mc/s (11.29 m.).



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).

"Down to Earth"

SIR,—I wish to thank Mr. Leslie Tearney for his interesting letter in your issue of March 19th, in reply to mine. I note that his unusual aerial is below the surface of the earth. It looks as though it will have to be admitted that wireless waves travel not only over the surface of the earth, but through the earth, and with your correspondent I am in agreement.

Since writing my original letter I have again changed the direction of my aerial which is now laid "permanently" along the ground beside a hedge, but the reception from Droitwich is *much* weaker than when the aerial was in a different direction.

I am now informed that ground aerials were in use for reception 20 years ago—it is therefore amazing that the subject is not more fully understood and explained in present-day theory! I will run the risk of being laughed at by suggesting that wireless waves can be *radiated* with the aerial of the *transmitter* on or in the ground. If successful, this would be very useful in the unfortunate event of war. I am of the opinion that it will be successful.—D'ARCY FORD (Exeter).

A Three-stage H.Q. Amplifier

SIR,—All music lovers should thank you for Mr. Bonavia-Hunt's interesting article on Direct Coupling (March 12th issue) and hope for further contributions from him in due course.

Quality enthusiasts will find his claims fully substantiated. Gramophiles, too, will assuredly hail the amazing improvement on previous methods of reproduction, and will find a new lease of life in many of their older records.—G. G. WILLIAMS (Guildford).

A 20-m. Log from Lancashire: Correspondent Wanted

SIR,—I hope my 20-m. 'phone log, which I give below, will prove of interest. All stations were heard from March 20th to 22nd, and times of listening were 09.00 to 09.30 G.M.T., and 16.00 to 17.00 G.M.T.

KA1BH, 1ME, 1MG, 1ZL, IJR (Philippine Is.), VU2CQ (India), ZB1L (Malta), ZS2N (S. Africa), HR5C (Honduras), K4EMG (Porto Rico), K7FDB (Fairbanks, Alaska), XE1GT, 1GK, 2BJ (Mexico), YT7MT (Yugoslavia), FI8AC (French-Indo-China), VS7GH (Ceylon), VS2AK (Kuala Lumpur), VR6AY (Pitcairn Island), ZL2AF (New Zealand), PK1MX (Batavia), VK2OQ, 2GU, 2VV, 2BE, 2YU, 2ABC, 3WA, 3WB, 3NP—15 watts input (Australia), XU8RD (Shanghai) and XZ2EZ (Rangoon, Burma), also W's from all nine districts.

Altogether, I have heard amateurs on 20 metres from 60 countries during February and March. All reception was on a two-valve battery set using headphones, with a 70ft. aerial.

I should like to get in touch with any short-wave amateur in the Nelson district. Also I would greatly appreciate any information about XZ2EZ, as he is not listed anywhere.—C. RUSHTON (4, Westmoreland Street, Nelson, Lancs).

Station VR6AY—Pitcairn Island

SIR,—I was rather interested to read D. C. Chamberlain's (2CHD) remarks *re* Pitcairn Island.

For some considerable time Pitcairn Island has been working on the 600 m. band under the call-sign PITC. It might interest other readers to note that practically all Shaw Saville Albion steamers outward bound to New Zealand (via Panama) call at this island and also call on the return journey to Panama. Several of the New Zealand Shipping Co.'s steamers also make a call.

The gear at the station was given by the Marconi Marine Service. Weather permitting, intending ships who wish to pay a call at the island, call PITC when likely to be in range, and arrangements are then made as to the approximate time of arrival. This is important, as owing to the rocky coast of the island, liners cannot approach the coast, and anchor about three miles from the island. The natives row out in punts filled with all sorts of curios they have made, and also large baskets of fruit. They are allowed on board, as the passengers cannot go ashore, and exchange their goods for shirts or razor blades, soap, etc. Of course, they will accept English money, but it is not of much value to them, as they cannot spend it on the island.

They speak English very well indeed, and seem quite a happy crowd. Their laws are very peculiar, and are very amusing to English people. The liners stay about one hour, and after all the mail, etc., has been cleared, the natives disembark and row back to the island.

I do not think they are quite so lonely as it appears from your correspondent's remarks, and visits are only postponed when weather conditions are very bad; after all there are islands off the British Isles under similar conditions, the inhabitants of which have to rely on the weather for mail, etc.

In conclusion, I wish 2CHD the best of luck, and also other readers who care to forward QSLs to this station.—C. HINDLE (G8JA) (Blackburn).

SIR,—I have read with interest Mr. D. C. Chamberlain's letter which is published in the March 26th issue of PRACTICAL AND AMATEUR WIRELESS, regarding the short-wave transmitter in Pitcairn Island.

I myself have heard this station several times, and have some further information about it. When I first heard Pitcairn Island, the call given was VR6A; and this has been the same up to March 19th, when the station identified itself as "VR6AY, Pitcairn Island."

Apparently VR6AY is the official call-sign, whilst VR6A was used only temporarily, as the official call, at the time the apparatus was received, was not known.—P. L. CHAMBERLAIN (Norbury).

A Good Log With a One-valver

SIR,—I enclose my log and hope that it will prove of interest to other readers. The period of listening covered was from 3.20 to 4.20 a.m., in the early hours of Saturday, March 19th. I am rather proud of this list, as the set I use is only a one-valver, taking only 40 volts H.T., and the usual 30ft. "inverted-L" antenna. All signals were easily readable, most being R7.

Americans:—W1CND (R8), W1CGY, W1GED, W9VPK, W1AHJ, W4BRR, W3EDO, W8NUN, W2CP, W2JQ (R8), W1JWD, W2AMM, W2IKV, W3EMM, W3LN, W1TW (R9), W1FNT, W2YC, W2IXY (R8), W2CLA, W2AZ, W1AVK, W3BNC, W4BYY (R9), W1IEE, W4AH, W2EE, W8JQ, W1BLO, W2CIL (R8), W1BKK, W4BMR (R9), W3GWL, W1CM, W1KKM, W1BLA, W4GW, W6GRL and W9ARL. I also heard CO2WM, in Cuba, and the following Canadians: VE2DE (R8), VE2FK, VE2LP, VE3KG, VE2EE and VE2KF. Only one "G" was heard—G3TL.

Besides this list, my set pulls in at R7 all the American short-wave broadcasting stations, the best being W2XE on 13.94 m. and W8XK on 25.26 m. Japan is heard regularly at good signal strength, and South Americans are heard very well indeed.

I should be pleased to correspond with any reader interested in amateur transmitting.—D. B. DUTTON ("Sunny Home," 9, Albert Avenue, Skegness).

[*Note: Owing to the large number of 'logs' which are now being sent by readers, these lists will not be published unless the letter is accompanied by veri's in respect of the stations. 'Local' reception should not be regarded as a 'feat' and only real D.X. work should be commented upon.*—ED.]

Do you know

—THAT although H.F. instability may sometimes be removed by reducing anode voltage, the efficiency of the stage is also reduced by so doing.

—THAT stability should always be obtained, where possible, without reduction of efficiency.

—THAT a small rubber-band twisted round the arms of a simple push-pull on-off switch will often prevent noises due to bad contact.

—THAT whistles in a superhet receiver may often be traced to bad alignment of the various tuning circuits.

—THAT variable selectivity may often be incorporated in a superhet without altering any existing components.

—THAT the simplest scheme of the above type is a variable condenser between primary and secondary windings.

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 Newnes, 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.

QUERIES and ENQUIRIES

H.F. Instability

"I have made an H.F. receiver which I cannot stabilise. I have made several tests and the only thing which puzzles me is that I can stop the whistle which is continually present by putting my finger on the top of the S.G. valve. This also gives a slight improvement in signal strength and I can tune right through the range satisfactorily. Does this indicate to you the fault and how can I stop it?"—F. G. L. (Cork).

THE most likely cause of the trouble is that H.F. is getting through to the remainder of the circuit, and when you put your finger on the anode you by-pass this H.F. Connect a fixed condenser at that point and to earth to confirm this. If that stops the whistle also you must improve the decoupling in the H.F. stage, and if choke-coupling is employed a better choke should be used. If, however, the condenser does not stop the trouble it will indicate that your body simply damps the H.F. stage which is oscillating, and, therefore, the H.T. voltage should be reduced, the screen voltage modified, or the bias altered. Pay particular attention to the lay-out and the screening of the anode lead.

Tuning Difficulties

"I am puzzled with my receiver, which does not tune in the same station at the same point two days running. I have called at the local dealer and he advises me to send it back to the makers, but this will mean being without the set for a long time and I would like to cure the trouble myself if possible. There is no instability or other trouble, but simply that when I get, say, London, it is always at some different point over a space of about three-quarters of an inch."—T. E. (Dewsbury).

WE think you will find that the dial locking-screw has become loosened and this causes the drive to slip over a short distance. On the other hand, there is a special form of dial now fitted to a number of receivers where a slow-motion drive comes into action over a short distance upon reversing the direction in which it is turned. A small screw provides for the locking of this device, and this may have fallen out. It would, therefore, be preferable to have the set examined by a representative of the firm or the makers.

Auto-bias

"I am building a set using the amplifier of Class B type, and I would like to use automatic grid-bias, but am not sure how to wire it. I have enclosed a circuit and should like to know if this is the method, or, if not, perhaps you would put me right."—W. G. (Darwen).

THE arrangement which you have sketched is incorrect and the only way in which you can obtain bias in a battery receiver is to connect the normal G.B. terminal of the L.F. transformer to H.T. negative and then to connect H.T. negative to the L.T. negative line through a fixed resistance of a suitable value. This will depend upon the bias voltage required and the total anode current of the receiver, dividing the latter into the former. In a Class B circuit, however, the anode current of the output valve fluctuates with the signal strength, and thus the bias would also fluctuate if you employed an automatic biasing arrangement. It is, therefore, not a satisfactory proposition to attempt auto-bias with a circuit of the Class B type.

Set for a Ship

"I should be glad if you could suggest a set from your Blueprint service that would be suitable for use on board ship. The voltage is 110 D.C., and most commercial sets are subject to engine-room interference, hum, etc. We desire good short-wave reception when out East."—J. D. (M.V.—B.M., E.C.).

YOU would probably find that a battery-operated receiver would be the best arrangement in your particular case. Good H.T. accumulators could be employed for the H.T. supply and kept charged from the ship's installation, and this would overcome all difficulties due to the possible erratic nature of the ship's supply. If, however, the D.C. is really smoothed you could no doubt fit some sort of interference-suppressing device to prevent H.F. interference and reliable smoothing could be employed, but for the operation of a mains-type set you would have to use a converter to change the supply to A.C. and then step it up and convert it back to D.C. Any good battery set would give satisfactory results, but we have not published a design for a superhet or other powerful short-waver such as would probably be found desirable in the part of the world covered by you.

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 queriists.

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 Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Tone Controls

"I send you a circuit of my eight-valve set, into which I should like to incorporate a tone control. I am uncertain as to the best method of doing this and should be glad of your advice on this point. Perhaps you would also state component values for the idea."—H. W. A. (S.W.9).

WE do not give instructions for modifying commercial apparatus, and can, therefore, only deal with the matter from a general point of view. When fitting a tone control the object is to suppress the higher frequencies (it being generally assumed with standard circuits that bass cut-off is not desired and bass boost difficult to attain). The suppression of the higher frequencies usually gives the effect of more balanced reproduction. We therefore suggest that you include such a cut-off circuit in the most suitable part of the receiver. Although it is usual to place it in the output anode circuit, it is often desirable to place it earlier in the L.F. circuits so that the subsequent amplification is only at the desired frequencies and this often prevents certain forms of frequency distortion.

Circuit Testing

"I am building a comprehensive transmitter and receiver and wish to make some provision for rapid tests of the various circuits. What, in your opinion, is the best way of doing this, say, for monitoring purposes?"—H. Y. (Warrington).

YOU will find that ordinary plug and jack connections cannot be beaten for this purpose. You could, by this system, use a single meter with converter scales and connect just where you desired, whereas with certain circuits permanently wired to a meter a greater expense would be needed for the equipment. Closed-circuit jacks are usually suitable and may be included in the cathode leads (or anode circuits) to ascertain rapidly the anode circuit which in most cases will automatically check grid-bias, anode volts, and valve. Care will have to be taken in some circuits to avoid open-circuiting the apparatus when the plug is inserted or removed.

Peak Volts

"I have a condenser which is marked 300 peak, and should like to know exactly what this term means. I want to use the condenser in a set I have just built which has a 250-volt rectifier, and I wonder if the condenser may be used in the smoothing circuit."—J. C. (Sheffield, 6).

THE peak rating is the maximum which may be applied to the condenser. In a mains unit of the type using a directly-heated rectifier, the voltage when the set is switched on may rise to a very high value, which will fall as soon as the valves have attained maximum temperature. If you include a voltmeter in the circuit you will find that with the type of rectifier mentioned the peak may easily be well over 300 volts for a few seconds and thus a much higher rating is desirable on the condenser. If an indirectly-heated rectifier is employed, or a thermal delay switch is used, the question of the surge or peak voltage will not arise.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

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NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT. 13 to 86 metres without coil changing. Complete Kit and Circuit. 12/6. **VALVE GIVEN FREE!**
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FILAMENT TRANSFORMERS, Tapped Primaries, 200-250 v. All secondaries C.T. 4 v. 3 a., 7/6; 4 v. 5 a., 8/6; 7.5 v. 3 a., 7/6; 6 v. 3 a., 7/6; 2.5 v. 8 a., 7/6; 6.3 v. 3 a., 7/6; 5 v. 3 a., 7/6.
SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of S.W. Coils, 14-150 metres, 4/- set with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplified S.W. receiver construction, suitable any type circuit, 2/6.
COIL FORMERS, 4- or 6-pin low-loss, 1/- each.
ELECTRIC SOLDERING IRONS, 200-250 v., A.C. or D.C., 1/6. Super model, 4/6.

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PHILCO brand new All-Wave Radio Sets, fully guaranteed, in maker's sealed cartons, at slaughter prices. Money returned if not as represented. Cash with order or C.O.D. Model A637 Table 6v. A.C. Mains, list 13 gns., sacrifice £6/15/0. A537 Table 5v. A.C. Mains, list 12 gns., sacrifice £5/10/0. P.337 Battery 3v., list £8/15/0, sacrifice £3/15/0. 450 Battery, list 13 gns., sacrifice £6. Get our List of other Bargains.—Aston Direct Supply Co., 261-3, Lichfield Rd., Aston, Birmingham.

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

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25 ONLY FOR SALE.—3-valve kits with valves and diagram, 12/6; 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation. —Universal Radio Co., 221, City Road, London, E.C.1.

ALL lines previously advertised still available.—Radio Clearance, 63, High Holborn, W.C.1. Phone, Holborn 4631.

OLIVERS offer Centralab Volume Controls, with switch, 2/-; Erie Resistances, 3½d. each, 3/- dozen, 2/6 dozen in 3 dozen lots.

465 kc/slitz wound L.F. Transformers, with trimmers, screened, brand new, 2/6.

Aluminium Chassis, 16in. by 10in., by 3in., 18 gauge, 5/3; 16 gauge, 7/6. Any size to order, prices pro rata.

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Cosmocord pick-ups, with Volume Control and rest, 9/6, 1 mfd. and 2 mfd. electrolytics, 9d.

Collaro Gramo. Motors, A.C. 110-250v., 50 cycles, Unitplate, Turntable, Auto-stop. Brand new, 25/6.

Olivers, 676, Christchurch Road, Boscombe, Hants. Send for list and quotations. Orders under 5/6 postage extra.

S.T.900 Specified Kits, including 10 Coils and Specified Valves, £4/15/-. A.C. Versions, £8/15/-. ST800, Author's Kits "B," £3/12/-.—Servwell Wireless Supplies, 64, Prestbury Road, London, E.7.

BANKRUPT Bargains.—All new. Phillips 1938 A.C. 5v. superhet all-wave chassis, complete out of 12½ gn. sets, less only cabinets, £5/15/-. Ferguson 5v. A.C./D.C. chassis, all-wave, £4/17/6. Plessey 4v. battery superhet chassis, 2-band, 57/6. All with valves and M.C. speakers. Brunswick 6v. 4-band 1938 sets, A.C., 7 gns. Decca 6v. A.C. 2-band 1937 superhets, £4/17/6. Decca 1938 model 55 5v. all-wave A.C./D.C. transportables, 5 gns. Lotus 4v. A.C./D.C., 57/6. Philco 1938 battery all-wave, 90/-. Many others. State requirements. Full stock valves and components. —Butlin, 6, Stanford Avenue, Brighton.

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AMERICAN Valves in Sealed Cartons, all types, 5/6, post paid.—Valves, 661/3, Harrow Road, N.W.10.

LOUDSPEAKER REPAIRS

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

REPAIRS to Moving Coil Speakers, Cones and Coils fitted and Rewound. Fields altered. Prices Quoted including Eliminators. Loudspeakers Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service, Estimates Free.—L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

CABINETS

MANUFACTURERS' surplus cabinets for Radiograms. Radio sets and Loudspeakers. Large and varied stock. Inspection invited, or send particulars of your requirements, with measurements of chassis. Photos sent for selection. (No catalogue.) —H. L. Smith & Co., Ltd., 287-289, Edgware Road, London, W.2. (Pad. 5891.)

TUITION

"R.T.I."—established 1929—still lead. Get free particulars latest Radio and Television courses: postal and private.—Radio Training Institute, 40a, Earl's Court Road, London.

SITUATIONS VACANT

MISCELLANEOUS

ADVERTISEMENT INDEX

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REACTION CIRCUITS—See page 117.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

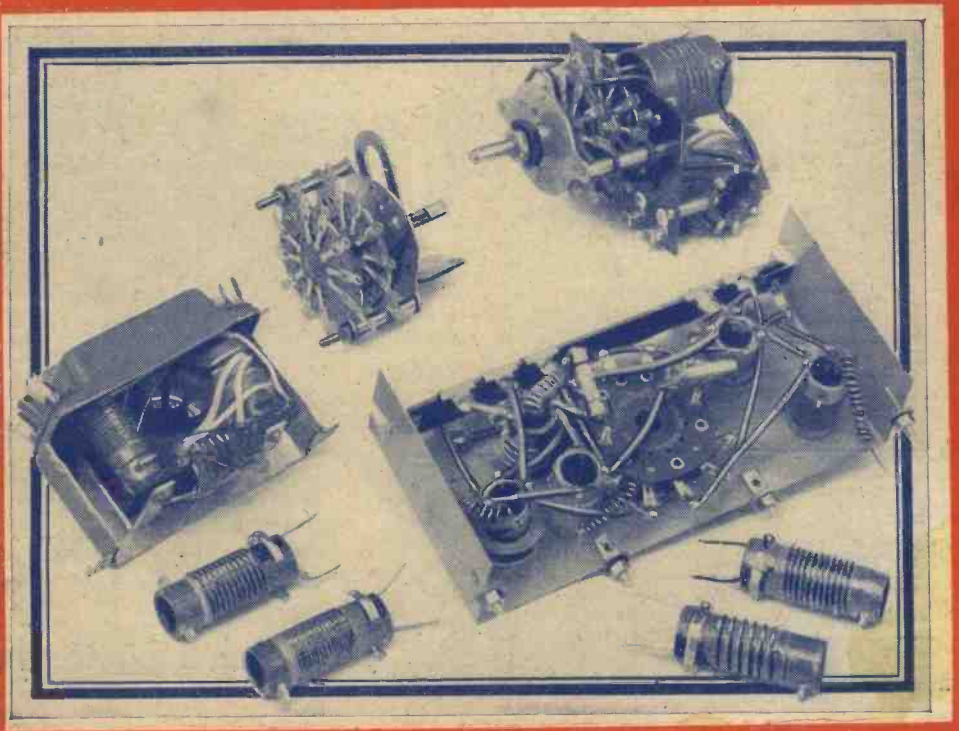
3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 12. No. 291. April 16th, 1938.

ALL-WAVE TUNERS



SHORT

MEDIUM

LONG

COIL CONNECTIONS EXPLAINED—SEE PAGE 111

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. XII. No. 291. April 16th, 1938.

ROUND *the* WORLD *of* WIRELESS

All-wave Tuners

WE have published several suggestions for making receivers and all-wave tuners, and in view of the increasing popularity of all-wave circuits we give in this issue some interesting data concerning the modern all-wave tuners. There are now many suitable components available for the home-constructor, and some of these are shown in the illustration on the cover this week. The term "all-wave," as we have before pointed out, may be very confusing, as the majority of receivers and components described as of this type have a wide gap, ranging from some point between 50 and 100 metres to 200 metres or so. In most cases it is found, however, that the waveband which is omitted does not furnish good entertainment value, being occupied by amateur and commercial transmitters. It is not a difficult matter to introduce coils to cover this band, but the additional complications in the switching and wiring are generally not worth while. The greater problem is generally concerned with the lowest wavelength to which the all-wave set or tuner will operate, and in most cases it will be found that 5 metres is the lowest efficient minimum. Various details connected with this subject will be found in the special article on page 120 this week.

Dummy Valves

CASES are still being reported of American receivers being fitted with valves which do not perform any useful function, merely being included as a selling point. One case is mentioned of a 15-valve set with 14in. speaker which, upon examination, was found to be so wired that eight of the valves could be removed without in any way affecting the receiver, the heaters only being wired in the circuit.

Radio Nurse

THIS novel term is applied to a special type of inter-communicator now available in America. It has a small "radio car" which is placed in a room and connected to any ordinary electric outlet and a small receiver unit is connected to an electric outlet in any other room. No other connecting link is needed and the "car" and "voice" units then enable the user to eavesdrop or hear sounds in the distant room. It is particularly designed to enable a mother to hear when the baby wakes.

Talking Lamp Posts

IT is stated that a suggestion has been put forward and tried out to facilitate traffic movements during a "black-out" arising from an air-raid. The suggestion is that loudspeakers and talking film equipment be fitted to lamps at cross-roads, the film being automatically set in motion with the changing of the traffic lights, and the loudspeaker then announcing clearly the name of the cross street or intersection.

ON OTHER PAGES

Forgotten Anniversaries

THIS title is to be given by the B.B.C. to a new series of talks to take place in the April to June quarter. The talk will be given within a week of the anniversary of some picturesque but generally forgotten event. The choice of occasions will be wide and the significance will cover science, literature, art, politics and other subjects.

Children's Concert

ON April 22nd Sir Adrian Boult will conduct a concert for young listeners, the B.B.C. orchestra (Section E) led by Laurance Turner, performing for this purpose in the Concert Hall at Broadcasting House.

Trolley-bus Interference

LISTENERS who experience interference from trolley-buses will be interested to learn that satisfactory interference-suppressors are now available and have been fitted to a number of such vehicles in various parts of the country. The latest district to be so modified is Hartlepool, where the buses running from West Hartlepool to Hartlepool are now interference-free. It is to be hoped that all new vehicles of this type will be made with the suppressors as part of the equipment

Cairo Telecommunications Conference

NOW that the German Post Office has taken over the former Austrian administration the Austrian delegation at the Cairo Conference has been instructed to join the German delegation and for the two parties to act as one.

Push-button Tuning

A SPECIAL memorandum has been issued by the makers of a well-known American push-button receiver warning dealers and service-men not to adjust any pre-sets connected to the automatic tuning circuits until the set has been switched on for some time. It is stated that, even if A.F.C. is fitted, the changes of tuning due to the changing characteristics of the valves in the initial warming-up period will result in wrong adjustments if this point is not attended to.

Radio Propaganda

THE recently-formed French Ministry of Propaganda has decided that radio is to play a very large part in its activities in the future. This Ministry is under the control of M. Frossard, a well-known journalist who has already experienced the value of radio propaganda.

New Milnes Company

THE manufacture of all the well-known Milnes radio products has been taken over by a new company to be known as Milnes Electrical Engineering Co. (Bingley), Ltd., of Victoria Works, Church Street, Bingley. The popular H.T. unit is to be continued, and the servicing of the original Milnes receivers is to be carried on by some members of the staff of the original company operating under the style of Bingley Radio Services of Church Street, Bingley.

ROUND the WORLD of WIRELESS (Continued)

Easter Sunrise Services

IT is announced that special short-wave broadcasts of the sunrise services from the Easter Bowl and the Death Valley National Monument, California, will be one of the special features of the NBC Easter Sunday programme on April 17th. The broadcasts will begin at 12.30 a.m. G.M.T., with a programme from the Sylvan Theatre in Washington; and fifteen minutes later listeners will be taken to the Hot Springs National Park to hear the voices of a choir of 400 singers from Hot Springs churches.

New French S.W. Station

THE Minister of P.T.T., M. Jean Lebas, recently opened the powerful new short-wave station at Essarts-le-Roi, which marks an important development in international broadcasting. The station has been allotted fifteen wavelengths between 16 and 50 metres, and with modulation the transmitter can reach a power of 100 kW.

Isle of Man Schools and Radio

EVERY elementary school in the Isle of Man is now equipped with Philips Radio. This represents the outcome of discussions which have been going on for some time between the Education Authority and the teachers. A total of 30 mains-operated, 15 battery sets and 20 extension speakers have been supplied through Mr. E. H. Dickinson, Philips Service Dealer, of Prospect Hill, Douglas, Isle of Man, who has also undertaken the work of installation and maintenance. It is interesting to note that this development brings the Isle of Man into line with the county of Ayr, which is the only other complete educational area in the British Isles in which every elementary school is equipped with radio.

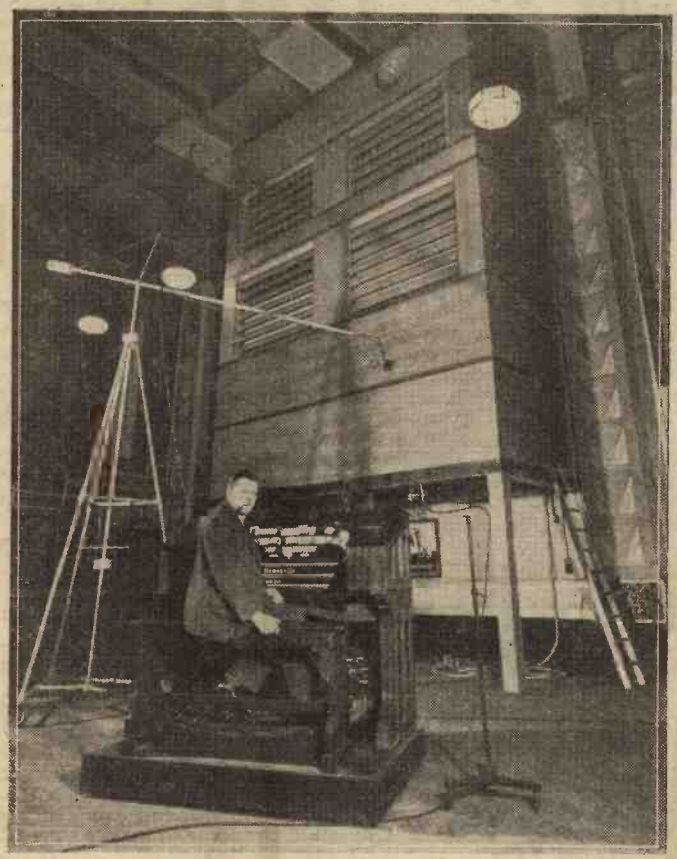
Swedish Broadcast Appeals

A REPORT by the Swedish Broadcasting Company gives an interesting indication of the effectiveness of wireless broadcast appeals for missing persons.

It is stated that 350 persons were called for over the radio as missing in Sweden during last year, of which about 300 were found, or turned up of their own accord. By a system of checking it has been estimated that the broadcast appeals were directly or indirectly responsible for the finding of a person ten minutes after the announcement had been broadcast.

INTERESTING and TOPICAL NEWS and NOTES

finding of 200 of these persons. As a rule the missing persons have been discovered or have turned up the day following the broadcast announcement, or at any rate only a few days after. The record was the



On Wednesday, March 16th, the new £3,000 Compton Organ was put into commission in the "His Master's Voice" Recording Studios, St. John's Wood. The first record was made by Reginald Foort, who played a medley of tunes from "The Gondoliers," and a medley of film hit tunes. Incidentally, this was Reginald Foort's hundredth recording session for "His Master's Voice."

An Easter Parade

AN Easter Parade, devised and arranged by P. Allender Fryer and José Craven, will be broadcast on April 22nd, from the Odeon Theatre, Llandudno. Jesse Yates and Rene Craven will be at the pianos, Allender Fryer will be at the organ, and the compère will be W. E. Holland. The production will be by Glyn Jones, whose light programmes, "When Day is Done" and "By Firelight," have been so popular with listeners. It is possible that this programme will be followed by a "Whitsun Parade" and "August Parade" later in the season from two other North Wales coast towns.

Music from Abroad

ON April 22nd (Regional) a concert of Norwegian music given by the Oslo Philharmonic Society's Orchestra, will be broadcast from Norway. The conductor will be Hugo Kramm, and the programme will include the Violin Concerto by Christian Sinding, played by M. E. Glaser.

Examples of German folk music from Munich will be heard in the National programme on April 24th, and on April 27th (National) Sweden will contribute a concert of light music.

W1XAL Rebroadcast Periods

THE schedule of rebroadcast periods, Section II, from Station W1XAL, University Club, Boston, Mass., is as follows:

Fridays at 5. 0p.m. E.S.T., 11.79 mc/s (25.4 m.).

April 15th. Crystal Oscillators. The use of quartz crystals for exact frequency control in our radio-frequency oscillators.

April 22nd. Radio-frequency Amplifiers. Vacuum tube circuits used for the amplification of the power generated by the oscillators.

April 29th. Radio-telegraph Transmitters. The combination of an oscillator and amplifier for the transmission of code signals.

May 6th. Plate Modulation. Accomplishing radio-telephony by varying the plate voltage on one of the amplifiers.

May 13th. Grid Modulation. Accomplishing radio-telephony by varying the grid voltage on one of the amplifiers.

Birmingham Military Band

HAYDN HEARD will conduct the Birmingham Military Band (which he founded about two years ago) in a programme of popular music on April 17th. The vocalist will be Vera Healy, the Coventry contralto, who won all four Contralto classes at the Brighton Festival in 1935, and has since taken two prizes at the Royal Academy.

SOLVE THIS!

PROBLEM No. 291

Jackson had a three-valve battery set which gave very good volume and he decided to add an additional speaker for use in another room. The existing speaker was connected direct in the anode circuit of the output valve and he accordingly decided that the primary of the speaker transformer would act as a choke for choke-feeding the second speaker and he therefore ran a single lead from the anode of the output valve to the distant room. Here he mounted two terminals, connecting one of these to earth, and he then joined the second speaker to the two terminals. When he switched on, however, he could obtain no signals. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 291 in the top left-hand corner and must be posted to reach this office not later than the first post on Tuesday, April 19th, 1938.

Solution to Problem No. 290.

Smithies overlooked the fact that by connecting the output terminals of his short-wave set to the pick-up terminals of another set he was applying the H.T. positive supply to the grid of his second set and this prevented signals. He should have joined a 1 to 1 transformer between the two sets.

The following three readers successfully solved Problem 289 and books have accordingly been forwarded to them: J. T. Shaw, 143, Agnes Street, Belfast; P. J. Munnery, 6, Stanstead Road, Forest Hill, S.E.23; R. Barrett, 179, Shepherds Lane, Dartford, Kent.

Coil Types and Connections—1

The Experimenters Show How Coil Connections, Although They Often Appear to Vary Considerably, are the Same in Principle, and are Easily Understandable

AS a change this week we are going to devote our notes to the less-experienced constructor. Many such have written to us recently, some of them suggesting that we might enlighten them on some of the more elementary matters, so that they will better be able to follow our other articles. Tuning coils appear to cause more confusion to the average beginner than does any other part of the receiver. This is not difficult to understand, owing to the great variety of coils available to the amateur set builder.

by The Experimenters

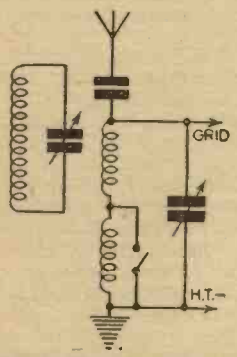


Fig. 1.—The simplest type of tuning circuit. On the right is the diagram relating to a two-range coil.

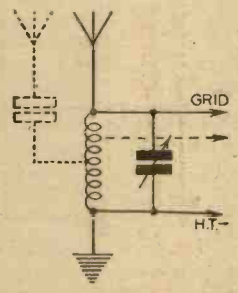


Fig. 2.—Selectivity can be increased by connecting both aerial and grid to tappings on the tuned winding.

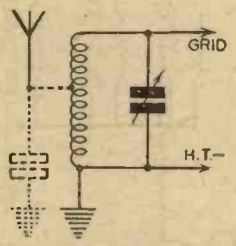


Fig. 3.—The capacity to earth of the aerial has the same effect as an additional fixed condenser in parallel with a portion of the tuned winding.

Those who build a complete receiver to a published design cannot go far wrong, because they have a full specification of the exact parts required. On the other hand, a reader who wishes to try out a new circuit often finds considerable difficulty in obtaining the correct connections for a coil that might be on hand, and which probably varies slightly from that shown in the diagram to be followed.

Interchangeability

Fortunately, the majority of the coils available can be interchanged in experimental circuits due to the fact that they are fundamentally the same. But since there is such a variety of terminal number connections and so many different methods of using those connections confusion arises.

Fig. 1 shows the essential arrangement of the simplest type of coil. It consists merely of a winding of wire which, in use, is connected in parallel with a variable condenser which serves for tuning. The combination forms what is known as an oscillatory or tuning circuit. In the simplest form, one end of the tuned circuit is joined to the grid of the following valve, the other being connected to the earth line. In a short-wave circuit there is generally a single tuned winding, but for broadcast reception the coil usually consists of two windings in series with a switch arranged to short circuit the larger winding when receiving on the medium-wave band. This also is shown in Fig. 1, and can be considered as identical in principle with the single tuned winding also shown.

Combined Input-Output Circuit

The one (or double) winding is frequently used for both input and output. In other words, not only is it connected to the following valve, but also to the preceding one or to the aerial and earth. The simplest method of connecting the aerial is by joining the lead-in to the same end or terminal of the coil as that from which the grid lead is taken. In order to prevent the full capacity of the aerial-earth system from being placed in parallel with the coil, and thus with the tuning condenser, a fixed condenser of about .0001-mfd. is generally included in series with the aerial lead, as shown on the right in Fig. 1.

Aerial "Damping"

Provided that the condenser capacity is low, the connection of the aerial has only a very slight effect on the wavelength to which the oscillatory circuit will tune. This assumes a fairly short aerial. But if the aerial is fairly long it is nearly always better to connect the lead-in—through a small-capacity fixed condenser—to a tapping on the tuned winding, as shown in Fig. 2. This connection is indicated by broken lines, the connection first mentioned being shown in full lines.

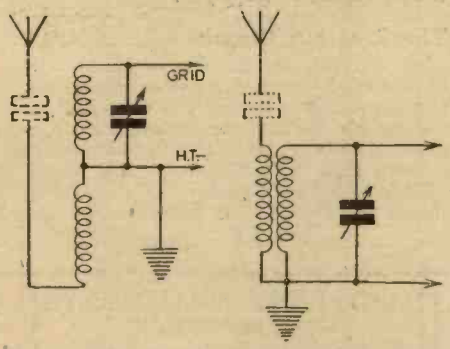


Fig. 4.—Although they appear different, these circuits for a separate aerial winding are identical.

The effect of using a tapping is to reduce what is known as "aerial damping." In other words, it gives the same result as shortening the aerial, as far as added capacity is concerned, and so produces sharper tuning. What is more, the nearer the aerial tapping is moved toward the earth end of the coil, the smaller is the damping effect. This is shown in Fig. 3, where the capacity of the aerial system is represented by a fixed condenser in broken lines. It will be clear that when the aerial lead-in is near the "top" of the winding the capacity is in parallel with a large proportion of the total winding; when it is near the "bottom" of the winding, the capacity is across comparatively few turns, and thus has a smaller effect on the coil as a whole.

Grid Tapping

The tuning circuit is also "damped" to a certain extent by the valve connected on the output side, since the valve represents a combination of resistance and capacity in parallel with the tuned circuit. That explains why tuning is sharpened by connecting the grid to a tapping on the winding instead of the upper end. A tapped grid connection is indicated by a broken line in Fig. 2.

Two Windings

Another method of obtaining a result similar to that produced by connecting the lead-in to a tapping on the coil can be obtained by using a separate aerial winding, as in Fig. 4. The aerial winding—often called a loose-coupled winding—is, in effect, a continuation of the tuned winding. If it has a fewer number of turns than the tuned winding an increase in selectivity is produced. Actually, selectivity might well be increased if the two windings were the same size, especially if the two windings are not very close together; this is because the oscillations in the aerial winding pass to the tuned winding and to the input circuit of the valve through a combination of capacity and inductance coupling. There are two diagrams in Fig. 4, and although both appear different they are identical in principle and effect. The first diagram shows that if both windings are wound in the same direction, the aerial must be connected to the "bottom" of one and the "top" of the other. If you study the two diagrams, you will see that the aerial winding in the second has simply been "bent" to give a better impression of the usual disposition of the two windings in an actual coil.

(Continued overleaf)

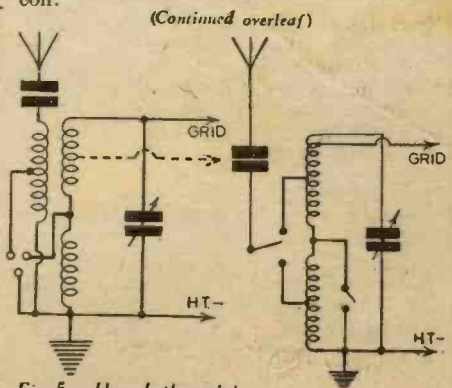


Fig. 5.—How both aerial and grid winding can be tapped, a section of each being short-circuited for medium-wave reception.

Fig. 6.—This tuning circuit is the same in principle as that shown in Fig. 5.

COIL TYPES AND CONNECTIONS

(Continued from previous page)

Double Tappings

An elaboration of the Fig. 4 arrangement is shown in Fig. 5, which applies to a dual-range tuner with separate aerial winding. A three-point wave-change switch is used, this short-circuiting a portion of each winding for medium-wave reception. Even this circuit can be further elaborated by having a grid tapping on the tuned winding, as shown by a broken line.

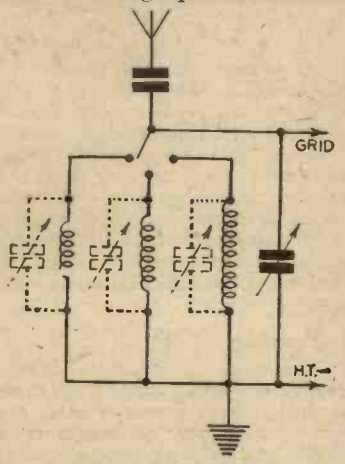


Fig. 7.—A simple method of all-wave tuning by using three separate coils with a three-way switch.

A corresponding circuit which produces a similar result in a different manner is shown in Fig. 6. In this case both medium and long-wave sections of the tuned winding are tapped, a change-over switch being used to transfer the aerial connection from one to the other. This switch is ganged with the shorting switch across the long-wave section of the tuned winding, so that two alterations are made by one movement of the combined switch. It will not be difficult to appreciate that if either of the circuits shown in Fig. 5 or Fig. 6 were shown in a complete diagram, the other could generally be used without altering the performance of the receiver to any appreciable extent. In the same way, Fig. 2 and 4 circuits are generally interchangeable.

All-wave Tuning

When we come to consider all-wave tuning circuits the same general principles hold good. Thus it can be seen that the circuit given in Fig. 7 is essentially the same as that represented by the full lines in Fig. 2. In Fig. 7, however, provision is made for bringing any one of three windings into use by means of a three-way wave-change switch. This simple circuit is not always satisfactory because it cannot conveniently be used with tapped coils, and the grid cannot well be "tapped down." In the circuit under discussion it will be seen that pre-set condensers are shown by broken lines in parallel with each of the three windings (generally separate coils). These are required only in a set having two or more tuning circuits controlled by a ganged condenser. The condensers are trimmers, and their purpose is to enable the corresponding coils to be matched so that accurate tuning can be obtained by means of the ganged condenser.

A better and more usual arrangement is that in Fig. 8; it is essentially the same as the circuit given in Fig. 4, but comprises three two-winding coils instead of one. There is a double three-way switch used to connect the aerial to any one of the three aerial or primary windings when the grid is joined to the corresponding secondary or tuned winding. As before, a pre-set condenser would be connected in parallel with each of the three tuned windings if ganged tuning were to be employed.

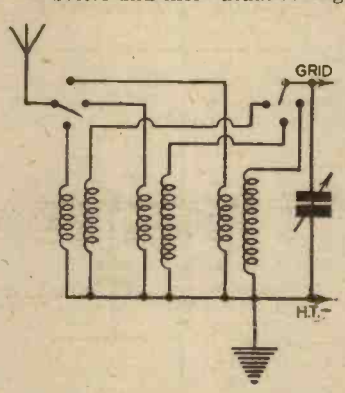


Fig. 8.—An improved form of the all-wave tuning system shown in Fig. 7. In this case each tuned winding has its own primary or aerial winding.

The Reaction Circuit

In the circuits so far considered no attention has been given to the reaction winding which is generally used on the coil feeding into the detector. A simple arrangement of this is given in Fig. 9, where it can be seen that the reaction winding corresponds with the separate aerial winding shown in Fig. 4; in other words, the winding is virtually a continuation of the tuned winding, the "upper" end being joined to the earth line and the lower to the detector anode, through the reaction condenser. In many coils the three connections shown in heavy lines are made inside the coil, so that no variation in the method of connection is permissible.

In other coils the three windings are entirely separate from each other, as shown in Fig. 10. In this case it is sometimes possible to obtain increased selectivity by connecting the earth lead only to the aerial winding, as shown. At the same time, it is usual to join together the "bottom" ends of these two windings in the interest of stability; the connection is shown by a broken line.

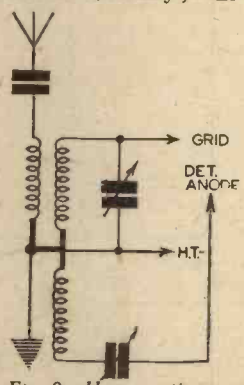


Fig. 9—How reaction connections are made when all three windings are internally joined together. Heavy lines show the connections that are made inside the coil.

The chief advantage of the separate windings is that the reaction connections can be modified by joining the "bottom" of the reaction winding directly to the detector anode, including the reaction condenser between the "top" of the winding and earth. By doing this the reaction condenser is at earth potential and there is less risk of hand-capacity effects being troublesome.

In this article we have dealt only with the simpler forms of tuning circuit and coil, but in a later one we hope to go more fully into this interesting question by explaining more-advanced and complicated coil arrangements.

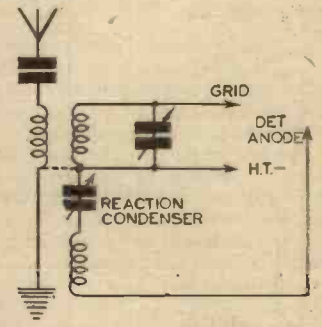


Fig. 10.—The same circuit as that in Fig. 9, but using entirely separate windings for aerial, grid, and reaction.

IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)

Wednesday, April 13th.—Boxing: The Services Tournament; a commentary on the final stages of the Imperial Services Boxing Association Tournament, from the Empress Hall, Earl's Court.

Thursday, April 14th.—Military Band programme.

Friday, April 15th.—The Dream of Gerontius (Elgar), from the Queen's Hall, London.

Saturday, April 16th.—International Junior Football: a commentary on the match, Scotland v England.

REGIONAL (342.1 m.)

Wednesday, April 13th.—Faust: a lyric drama in five acts by Charles Gounod.

Thursday, April 14th.—Gallery Goddess: a romantic comedy of the Theatre, by Joyce Lustgarten.

Friday, April 15th.—Fact or Fiction? Mermaids, an enquiry into their existence, written by R. F. Delderfield.

Saturday, April 16th.—Vivanti, a play from the book by Sydney Horler.

MIDLAND (296.2 m.)

Wednesday, April 13th.—A song recital.

Thursday, April 14th.—An eye-witness account of The Maundy Thursday Ceremony at Wicken, Northants.

Friday, April 15th.—Music from the Gilbert and Sullivan Operas: Orchestral programme.

Saturday, April 16.—Easter Carols and Hymns: Choral and orchestral programme.

WEST OF ENGLAND (285.7 m.)

Wednesday, April 13th.—Les Dames Blanches: A Radio Roadhouse—variety programme.

Thursday, April 14th.—Westward Ho! No. 8, of a radio magazine.

Friday, April 15th.—Music of Other Countries, No. 9—Russia: choral programme.

Saturday, April 16th.—Mrs. Proudie and her times, read by V.C. Clinton Baddeley.

NORTHERN (449.1 m.)

Wednesday, April 13th.—Not very long ago: first of a fortnightly series of talks.

Thursday, April 14th.—Gallery Goddess, a romantic comedy of the theatre, by Joyce Lustgarten.

Friday, April 15th.—Instrumental programme from the Hotel Majestic, St. Annes-on-Sea.

Technical Fundamentals—5

H.F. Coupled Circuits, including Transformer and Aerial Couplings, are Discussed in This Article.

EVEN the simplest of receivers normally incorporate at least one example of H.F. coupling, while in more elaborate assemblies not only may there be a number of H.F. couplings, but the performance of the receivers concerned will be very dependent upon the design and adjustment of these.

As already stated, the coupling of two circuits involves some form of impedance common to the two circuits. Fig. 11 illustrates a case where two circuits, L1, L, C1, and L2, C2, L, have the inductance coil L in common. This form of coupling is known variously as "direct" coupling

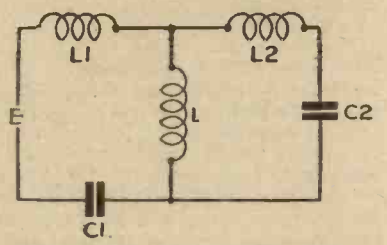


Fig. 11.—Two coupled circuits with a common inductance.

or "auto-inductive" coupling. In Fig. 11, and the succeeding diagrams, E represents the source of e.m.f., so the left-hand circuits must be regarded as primary circuits, and the right-hand ones as secondary circuits.

In Fig. 12 the common coupling impedance is formed by the condenser C, which is obviously part and parcel of the two circuits. This is a case of capacity coupling.

Fig. 13 illustrates a case where the diagram itself actually shows nothing that is common to the two circuits, but if the coils La and Lb are so disposed in relation to each other that current in one produces a magnetic field which threads through the turns of *both* the coils, then this magnetic field provides the coupling. It will, as a matter of fact, be a case of mutual inductance coupling (sometimes referred to under the simple title of "inductive" coupling).

Figs. 11, 12 and 13 cover very commonly used forms of coupling, although they must not be looked upon as being a complete survey of all possible cases.

The three examples given merit very careful consideration. First we must have a clear understanding as to how the primary circuit excites the secondary. With auto-inductive coupling (Fig. 11) the primary current passing through L sets up a voltage across the latter which, ignoring resistance, is equal to ωLI volts.

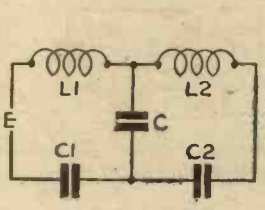
where ω=6.28 x frequency (in cycles per second),
I=primary current (amps.),
L=inductance of coupling coil (henrys).

As far as the primary circuit is concerned ωLI volts represents the inductive reactive voltage in L. To the secondary circuit, however, this voltage acts as the injected e.m.f., and will set up a secondary current the value of which will be dependent upon the values of the voltage and of the effective secondary impedance.

With capacity coupling (Fig. 12) the secondary e.m.f. is the voltage established across C by the primary current and is equal to $1/\omega C \times I$, or $I/\omega C$ volts (C being in farads).

In the case of mutual inductance coupling (Fig. 13), the secondary e.m.f. is the voltage electromagnetically induced into the secondary by the primary current and is equal to ωMI volts, where M is the mutual inductance, in henrys, and I is, as before, the primary current.

At this stage it is advisable for us to look into the matter of degree of coupling. Suppose there were two separate coupling cases, both involving a similar kind of coupling, but that in one case a small value of primary current produces (comparatively speaking) a large secondary output, while in the other case a large primary current produces only a small secondary output, then although the couplings are of similar type, there is obviously a difference of degree. How can the degree of coupling be expressed? The matter is not quite so simple as first ideas might suggest, for, actually, it is not only the value of the coupling impedance that must be taken into account, but also the values of the impedances (of the same kind as that forming the coupling) which are present in the circuits, but which do not happen to be common to the two circuits. In the case



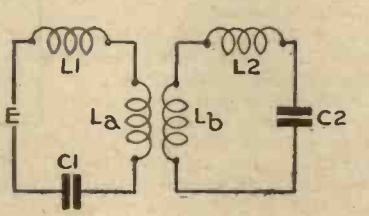


Fig. 12 (left) Two circuits with common coupling impedance.

Fig. 13.—Two circuits with magnetic coupling.

of Fig. 11, for instance, the degree of coupling depends not only upon the common impedance ωL, but also upon the values of ωL1 and ωL2. (Note: resistance is neglected here.)

It is customary to express the degree of coupling as a ratio. For Fig. 11—

$$k=\frac{L}{\sqrt{(L1+L)\,(L2+L)}}$$

For Fig. 12—

$$k=\frac{\sqrt{Ca\ Cb}}{C}$$

where Ca=joint capacity of C1 and C in series
and Cb=joint capacity of C2 and C in series.

For Fig. 13—

$$k=\frac{M}{\sqrt{(L1+La)\,(L2+Lb)}}$$

k is known as "coupling coefficient," or "coupling factor." Sometimes it is given in percentage form (simply multiply k by 100).

The larger the value of k the "tighter" is said to be the coupling; the smaller the value of k the "looser" is the coupling.

Certain similarities of form will be noticed in the three cases, but the common capacity case, $\sqrt{Ca\ Cb}/C$ has an upside-down character about it compared with the other two. This arises quite simply as a consequence of the fact that, with common capacity coupling, the larger the value of the coupling condenser, the *smaller* is its reactance $1/\omega C$ and, therefore, the looser is the coupling.

The Tuned Secondary H.F. Transformer (Intervalve)

We will start with the case of the H.F. intervalve transformer (see Fig. 14). The untuned primary circuit somewhat simplifies this case, and it will be a good example to start with.

Fig. 16 is the theoretical equivalent of Fig. 14. Ra represents the anode A.C. resistance of the valve V1. M indicates that there is mutual inductance between the two circuits.

As neither diagram directly shows any inductance in the two circuits, apart from the two coupling coils, it may appear at first that there is 100 per cent. coupling. This will not be the case, however, because there will necessarily be magnetic leakage, i.e., there will be a certain number of magnetic lines of force which will not thread through all the turns of both the coils. To move the coils farther apart, so as to increase the magnetic leakage, is, of course, one way of loosening the coupling.

As a matter of interest it should be noted that if the coupling were to be 100 per cent., then M would equal $\sqrt{L1\ L2}$ (ref. Fig. 14).

We now come to a very important fact about coupled circuits. When two circuits are coupled together, each one affects the other as regards tuning and impedance so that neither behaves exactly as it would if it were isolated. In connection with Fig. 14, and as regards the influence of the secondary circuit upon the primary, we need only consider the case in which L2 C2 is tuned to resonate at the frequency of the e.m.f. which is induced into it by the primary. This would be the normal circumstance, in reception.

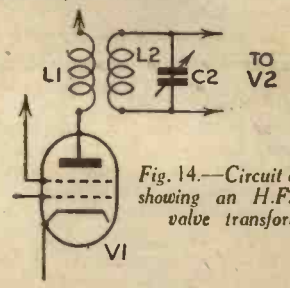


Fig. 14.—Circuit diagram showing an H.F. intervalve transformer.

The primary current sets up a secondary e.m.f. equal to ωMI_1 volts (where I_1 is primary current). As the secondary is in resonance its impedance will simply be R2 (R2 representing the H.F. resistance of the secondary circuit), so the secondary current will be $\omega MI_1/R2$ amps.

There is nothing to stop this secondary current utilising the coupling to induce

(*Continued overleaf*)

TECHNICAL FUNDAMENTALS

(Continued from previous page.)

a voltage back into the primary, and it does do so, this voltage being ωMI_2 (where I_2 is secondary current). This "new" voltage operating in the primary has the direct result of putting up the primary circuit opposition. Actually, the effect is just as though the secondary circuit had thrown an extra value of resistance into the primary. This resistance (sometimes called the "reflected" secondary resistance) is equal to $(\omega M)^2/R2$ ohms and, with a low loss secondary circuit, can very greatly modify the conditions in the primary.

Since Fig. 14 represents an H.F. amplifying stage there are two factors in which we need to be particularly interested, in view of their practical importance. The first is the value of the voltage that is developed across C2. This is the voltage that will be applied as input to the succeeding valve. The second is the selectivity of L2 C2.

It will need little thought to appreciate that the greater the amplitude of the oscillations in L2 C2 the greater will be the voltage built up across C2. This implies that the greater the H.F. power that can be introduced into L2 C2 the greater will be the output voltage of the stage. Coming back a step, the greater the H.F. power in the primary the greater will be that in the secondary. The transformer primary represents a power consuming load on the valve V1, so it becomes obvious that the matter of anode circuit power efficiency is important.

Before investigating the optimum conditions from this point of view it may perhaps be advisable to emphasise that all this talk about power is not contradictory to the idea of the stage illustrated by Fig. 14 being an H.F. *voltage* amplifying stage.

As regards the primary circuit, there is the anode A.C. resistance (Ra) of the valve V1, and also the effective load resistance set up by the H.F. transformer primary. This load resistance is made up of the H.F. resistance of the primary itself plus the reflected secondary resistance. The reflected secondary resistance is so very much greater than the H.F. resistance of the primary itself that the latter can be neglected in comparison. So we have an internal valve resistance of Ra ohms, and an external load resistance of $(\omega M)^2/R2$ ohms, approximately. Under what conditions will there be maximum H.F. power developed in the load and, consequently, the maximum H.F. voltage developed across the secondary? The optimum condition is that the internal and load resistances should be equal, i.e., that $(\omega M)^2/R2$ should equal Ra.

Since the reflected secondary resistance, which we are taking as approximately representing the load resistance, is very dependent upon the closeness of coupling, it follows that there is an optimum degree of coupling for maximum stage amplification.

The question of selectivity, however, introduces a complication. The selectivity of the tuned secondary is lessened by the presence of the primary circuit, and as far as selectivity is concerned, the primary circuit must be regarded as a damping load upon the secondary. To be more exact, the primary circuit reduces the selectivity of the secondary circuit to the extent that would be caused by an extra H.F. resistance of $(\omega M)^2/Ra$ thrown into the secondary. This brings to light two interesting facts: (1) The resistance (Ra) of the valve has a considerable bearing upon the selectivity, and (2) Selectivity, as well as amplification, is dependent upon the coupling. Selectivity, however, progressivly improves with loosening of the coupling.

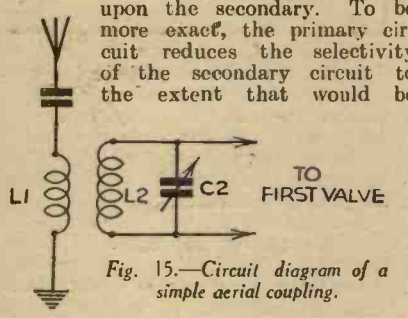


Fig. 15.—Circuit diagram of a simple aerial coupling.

It has, perhaps rather maliciously, been said that Radio is "the art of compromise." Be that as it may, a compromise is certainly called for with an H.F. transformer of the Fig. 14 type. If the coupling were to be designed for maximum amplification the selectivity would almost certainly be too low, and it is customary for the coupling to be made rather looser than the amplification optimum.

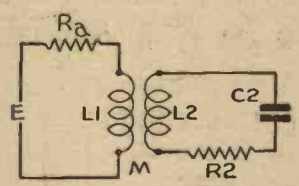


Fig. 16.—This diagram represents the theoretical equivalent of Fig. 14.

Aerial Coupling

We can see from the foregoing that the main object of using a tuned secondary H.F. intervalve transformer is to obtain satisfactory selectivity and, at the same time, as near to maximum signal amplitude as it is possible to get, consistent with the selectivity requirements.

The familiar aerial coupling system of Fig. 16 has much the same ideas about it. The H.F. resistance of an aerial circuit is necessarily rather high. Quite apart from the possibility of their being, in some cases, heavy losses due to inefficient rigs, the aerial circuit is of the open oscillatory type and must therefore have radiation losses.

By using L2 C2 (Fig. 15) we gain the selectivity of this closed circuit, lessened, however, by the H.F. resistance of the aerial circuit in so far as it is "reflected" into the secondary. The value of this reflected resistance will decrease, the looser the coupling. There is here, too, an optimum coupling value from the signal strength point of view, but it is normal to use looser coupling than this, in the interests of selectivity.

The case of Fig. 15 is actually somewhat more complicated than that of Fig. 14. In the H.F. transformer case that we considered we had an untuned primary. This primary must, of course, possess a resonant frequency, but this will normally be very much removed from any of the signal frequencies. This fact, allied with that of the presence of the very high valve resistance in series with the primary, enabled us to ignore any influence of the primary upon the secondary tuning.

Secondary Tuning

In the aerial coupling case the secondary circuit is variably tuned. The aerial circuit is not variably tuned. Its natural frequency will be partly dependent upon the inductance value of L1, but in the most common cases the natural frequency of the aerial circuit will be higher than any of the signal frequencies. The fact that the aerial circuit's natural frequency is not very far off signal frequencies has the result that the tuning of the secondary circuit is somewhat affected by the aerial circuit.

In a case where the signal frequency is "below resonance" in the aerial circuit, the capacity reactance will exceed the inductive reactance and, as a consequence, the aerial circuit will have an essentially capacitive character. The effect upon the secondary circuit will now be as though a little extra capacity had been "reflected" into it. Unfortunately, the magnitude of this effect varies with frequency. This does not matter at all if the secondary circuit is individually tuned, but it complicates matters when the circuit is gang-tuned with others. It is to be noted that the influence of the aerial circuit upon the secondary tuning will decrease with loosening of coupling.

"Bedside Anthology"

MR. JOHN C. MAUDE, well known to many listeners for his microphone readings, talks and radio discussions, will give the first of a new monthly series of broadcasts in the Regional programme on April 25th.

The series, which is entitled "A Bedside Anthology of Diaries and Letters," is intended to provide the sort of quiet fare that many people may fancy just before turning in. The broadcasts will, in a sense, be a kind of radio bedside book.

Mr. Maude's broadcast in April will consist of readings fron notable diaries and letters written during that month in past years. The same idea will be carried out in each of the subsequent broadcasts.

PROGRAMME NOTES

Red Marley Hill Climb

ANNUALLY on Easter Monday the Red Marley Hill Climb for motor cycles draws large crowds to the Abberley Hills in Worcestershire. The event is organised by the Birmingham Motor Cycle Club, and was first held in 1928. Many famous riders take part, ascending this freak hill in pairs. In the middle is a stretch with the terrifying gradient of one in one-and-a-half. Graham Walker, the former crack rider, will be the commentator.

This broadcast will be given in the Midland Regional programme.

Old English Melodies

FROM a collection of old English tunes made by Dr. Desmond MacMahon, a programme has been chosen for performance by the B.B.C. Midland Orchestra, conducted by Dr. W. K. Stanton, on April 18th. The vocalist will be Robert Easton, the well-known bass. Altogether Dr. MacMahon has collected nearly a thousand old tunes dating from before 1800. Some are purely instrumental and others are vocal with instrumental accompaniment.

Bristol Ensemble

THE Bristol Light Ensemble is composed of a string quintet and pianoforte, and its aim is to play the better type of light music, as opposed to jazz. This combination will make its debut in the West of England programme on April 21st.

ON YOUR WAVELENGTH

By Thermion

The Ray Again

I HAVE only to pen a paragraph about rays or crooners, when one of my argus-eyed critics, who seem to be on the look-out for me to drop a brick, turns my paragraph upside down, inside-out, reads between the lines, places his own interpretation on my words, subtracts the meaning of my paragraph, multiplies by the hatred of my hatred of crooners, and divides by his estimation of his own intelligence, and writes me a snorter telling me exactly where I alight. We have units for everything nowadays, except intelligence, and I am now trying to think up some unit of intelligence, so that I can appraise my critics accordingly.

The other week I wrote a paragraph about the drivel which appeared in daily papers from time to time about remarkable rays which would stop aeroplanes and motor-cars, and I stated the fact that a ray cannot do this, nor affect a human being in any way. One of my readers H. T. G., of S.W.14, has gone all berserk over this, and has penned a letter which he thinks excruciatingly funny. I have read it several times, and presume that he could not have read my paragraph correctly. I accentuate, underline, and emphasise my paragraph by repeating that these so-called rays *cannot affect a human being in any way*. I was not referring to ultra-violet rays or any other of the rays—not even the ultra-violet rays which the hairless barber retails to you at about 5s. per second with the assurance that it will stop you from going bald. I think it is time that the British Medical Council put a stop to this nonsense. I therefore advise H. T. G. to get out the ashes and sackcloth.

The Scots Protest

ONE or two of the few remaining Scots who still reside in Scotland have written to me protesting that the majority of Scots people have up-to-date sets, and do not wish to depend upon foreign programmes for the greater part of their wireless entertainment. They assure me that the Scots are not according to the well-known jokes, and that they are not afraid to spend when their comfort or pleasure is concerned; they protest that the National programme cannot be received over the district it is intended to serve. However, as I write this, I believe that an army of them is marching down South to voice their protests in person. One of them says that he has a high-class six-valve set, and that when listening to the Scottish National the quality is bad, and sometimes the transmission bursts into an ear-splitting blast. If he switches over to Droitwich there is a terrible amount of interference. It is too bad, and I hope the B.B.C. will do something about it.

Joke

THIS joke comes from Scotland. Three men were sitting in a railway carriage, and they were discussing wireless. One said: "I connected my neighbour's and my own aerial together and I got China." I won't tell you the answer, but I offer a book for the best received by me not later than Monday next. Readers who send me the obvious answer about Chile will get H——!

The Spelling Bee

AN Irish reader (that's a good one) is disappointed because in my paragraph about the Spelling Bee I referred to pronunciation. This reader, however, spells it *pronounciation*! There's a critic for you. On second thoughts I am in favour of this spelling bee business. He thinks that it is too sweeping to say that you can find a dictionary to agree with your spelling, and as far as the word pronounciation is concerned I agree with him. I recommend this reader to listen in to the Spelling Bee quite a lot. My point was that the work of compiling a dictionary should be in the hands of a Government department. It is impossible to believe that every lexicographer never makes a mistake, and every dictionary must therefore contain a mistake either in spelling or pronunciation. Additionally, what is to prevent the compiler of a dictionary inventing a few words of his own? I see that someone can spell words backwards better than most people can spell them forwards. How comic it is to reflect that several Continents can be linked up by radio by such a childish game as this!

Television

NOW that the television programmes are developing in duration I hope they will develop in quality. A gang of my special cronies invaded my den to see the broadcast of the Grand National. Presented on the screen was a map of the entire course, and a pointer was used to illustrate the remarks of the commentator. It would have been much better to have shown snatches of the race by means of the delayed television system. It was not a good performance, and my friends, who had not witnessed a television demonstration before, were not impressed. Nor were they with the programme which followed. Regarding these broadcasts, I have had a number of letters from readers protesting that only Englishmen should be allowed to act as commentators on an event so obviously English as the Boat Race which was first inaugurated in 1829. Surely, there are Englishmen who can describe English events?

The dealer seems to be doing very little to help television, and until he does so he cannot expect sales. The average dealer wants the manufacturer to do all the work, whilst he sits behind his counter smoking a pipe, or dangling a cigarette limply from the lower lip, handing out the goods at a fair margin of profit. I suggest that the television manufacturers should appoint one reliable dealer in each district to handle television. He would soon corner not only the television business of the district but the radio side as well.

Blackburn's New £100,000 Factory

ON Wednesday, March 30th, the Mayor of Blackburn, Alderman James Fryars, J.P., laid the foundation stone of the new £100,000 factory of Philips Blackburn Works,

Limited, which is now in course of erection on a 32-acre site at Whitebirk Drive. Supporting the Mayor were Sir Alan Hutchings, K.B.E., Chairman of the Company; F. J. Philips, Esq., Director of Philips, Eindhoven; H. N. Grundy, Esq., O.B.E., Divisional Controller, Ministry of Labour, and J. Visman, Esq., Managing Director of Philips Blackburn Works, Ltd.

To the eagerly watching crowds there was a good deal more in this simple act than the symbolism usually associated with such ceremonies. It represented the practical realisation of their hopes of new employment and better times after the grim depression which has for so long lain heavily over this part of Lancashire. At the luncheon at the Town Hall which followed the ceremony, the Mayor expressed the gratitude of the Corporation and people of Blackburn to the company for what this new development would mean to them. Obviously the full employment capacity of the new factory would only be realised as time went on, but its establishment had had an immediate effect on Blackburn employment.

Apart from the erection of the factory buildings themselves, the development of the site involved the construction of an entirely new road, and this had already been the means of providing immediate work for skilled and unskilled workers.

Responding, Mr. F. J. Philips paid a tribute to the excellent co-operation they had received from the authorities, and particularly from the Blackburn Industrial Development Committee. In making Blackburn their choice for the new factory, they had been very favourably impressed with the type of labour that was available. Proposing "The Corporation and Trade of Blackburn," Sir Alan Hutchings said that he looked forward to a development comparable with that which had taken place at their factory at Mitcham, Surrey, which started in 1928 with only a few hundred workpeople, and which today gives employment to nearly 5,000.

The physical and social well-being of their workpeople had always been an essential part of the Company's policy, and he felt sure that the Blackburn workers would be as happy and contented as those at Mitcham.

Triumphant Over Difficulties

THOSE viewers who had the opportunity, as I did, of witnessing the first televising of the Oxford and Cambridge boat race must join with me in congratulating the B.B.C. on the way they triumphed over unexpected difficulties. A blustering windy day more typical of March than April started the trouble, and when Elizabeth Cowell appeared on the screen she had to ask the indulgence of viewers because telephonic communication with both Broadcasting House and the river had broken down owing to the Post Office telephone lines being damaged. The sound accompanying the vision transmission from Alexandra Palace was therefore the London National station commentary received by radio and re-radiated as the sound modulation on the ultra-short-wave carrier of 41.5 megacycles. On a large chart in the studio we saw Elizabeth Cowell rather nervously move the model boats along the river route in accordance with the positions given by the B.B.C. announcer on the river launch, and then as the two University craft approached the winning post a fade over was made to the television cameras admirably positioned on the river bank. All the intimacy of the historic occasion associated with this spot on the river came through with marvellous clarity—the triumphant Oxford crew, the exhausted Cambridge rowers, spontaneous interviews with some of the crowd near the boathouses, and finally a few words from each of the coxes. The obstacles which had conspired to wreck the B.B.C.'s effort had been overcome admirably, but that was not all. A film was taken of the race, and when the processed negative was being rushed to Alexandra Palace so as to be in time for the evening transmission the B.B.C. van was "gonged" twice for exceeding the speed limit.

Notes from the Test Bench

Intermittent Signals

A VERY common trouble experienced in mains receivers is that which gives signals of an intermittent nature. It is found very often that signals will suddenly die away, without any apparent reason. If the set is switched on and off quickly they are restored, or operation of the wave-change switch may also be effective in bringing back the signal. This trouble is generally found to be due to the fact that a condenser or an inductive component has broken down. When the set is switched on and off quickly, or the wave-change switch is operated, a surge takes place and this causes the broken ends of the components to move or the gap at the broken point to be bridged by an arc which ionises the air across the gap and provides conductivity. The fact that the wave-change switch or the on-off switch will restore the signals may also assist in locating the source of the trouble, as in some cases only one of these operations will prove effective.

Earth Connections

IN some short-wave receivers it may be found that performance is below average and is not brought to a high standard until earth return wires are all bonded. Although a metal chassis or common bus-bar may be employed it should be remembered that under certain circumstances such earth returns may form inductive loops which will introduce either instability or peculiar tuning effects. The same thing may also occur in the actual earth wire, where the earth is attached to a water or gas-pipe which eventually touches some other earthed body.

Calibrated Resistors

WHEN making test equipment, or during experimental work, it is often found necessary to make use of a standard or calibrated resistor which will enable other values to be ascertained. A standard wire-wound resistor may be provided with a scale marked off to provide equal divisions (taken from the physical characteristics of the component) or some of the specially designed commercial components may be used. Several manufacturers now supply resistors guaranteed accurate to ½ per cent., and these may be used for all such purposes.

Empire Exhibition

I AM informed that public address equipment incorporating 160 loudspeakers and 20 microphone points will be used at the Empire Exhibition at Bellahouston Park, Glasgow, from May to October. Part of this equipment, involving 30 loudspeakers and 5 microphone points, is a completely self-contained installation. It was recently supplied for the adjoining Ibrox Stadium, which will accommodate 120,000 people at sports, tournaments and tattoos in connection with the exhibition. The installation in the main exhibition grounds will form what is probably the largest and most comprehensive sound system of its kind ever used in Great Britain. The output will be 1,100 watts and, taking into account the feed amplifiers, this total will be increased to nearly 1,500 watts. All the necessary equipment is being supplied by The General Electric Co., Ltd.

REACTION CIRCUITS

The Principles and Operation of Regenerative Detectors are Briefly Explained in this Article

By R. J. STRICKLAND

THE regenerative detector circuit has made long-distance reception possible with the simplest of wireless receivers. It has always been standard practice in such receivers to employ the most sensitive of all regenerative detectors—the cumulative (or leaky-grid) detector with a capacity-controlled reaction circuit. In the arrangement given in Fig. 1 a typical circuit of this type is shown. The principles of the cumulative grid detector are well known, but a brief explanation of the reaction circuit will help the reader to appreciate points raised in subsequent paragraphs.

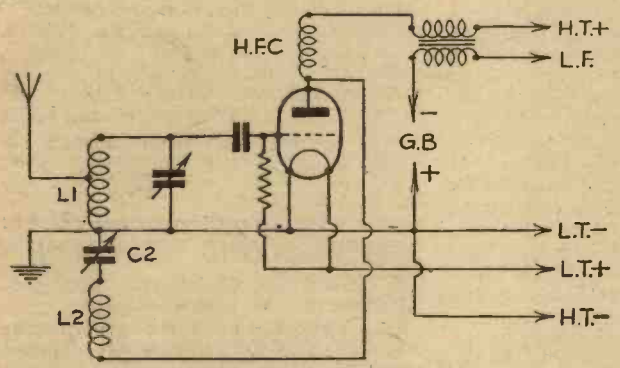


Fig. 1.—A typical cumulative grid detector circuit.

Reaction Circuit

The signal voltage on the grid of the detector (Fig. 1) is both amplified and rectified, but an amplified H.F. component still remains in the anode circuit. There are two paths in which high-frequency current may flow: either through the H.F. choke into the H.T. line, or through the reaction coil L2 and the reaction control condenser C2 to earth. The H.F. currents will flow through the path of least resistance which is L2C2. The impedance of C2 is given by $\frac{1}{\omega c}$ or $\frac{1}{\pi fc}$ ohms, and from this formula it can be seen that the larger the capacity of the condenser the lower its ohmic impedance. In other words, when the condenser C2 is at maximum, i.e., vanes closed, the path L2C2 will be of minimum resistance, and the flow of current will reach its greatest value. The reaction condenser, then, may be said to control the amount of H.F. current fed back from anode to grid circuit. The flow of an alternating current through L2 causes an alternating magnetic field to build up, and since L2 is coupled to L1 (both coils are normally wound on the same former) the field around L2 will induce an alternating voltage of the same frequency across L1 and if the reaction coil is wound in the correct direction this induced A.C. voltage will be in the same phase as the signal voltage, and will cause greater variations in anode current, i.e., an increase in the rectified detector output. This means that greater variations of grid voltage will be obtained—since the anode feed-back is greater—causing a further increase in anode power. The action is cumulative, and if the transfer of energy from anode to grid is great enough the stage will burst into self-oscillation.

Another way of considering the matter is to say that the H.F. resistance in the grid circuit has been decreased, or that various grid-circuit losses have been made good. Reaction, therefore, has the effect of improving the T.R.F. grid circuit, consisting of an inductance tuned by a variable condenser. Two outstanding advantages thus derived are:

1. Better selectivity.
2. Better sensitivity.

When a regenerative detector is used on the point of oscillation the selectivity and sensitivity of the stage are both at maximum.

On the type of receiver employing, say, a three-valve circuit, reaction is the only form of volume control available, and a serious disadvantage arises in consequence: if the reaction control is turned back to decrease volume the selectivity of the receiver falls off and adjacent-channel interference increases.

Constant Selectivity

This snag is partially overcome in some sets by employing a variable mu screen-grid in the first stage, and controlling the bias on its grid. The bias potentiometer then becomes the volume control, and the reaction condenser solely a selectivity control. This is quite a good method, but there is a better way in which constant selectivity is obtained irrespective of the setting of the reaction condenser. The circuit of Fig. 2 illustrates the circuit necessary for constant selectivity. It will be seen that there are two variable controls that affect selectivity—the aerial coupling condenser C1 and the reaction condenser C2. Both controls are ganged in the normal manner, so that when the one condenser is opened or closed the other is in the same position. When they are closed the detector stage should be oscillating, but if the reaction condenser is turned back until oscillation just ceases the detector circuit is operating at maximum selectivity (and sensitivity). But the aerial circuit is coupled to the grid coil through the large capacity of the condenser C1, which is almost closed, and the damping due to the aerial reduces the selectivity of the first stage. When it is desired that the volume be reduced the reaction condenser is turned back, and since they are both ganged the aerial coupling will be reduced. Consequently, the aerial loading on the first grid is lessened and the selectivity of the first stage increased. It will be seen that when the selectivity of the first stage is increased that of the detector is decreased, and vice versa.

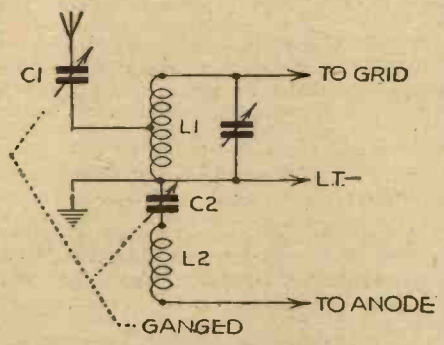


Fig. 2.—A circuit for providing constant selectivity.

Practical Consideration

A value of about .0005 microfarads is recommended for the aerial condenser, and the reaction condenser may be of any conventional value. Actually the capacity of C1, the aerial condenser, depends upon the position of the aerial tap, and this must be found by experiment and a position will be found that gives the best constancy of selectivity. The ganging of the circuits is a simple matter, as a mechanical coupling consisting of about an inch of metal tubing tapped at each end to allow two grub screws to be screwed through the metal tubing, and bear on the condenser shafts, serves admirably.

Smooth Reaction

In order that the system be used to fullest advantage it is essential that the reaction is efficient and allows smooth control. The circuit in Fig. 3 includes an H.F. filter in the anode circuit of the detector, and this, together with a mechanically sound reaction condenser, ensures very smooth control, and also lessens the damping of the grid circuit due to Miller effect.

It will be noticed that an H.F. stage is included in the circuit shown in Fig. 3: this is not essential but is merely shown to indicate the connections when such a stage is used before the detector. In this case it must be noted that C1 and C2, although ganged together, must be screened from each other.

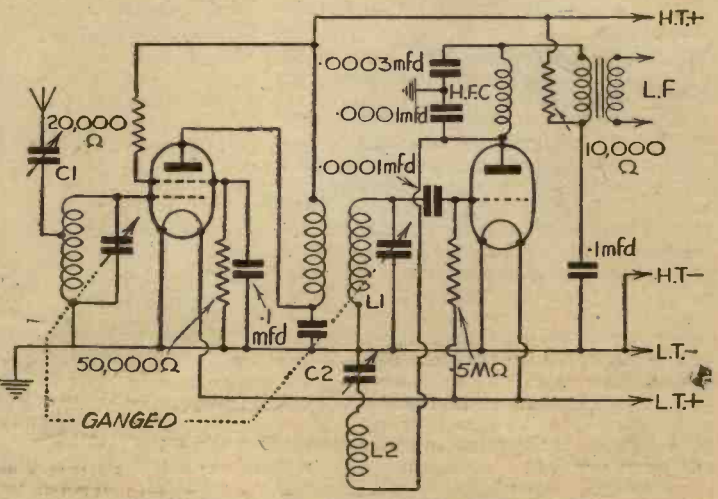
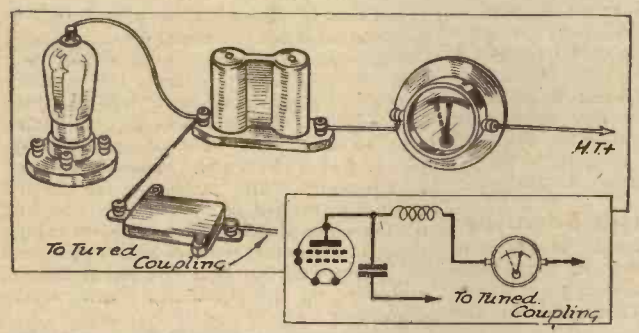


Fig. 3.—In this circuit an H.F. stage is employed.

THE BRITISH LONG-DISTANCE LISTENERS' CLUB

Meter Connections

IT is well known that the inclusion of a milliammeter in the anode circuit of a valve is one of the most satisfactory methods of testing a complete stage. If the H.T. voltage is first checked, the milliammeter will enable you to ascertain whether the anode circuit load is broken or short-circuited; whether the bias applied is correct (and incidentally whether an auto-bias circuit is working properly); whether the valve is up to standard, and many other details. To do all this it is, of course, necessary to have the valve-makers' curves at hand, but the meter alone will enable many tests to be made in the shortest possible time and with the minimum of difficulty. The fact which must be borne in mind when using a meter in this way is that it must be included on the earth side of the anode component. The accompanying illustration shows the arrangement, where an H.F. choke is included in an S.G. anode circuit, and it will be found in the majority of cases that the inclusion of the meter will not affect the performance of the receiver. If, however, instability sets in when the meter is included a large capacity fixed condenser should be joined across the meter terminals. Either 1 or 2 mfd. will be found suitable. The meter should, of course, be of the moving-coil type and have a low resistance.



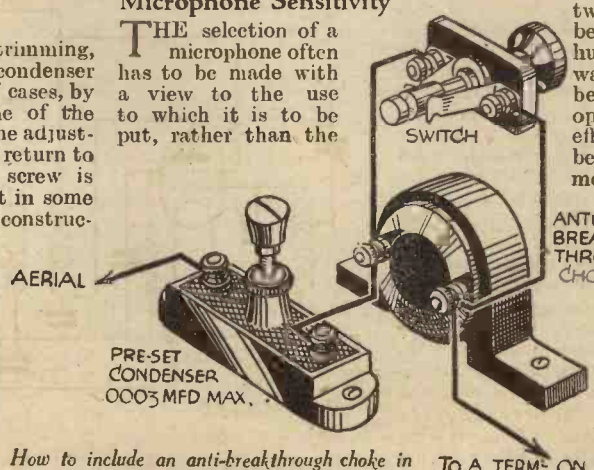
When using a milliammeter in an anode circuit it should be on the earth side of the anode load.

Trimmers

THE small condensers used for trimming, and mounted on gang condenser units, operate, in the majority of cases, by means of the springiness of one of the plates. This is depressed when the adjusting screw is tightened, and should return to its original position when the screw is released. It has been found that in some cases of receivers built by home-constructors continued adjustment of the screws has resulted in the springiness of the plate being destroyed, with the result that movement of the screw does not affect the capacity between the two sets of plates. In this case the trimmer should be dismantled and the upper plate bent so that it will open fully with the screw in the minimum position. Where the condenser has been so abused that the trimmer cannot be so repaired, one of the latest small ceramic trimmers should be mounted on the condenser or on the baseboard or chassis and wired to the condenser, but the position selected should be that which provides the very minimum of wiring between trimmer and condenser.

Breakthrough

MANY receivers are found to give disappointing results on account of what is now loosely referred to as "breakthrough." This term is applied to the trouble which causes medium-wave stations to be heard on the long-wave band; long-wave stations to be heard on the medium waves; medium or long-wave stations to be heard on the short waves, and also to the trouble met with in a superhet where a station or stations operating at the I.F. are heard at all settings of the tuning dial. In practically every case it will be found that the trouble arises from the fact that the aerial circuit resonates to the frequency of the station which breaks through. Consequently, the cure for these troubles is to modify the frequency of the aerial circuit, and the most suitable way of doing this is to fit a choke in series with the aerial. By using a medium-wave choke, medium-wave breakthrough will be avoided, and so on. As, however, the inclusion of the choke will affect the performance on the wave-band corresponding to the choke, a short-circuiting switch must be included across it so that it may be shorted when reception is desired on that wave-band. The accompanying illustration shows the idea, which will be found of great use with simple sets used in close proximity to a high-powered station, commercial code stations, and similar cases.



How to include an anti-breakthrough choke in the aerial circuit, with a switch to short-circuit it when not needed.

Microphone Sensitivity

THE selection of a microphone often has to be made with a view to the use to which it is to be put, rather than the general design of the instrument. Thus, many amateurs who wish to use a mike for some purpose obtain the most sensitive instrument they can afford, whereas it might be advisable to choose an insensitive instrument for their particular purpose. This fact is brought home at the moment by the announcement that the B.B.C. have had a special insensitive mike developed for the use of an announcer at outside broadcast events, where it is necessary for the announcer to be prompted with regard to various items.

The prompter is able to make his announcements in a normal voice which is heard by the commentator, but which is not picked up by the mike. Consequently, he is able to carry on his announcements through the mike without interruption, and incidental sound effects which are needed are provided by a separate mike situated some distance away, and the output from this is "mixed" by the control engineer. A device of this type might prove very valuable in a dance band, where two or more insensitive mikes could be placed in the various sections, and by having controls handy the rhythm section, for instance, could be given prominence in certain numbers, whilst the melody section could be emphasised in other numbers. A judicious blending of the outputs would result in perfect balance between the sections, no matter what type of hall was being used.

STEREOSCOPIC TELEVISION

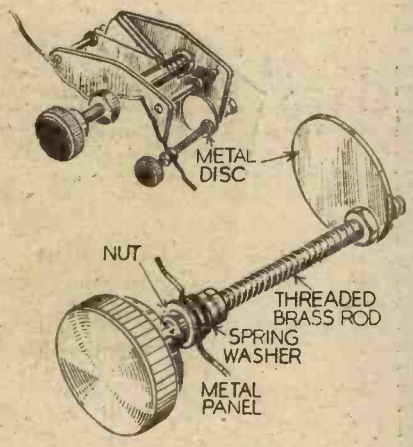
THE activities of Zworykin, the inventor of the Iconoscope, which gave television a much-needed fillip at the transmitting end, have now been turned towards the perfection of a scheme which aims at giving television pictures reproduced with all the advantages of stereoscopic relief. In normal human vision each eye sees a separate picture, and the combination brings about vision in three dimensions, or in other words scenes have depth, which is missing when either of the eyes is used alone. As far back as 1928 Baird experimented with stereoscopic television, using low-definition disc-scanning with two sets of spirally-traced apertures. The results obtained, although rather crude when compared with modern standards, definitely established that stereoscopic pictures were possible. Now Zworykin has advanced a stage further and applied his researches to images of a high-definition standard so that the results appear on the receiver screen as though they had depth, just as the original scenes televised would be seen by an eye-witness on the spot. To carry this into effect two transmitting tubes are employed, these being spaced apart the same distance as the human eyes. Each Iconoscope in this way sees a separate image of the scene being televised, and the conversion of these optical pictures into television signals is effected in the usual way by allowing the beam of electrons to scan the photo-electric mosaic. The actual scanning in each tube, however, is carried out alternately. That is to say, the tubes operate in turns, the beam in the first tube, for example, scanning the odd lines, while the beam in the second tube does the even line scanning. In this way each Iconoscope analyses alternately adjacent lines of the scene under observation, and the result is that two separate and distinct electrical pictures, corresponding to that which each eye of an observer would see, are broadcast over the usual ultra-short-wave ether channel.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

A Simple Trimming Device

WHEN listening on the short waves there is often some difficulty in tuning dead on the station to be received, and even with small variable condensers tuning is apt to be very sharp. For broadening the tuning, the simple device shown in the sketch will be found particularly useful with receivers, such as one-valvers and adapters, especially with metal panels, as no wiring is required.



An easily-made trimmer.

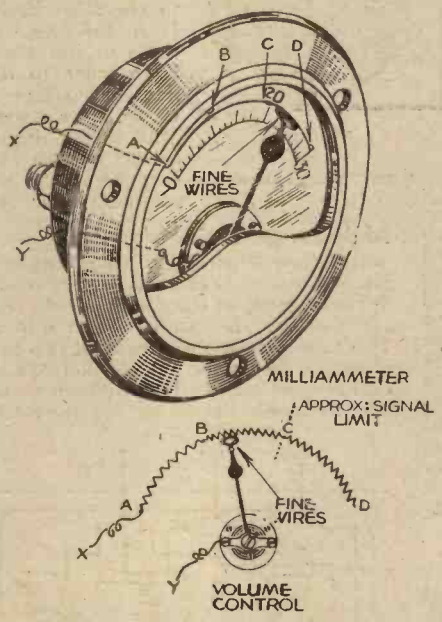
From the junk box take a piece of threaded brass rod, about 2in. long, several nuts to fit, two fairly large washers, a spring washer and knob, and also a piece of flat brass or copper. A hole is drilled into the metal panel close to the dial of tuning condenser, to take the threaded rod, as shown in the top sketch.

The piece of sheet metal, which should be filed to a disc about the size of a halfpenny, should be fitted eccentrically on the rod and fairly close to the fixed vanes of the tuning condenser. Set the small plate half in, tune in the ordinary way to the station you are receiving, and a touch on the controlling knob will bring the station nicely into tune.—J. HOOD (Wilmslow, Nr. Manchester).

A Novel Volume Control

HERE is a device that may be useful to other short-wave readers at night when the rest of the family prefers sleep. It is so arranged that on reception of a signal above a certain limit, the needle of a milliammeter, or an R meter (such as described in PRACTICAL AND AMATEUR WIRELESS some months ago), carrying a bunch of fine wires on one end, moves along a resistance wire and acts as a volume control. It cuts down the + signal to a certain limit while having no action on signals below that strength.

The element comprises three sections: AB a piece of wire of very low resistance in series with a length of fairly low resistance (BC) in series with a very high resistance (CD), the sections being nearest the zero of the meter in this order. If the resistance AD is bent to conform to the curve traversed by the end of the pointer, the signal strength limit can be increased by moving the resistance clockwise, and *vice versa*. In the construction of such an instrument as described it is important that the surface of the resistance AD should be level and parallel to the path of the needle, otherwise the latter may stick.—T. H. PHILLIPS (Shirley).



A combined milliammeter and volume control.

THAT DODGE OF YOURS!

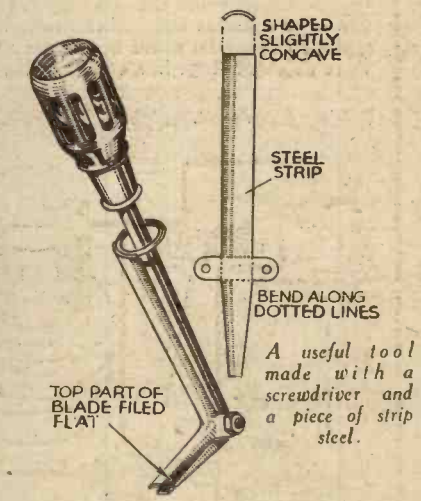
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

A Handy Tool for Awkward Corners

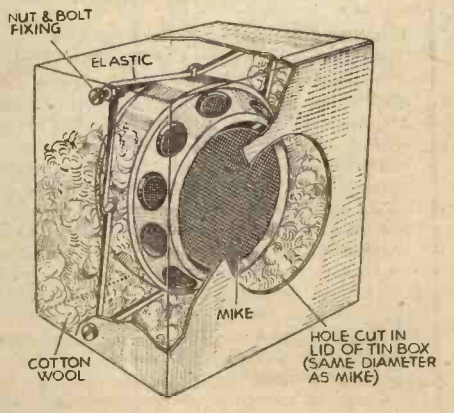
MANY uses can be found for the simple tool shown in the accompanying illustration. The only parts required are a strip of sheet steel and a screwdriver. After shaping the steel as shown the screwdriver is heated and the end bent at right angles, after which a hole is drilled through the bend. Next a ring of heavy gauge wire is soldered to the top of the steel part. The tool is completed by fixing the bent steel strip to the screwdriver with a small nut and bolt. This tool will be found useful for such jobs as holding small nuts in place, picking up blobs of solder, etc. With the steel jaw removed the bent driver is handy for removing stubborn valves from their sockets, adjusting trimming condensers, and many other little jobs where an ordinary screwdriver would be useless. —G. H. HUNTER (Ashington).



A useful tool made with a screwdriver and a piece of strip steel.

Mounting a Microphone

THE following dodge may prove useful to other A.A. licence holders who are using cheap carbon microphones. While using a microphone of this type I discovered that there was a very bad "echo" and boom effect on the speech. This was remedied as follows: I obtained a metal box of suitable size and mounted the microphone by spring suspension inside, as shown in the sketch. I then filled the box entirely with cotton wool.—H. J. BRITTON, Jnr. (Ladywood, Birmingham).



An effective method of mounting a microphone to avoid "boom" effects.

ALL-WAVE

A Description of the Evolution of the Modern Component May be Built U

IN the early days of broadcasting many receivers employed a single tuning band only, and this was subsequently modified so that a medium and a long-wave range could be employed. The idea originally was to enable alternative programmes to be obtained and to assist the listener in obtaining maximum volume—it being assumed that the long-wave signals could be easily obtained under practically any circumstances. Subsequently the short waves were explored and gradually broadcasting stations in various parts of the world utilised a short-wave band for signals intended for far distant countries. Short-wave receivers came into use and eventually it was found possible to receive both the short waves and the ordinary broadcast waves on a single set, one common way of doing so being to build a complete short-wave detector stage in a corner of the base-

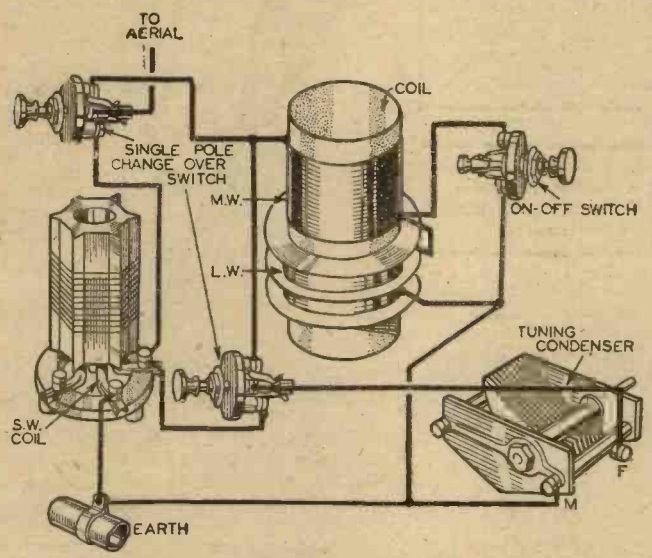


Fig. 1.—The basic arrangement for an all-wave tuning circuit, utilising separate standard components.

board and transferring the aerial from one section to another. It is not to be denied that this arrangement works with 100 per cent. efficiency and such a scheme is still recommended where it is desired to get maximum efficiency on all wavebands. Unfortunately a large and cumbersome lay-out is needed for such a scheme, and it is possible to make a receiver in which the change from one circuit to another is carried out by means of switches. In the simplest form this could consist of an ordinary medium and long broadcast coil and a standard 6-pin plug-in coil, with a change-over switch to bring either into circuit.

Circuit Design

This scheme is shown in Fig. 1 in pictorial form, but it will be seen that this is only applicable to a simple detector circuit, and although this can give remarkable results under suitable conditions, it is not so efficient as some types of circuit now in general use. To avoid the difficulty of coil changing (which would be needed to enable the short-wave range to be explored fully) certain manufacturers have now produced coil units in which the necessary short-wave and broadcast coils are assembled with the necessary wave-change switch, and two of these are illustrated in our cover design this week. The screen of one of these has been cut away to show the method of assembling the separate coils round the multi-contact switch, and the circuit of such a tuner is shown in Fig. 2. As it is necessary to use a .0005 mfd. tuning condenser to explore fully the broadcast wavebands, it becomes necessary with this type of tuner to use a similar capacity for the short waves, and whilst this gives a wide waveband with a single coil it obviously renders tuning slightly more difficult. Furthermore, the lowest range to which the receiver may be tuned is also limited, due to the high minimum capacity of the standard tuning condenser and the associated stray wiring.

To-day there are hundreds of listeners who will find the television sound signals of interest and to tune to these it is necessary to go down to 7 metres. On the 5-metre band there are also hundreds of amateur transmitters, and these also prove of interest to the keen listener. It is therefore worth while to use an all-wave tuner to cover from 5 metres upwards, but a standard .0005 mfd. tuning condenser will be found very awkward when used on such a band.

Multi-range Units

It becomes necessary when tuning so low to use a more efficient type of receiver in the majority of cases, and our old friend the superhet has to be called into use. This necessitates a minimum of two tuned circuits—one for the grid of the frequency-changer and one for the oscillator section, and to enable maximum efficiency to be

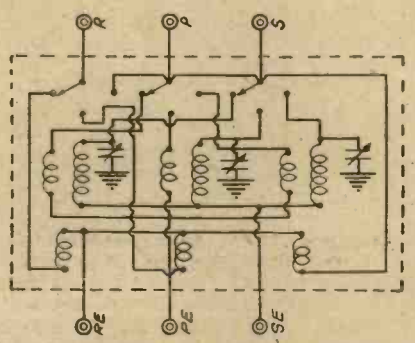


Fig. 2.—The circuit which is employed in the Wearite all-wave tuner.

obtained separate coils should be used to cover two or three separate wave ranges on the shorter wavelengths. There are now available some neat and efficient coils designed for use with a maximum tuning capacity of .0005 mfd., and some of these are included in the group on the cover. With the aid of these a multi-range tuning unit may be built up to include the television signals, and by stripping one or two turns from the smallest coil and adopting one of the ideas to be mentioned later, these coils may be used to tune down to 5 metres. The Bulgin unit, which is also shown on this page, makes use of a similar type of coil and tunes from 5 up to 2,000 metres in five separate bands, namely,

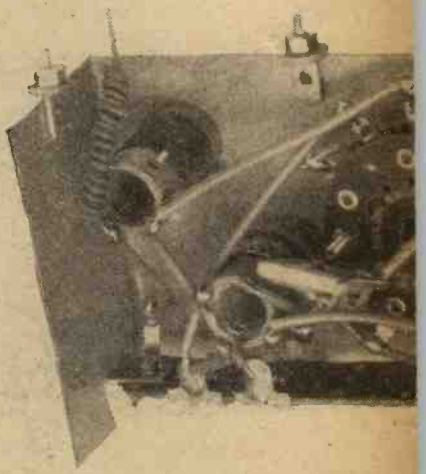


Fig. 3.—This is the Bulgin 5-range tuner, co aerial or osci

from 5 to 10, 12 to 33, 30 to 85, 200 to 550, and 900 to 2,000 metres.

Series Tuning

The first requirement on the very low ranges is to reduce the maximum tuning capacity, and this may very easily be carried out by connecting a small pre-set condenser in series with the tuning condenser on that particular coil as shown in Fig. 5. A .0003 mfd. pre-set will reduce the effective tuning capacity to approximately .0002, the actual maximum depending upon several things. A really high-class variable condenser should be employed, and the pre-set should preferably be of the ceramic type. The principle of avoiding all losses on the short waves must be rigidly borne in mind, and heavy gauge wire should be used for connections, cutting down the leads to the short-wave coil to the very minimum. These coils should be mounted as close to the switch as possible, removing the broadcast coils at a suitable distance to avoid interaction, and also placing them at right angles if possible, to prevent any stray inductive coupling. A rigid mounting should be employed for the coils and the switch should be bolted to the mounting plate, following in this respect the same idea as in the Bulgin component. The latter is made in such a manner that two or more may be ganged and a common spindle used for adjusting all the switches, whilst the oscillator unit is provided with air-

TUNERS

Tuning Unit and How a Highly-efficient

2. By W. J. DELANEY

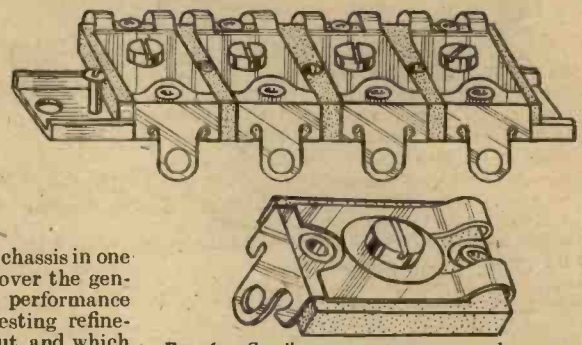
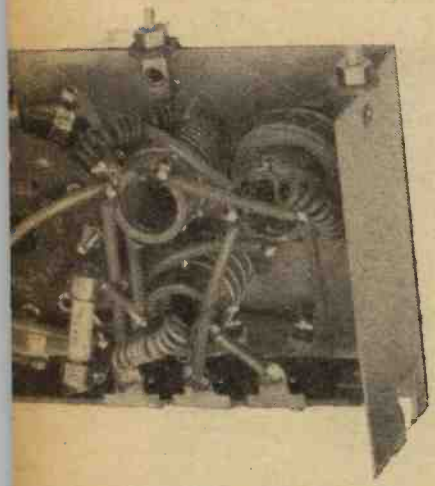


Fig. 6.—Small ceramic trimming condensers are available in the forms shown here for all-wave trimming and similar purposes.

dielectric trimmers to provide the necessary high efficiency. It should be noted that when using several coils in an all-wave tuner the necessary trimming for aligning each set of coils should not be carried out on the gang tuning condenser, as it will be impossible to adjust the trimmer capacity so that it holds for each coil in the range. This form of trimming is quite satisfactory for medium and long-wave coil combinations, but the minimum capacity will be found too high for short-wave coils and



vering from 5 to 2,000 metres and available for llator tuning.

furthermore an adjustment would be very difficult to attain which would hold for all ranges of the coils.

Refinements

Therefore, each short-wave coil should be provided with a separate trimmer, connected in parallel and mounted direct on the coil

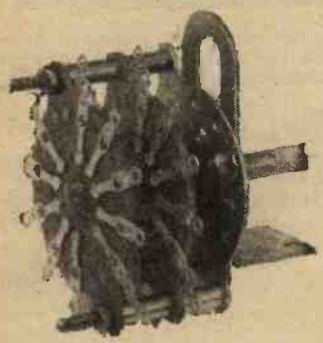


Fig. 4.—A suitable type of multi-contact switch for use in all-wave tuners.

if possible to avoid additional wiring. These trimmers should be of the type shown in Fig. 6, having ceramic insulation (to reduce losses) and with a maximum capacity of only approximately 50 mmfds. To assist in trimming the coils all trimmers should be mounted so that the adjusting screws are available in one position, and the receiver may then be trimmed with the chassis in one position. The above details cover the general design, but for maximum performance there are two or three interesting refinements which may be carried out, and which we have found very useful when building an all-wave receiver, to give as good a performance as a specially-designed short-wave set. The first point concerns tuning shift and we recommend that the tuner—consisting of the gang condenser and the

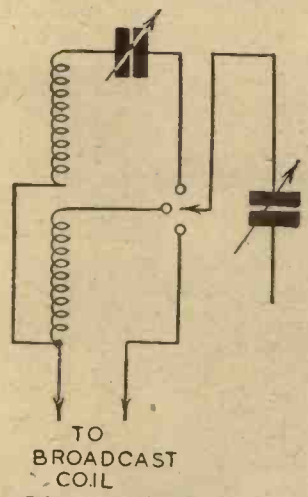


Fig. 5.—Efficiency on the ultra-short wavelengths may be increased by including a small capacity in series with the ultra-short-wave coil.

tuning coils and associated switching—be mounted on a separate small metal chassis. This should then be attached to the standard receiver chassis by means of rubber mounting bushes so that it "floats," and in this way it will not vibrate when placed in a cabinet which contains also a loudspeaker working at fair volume. It will no doubt be found, if the tuner is rigidly mounted, that under certain circumstances the signal will vary due to tuning drift, the amount of variation being quite considerable on the shorter wave-ranges.

A further useful idea is to shunt the ultra-short wave coils by a non-inductive resistance—a value between 20,000 and 50,000 ohms being found most suitable. This should not affect the efficiency, but will give a slightly better coverage and in some cases may even improve the performance owing to the simplification of tuning.

The utility of band-spread tuning is already well known to short-wave listeners, and a scheme which we favour and which has been tried and found very effective, is to include a band-spreading condenser assembly on the all-wave tuner chassis, ganging two or more (according to the number of tuned circuits) to simplify control. These band-spread condensers are wired only to the short-wave coils, and thus the manipulation of the wave-change switch not only brings into circuit the short-wave tuning coils, but also introduces the band-spreading condensers, and the receiver may thus be handled on the short waves with much greater ease, and stations which would otherwise be found difficult to tune will be brought in with certainty. The scheme for such a tuning unit, including the shunt resistance and series capacity, is shown in Fig. 7, and readers who are interested in building a really worth-while tuner are advised to design the unit on these lines. It should be remembered, of course, that a tuner of this type could be employed in a straight T.R.F. circuit, but the superhet will provide certain advantages—especially from the point of view of stability.

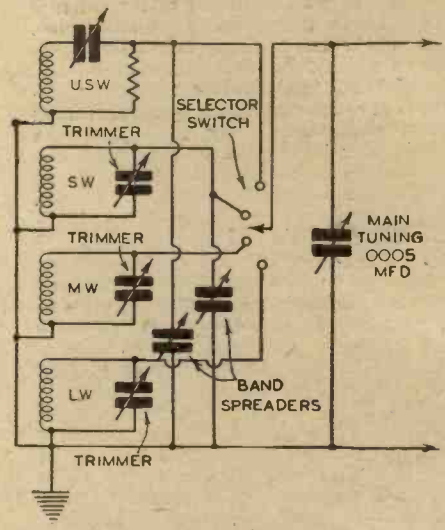


Fig. 7.—A comprehensive all-wave tuning circuit, showing how to incorporate all refinements as mentioned in this article.

Practical Television

April 16th, 1938. Vol. 3. No. 86.

The O.B. Equipment

SINCE it is felt in many quarters that the future of television will depend very materially on the successful development of outside broadcasting on an extensive scale, the B.B.C. have quite naturally carried out an exceedingly large number of tests with the mobile television unit in order to gain all the experience that is possible. Before any actual television transmissions are undertaken from a chosen site, engineers carry out a preliminary investigation with the aid of a low-powered (100 watts output) portable transmitter which is a miniature replica, except for the modulator equipment, of the actual broadcast link normally employed. A sectionalised mast capable of running up to 50ft. carries the aerial, and with this equipment valuable information can be gathered for the purpose of showing whether the full-dress transmission of television is likely to be free from difficulty or not. The motor van housing the main transmitter which forms one unit of the O.B. equipment accommodates all the ultra-short-wave transmitting apparatus in rack form, and when fully modulated the transmitter is capable of delivering one kilowatt to the aerial working on a carrier wavelength of approximately 5 metres.

The Beamed Aerial

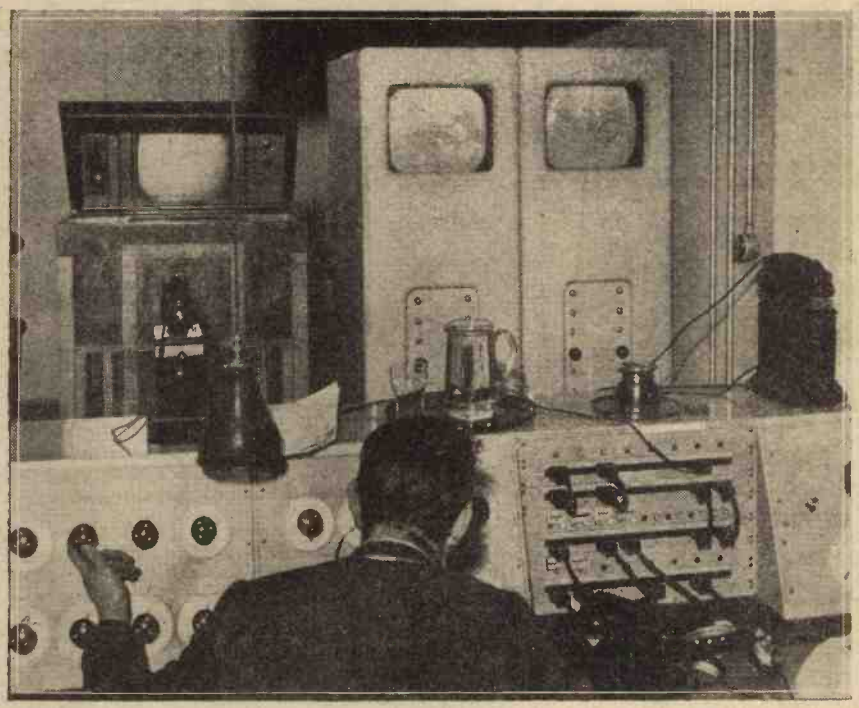
The transportable aerial is compass beamed on to the Alexandra Palace aerial, but to facilitate matters a fourth unit is to be added shortly by the B.B.C. This will be a van housing a vertical dipole reflector aerial which can be raised and lowered from the roof in a manner similar to a modern fire escape. The effective aerial height will then be 80ft., and this will enable the radiated waves to be clear of any local electrical interference which in the past on occasions has marred what would have been otherwise an excellent broadcast. To enable full advantage of high and open ground to be taken, the control room van can be cable-linked up to a distance of 1,000ft. from the transmitter, while the cameras themselves can also be separated from the same van by long lengths of multicore cable (24 conductors are actually used in this cable) and so furnish a degree of flexibility which is so essential for broadcasts of this nature. That the B.B.C. is making a strenuous effort to ensure the greatest possible success with these outside broadcasts is borne out by the results achieved in the head of the river races. On this occasion not a trace of interference marred an admirable broadcast and incidentally a new record was established, although with the increased range of reception which is now coming to light it is a record which will no doubt be broken in the very near future. The transmission of this race was watched under nearly perfect conditions on a television receiver at Eastbourne, which is approximately seventy miles away from Alexandra Palace. So pleased were the B.B.C. that this was included as an item of news in the normal news bulletin broadcast later in the day.

Another Colour Television Scheme

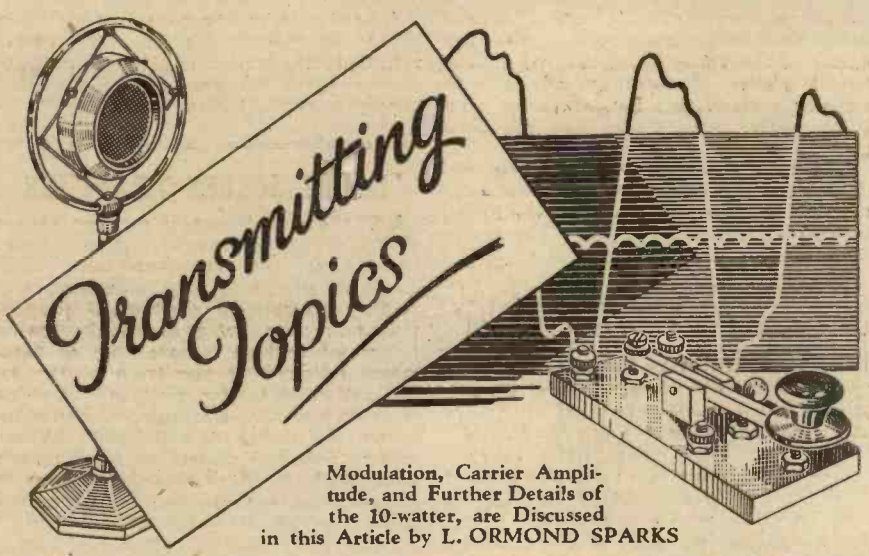
FROM reports which keep coming to hand it would appear that the problems associated with colour television are engaging the earnest attention of the leading laboratories throughout the world. This is particularly gratifying, for it is television's answer to the film industry's colour talking films with which they had hoped to offset the public's attention on the rapid growth of television as an entertainment service. Many and varied have been the schemes proposed and one of the latest reports concerns an interesting suggestion to replace a fluorescent picture with an incandescent one. It is proposed to use a cathode-ray tube of the projection type and replace the normal screen with a screen of atomic thickness made from molybdenum or tungsten foil. This gives an incandescent picture as a result of the electronic impact during the scanning process. This incandescent picture is claimed to have all the primary colours present as against the monochromatism of the fluorescent screen and by using varying coloured filters it should be possible to project on to a remote screen a reproduction of the original scene resplendent in all its natural colours. For example, if different coloured filters are brought before the screen in rapid succession then the pictures projected on to the remote screen can be made to merge into one colour-blended picture. Furthermore, since an incandescent picture is, as a rule, much brighter than its fluorescent counterpart, this gives a very material advantage for projection purposes.

Main Considerations

MANY factors have to be considered when preparing a good tube screen for television picture reproduction and not the least of these is that it should have a sufficient degree of bright fluorescence to produce a properly contrasted picture in either daylight or normal room illumination. There is a growing tendency nowadays to use television receiving sets in rooms which are not darkened, a factor so essential in the earlier days when tubes were far less efficient. In this connection it is important to remember that a television tube screen looks quite a different colour when viewed in a darkened room and when observed in daylight, and this factor has to be allowed for in modern design. Afterglow, that is the persistence of screen luminosity after the stimulus from the electron beam has been reduced or removed, calls for a very special study. If there is too much, then movement of the subjects in the television image will be blurred. For example, a rapidly moving ball would appear to have a comet's tail, or a face a series of ghost images. On the other hand, experiment has shown that a measure of afterglow is capable of reducing any inherent flicker in the brighter parts of the picture to a tolerable level. These apparently conflicting points call for a careful balance and a knowledge of the conditions and form of service under which the tube is to be employed. Another oft-overlooked point is the fact that a good screen has a sensibly linear response over the range of excitations corresponding with full brilliance to dark.



In the producer's control gallery. On the screens in the background appear the televised pictures as picked up by the three television cameras employed, one being transmitted. Through a large window on the right he can follow the performance in the studio.



Modulation, Carrier Amplitude, and Further Details of the 10-watter, are Discussed in this Article by L. ORMOND SPARKS

HAVING briefly explained the fundamental keying arrangements of a C.W. transmitter, it now becomes necessary to proceed further with the question of modulation to see how the "carrier wave" can be utilised for the transmission of speech and other sounds.

In the first place, sounds do not possess any electrical characteristics; therefore, before any modulation process can be adopted, it is essential for some arrangement to be employed whereby the sounds under consideration can be converted into their electrical equivalents.

This conversion is carried out in several ways, but it is not the purpose of this article to elaborate on the different methods which can be employed, it being sufficient to say that the apparatus used for the process is known as a "microphone." By virtue of the properties of a microphone, any sound produced within its effective range is converted into minute electrical variations, and if these variations were depicted graphically, it would be seen that all sounds produce wave-forms the shape of which would depend on the characteristic and amplitude of the sound originally produced. For example, the vowels a, e, i, o, and u, would each produce different wave-forms, but that does not mean to say that the wave-forms will always be identical for any given vowel. So much will depend on the pitch and timbre of the voice, the inflection placed on the vowel, and the quality of the voice, thus allowing individual characteristics to be recognisable.

Modulation

Bearing in mind that the original oscillations produced by the transmitting oscillator possess in themselves definite wave-forms, as previously illustrated, it now becomes a matter of combining them with the wave-forms of the sounds to be transmitted, and the process of doing this is known as "modulation."

To make this quite clear, graphical illustrations can be used, and Fig. 1 shows a train of continuous waves, i.e., the carrier wave and, below them, a wave having a very much lower frequency, so low, in fact, that it represents an audible sound and is, therefore, referred to as an L.F. oscillation. By one of the processes which will be described later, the carrier wave is modulated

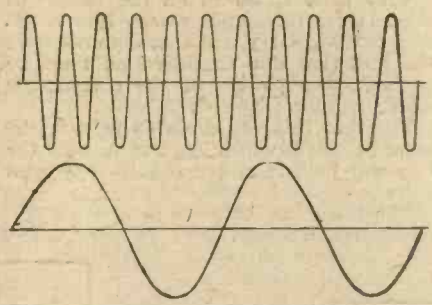


Fig. 1.—A train of continuous waves before modulation is applied. The lower curve represents an L.F. oscillation which will be used for modulating purposes.

by the L.F. oscillation, the result, for perfect conditions, being shown in Fig. 2, where it can be seen that the carrier has taken a new shape. As in the case of the Morse transmission, the dotted line denotes the "modulation envelope," and if the new wave-form is examined, it will be noted that the frequency of the carrier wave *remains unaltered*, but the amplitude varies in accordance with the shape of the L.F. oscillation. This is an important item, as it denotes that the "amplitude" variation method of modulating is employed as distinct from another system which makes use of variation in the frequency of the carrier. The latter is not likely to interest the amateur, so there is no need for it to be discussed at this stage. To obtain a more accurate idea of amplitude modulation, reference should be made to Fig. 3.

The original amplitude of the carrier wave is shown, and it will be seen that when the modulation is applied the amplitude varies between twice that of the carrier and zero. This, at first sight, may seem rather strange, but I hope the following will make the matter more clear.

Carrier Amplitude

Without going into the question of "sidebands," which will come at a later date, it must be appreciated that it is possible to govern the amount of modulation applied to the carrier and it is usual to express the amount in terms of percentage of the carrier amplitude. The example shown in Fig. 3 is of a carrier modulated 100 per cent., and it is important to note the charactoristics of the resultant wave-form.

If a smaller percentage modulation is applied, then the formation shown in Fig. 4 will be more in keeping, the percentage in that case being in the neighbourhood of 60. Note the difference in the maximum and minimum amplitudes.

While it is more usual to under modulate it is possible to go to the other extreme and over modulate the carrier, but if due consideration is given to Fig. 5, it will be seen that such undesirable procedure not only causes prolonged breaks in the carrier and distorted transmissions but it also means that signals will be radiated over a much wider waveband and cause severe inter-

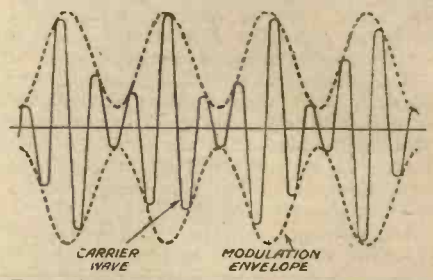


Fig. 2.—Showing the shape of the modulation envelope after the L.F. oscillation has been applied to the train of C.W.

ference to nearby listeners; therefore, *don't do it.*

The percentage of modulation can be determined or written thus: $\frac{\text{Modulation amplitude—carrier amplitude}}{\text{Carrier amplitude}} \times 100$

The 10-watter

Before leaving the modulator section mentioned in my last article, there are a few words I would like to say on the subject of microphones.

For general utility—bearing in mind cost—a good transverse current type of microphone requires a lot of beating, but

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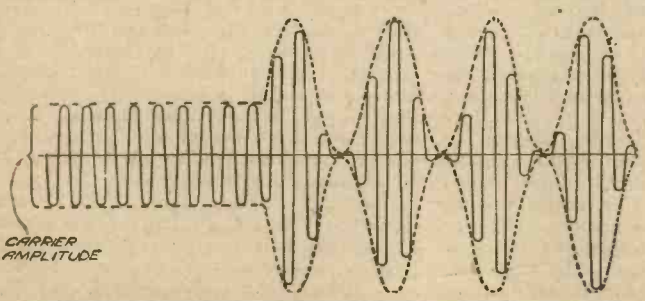


Fig. 3.—Indicating the wave-form when 100% modulation is applied. Note the well-defined maximum and minimum.

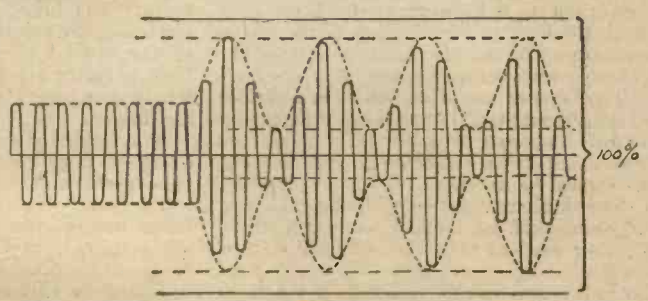


Fig. 4.—The same wave-train modulated only 60%. This is far better than Fig. 5.

TRANSMITTING TOPICS

(*Continued from previous page*)

before deciding hear some of the various makes and types.

If funds permit, one cannot overlook the sterling features of the moving-coil and the crystal microphones, so it really comes down to a question of individual tastes, requirements and finance. The manufacturers of the various types will always supply full details of their models.

When purchasing, it is always advisable to allow the makers to supply the transformer, if such is required, as so much depends on the matching and the quality of the transformer. A good microphone can be ruined by a badly designed transformer.

If all the constructional work so far described has been completed, it would be advisable to test out the mains unit and the modulator section, and check up all operating potentials, but don't forget that a certain voltage drop will be produced when the other stages are added. It is in this respect that it is better, if funds or gear permits, to provide the modulator with its own power pack, but that can come at a later date as one progresses with the subject.

The Tritet Stage

The next shelf to be completed is that which holds the heart of the transmitter, namely, the Tritet oscillator and doubler, and I expect that many of you have been anxiously waiting for the details.

The panel, as indicated in Fig. 6, carries the two tuning condensers, the one on the left being for the cathode circuit and having a capacity of .0002 mfd. It is very advisable to use a condenser of good and accurate make, and I would suggest the J.B. special short-wave type, the same as used in the original rig. This particular type is provided with three- or one-hole fixing. It is quite immaterial which is used, though the latter is quicker to fix and quite secure.

The condenser on the right is used to tune the anode tank circuit, and again

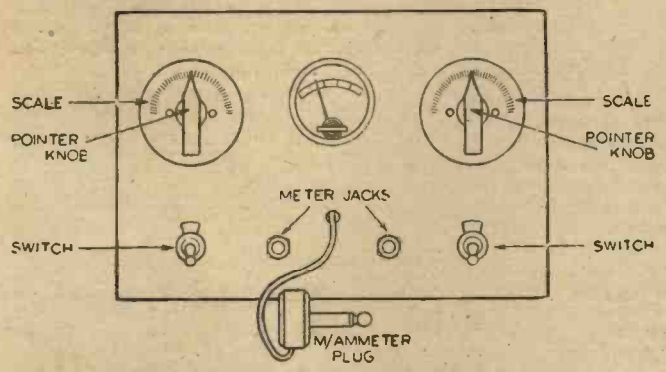


Fig. 6.—A suggested lay-out for the panel of the Tritet section. Keep the condensers below the centre line.

it is very important that it has low losses and perfect H.F. insulation. I used an Eddystone type 900 having a maximum capacity of 50 mmfds., as it is ideal for the job and very compact as regards size.

The type of knobs and dials is a matter of individual taste, but as it is not necessary to use elaborate slow-motion types, I do not think those shown—Eddystone—can be improved upon.

The milliammeter—the fixing hole for which should be already cut—can be of the low reading type with suitable shunts, or, say, having a maximum reading of 30 m/A's and shunts to bring it up to 60 and 120 m/A's, thus allowing it to be used for most purposes.

Just above the meter is a Bulgin pilot light, this being connected across the heater of the valve to indicate when that circuit is alive. It is always advisable to embody some visual indication for each stage as the operator can then see at a glance just what is on or off.

The three holes below the meter are drilled to allow the meter leads to come through the panel and to allow the fitting of two closed-circuit jacks. The meter

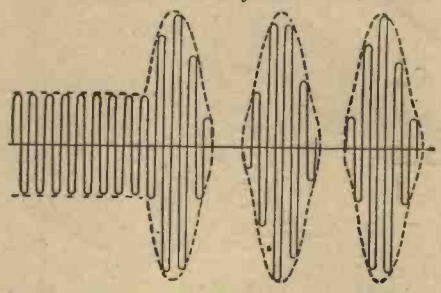


Fig. 5.—Showing the effects of over modulation. Note the wave form distortion and breaks in the carrier.

leads terminate in a suitable plug so that it can be plugged into either pack.

On the extreme right is a Q.M.B. switch for the control of the H.T. supply to this shelf, it being very essential to provide such means whereby the apparatus can be rendered dead during tests and modifications.

Baseboard

Very little is shown on the baseboard (Fig. 7), for the simple reason that it has very little to carry, but that does not alter the fact that due consideration must be given to the placing of the components which will be required.

The first thing to do is to prepare the mounting strip which is going to hold the two coil holders and a chassis-type octal valveholder.

The strip can be made from ebonite, fibre, bakelite sheet or dry, well-seasoned wood, its length being 10ins. and its width 2¼ins. The brackets which raise it above the baseboard can be made out of aluminium of the same width, but do see that they form a really rigid support, otherwise the whole structure will be free to vibrate and too flimsy.

As regards the exact height, this must be determined by the location of the variable condensers and the height of the panel.

The sole object of the platform is to bring the coil and valveholders close to the terminals of the condensers to allow short and simple wiring to be obtained, so take some care in placing it and locating the variable condensers. Don't make the mistake of drilling the condenser fixing holes too high up the panel; if anything, be below the centre line. The small terminal strip or sockets shown at the back of the baseboard are to take the H.T. supply from the bottom shelf.

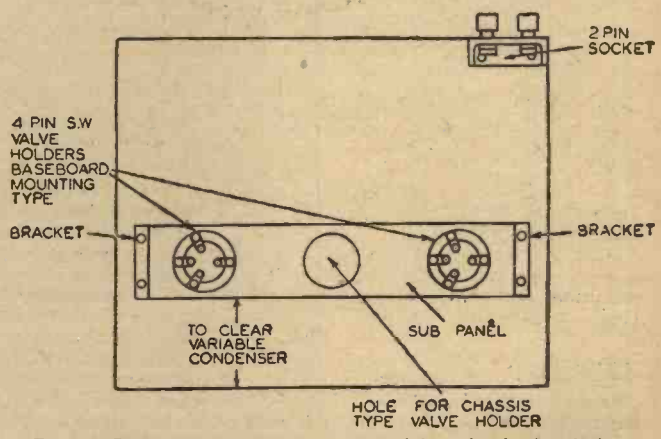
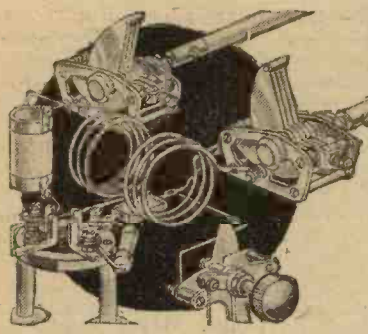


Fig. 7.—Showing the approximate position of the coil and valve platform. The two-pin socket and terminal strip is for H.T. supply.

LARGE SCREEN TELEVISION

AT the recent annual meeting of one of this country's biggest cinema companies, the chairman was quite frank in admitting that television was rapidly becoming a commercial proposition and may bring about changes as important and as far reaching as those which followed in the train of the inauguration of talking pictures. Coming from such a well-informed and important source the comment was significant and was regarded as something more than a wild prophecy. It is regarded as practically certain that one day television will become a regular part of the cinema patrons' entertainment. It will, of course, necessitate a complete change of policy, inasmuch as the film industry is concerned, but if based on co-operative lines then both sides will benefit. That no universal ban on large screen television presentations in cinemas is contemplated, at least for the time being, is borne out by the Postmaster-General's reply to a question in the House of Commons when he was asked what steps the B.B.C. was taking to protect its rights under the Copyright Act regarding television in cinemas. His reply was to the effect that in a few special cases in which the interests of other parties were involved, a precautionary notice regarding copyright was included in the programme. Beyond this no general steps had yet been found necessary. There is no doubt that for legal purposes television pictures on large screens in places of public entertainment can be deemed to come within the scope of theatrical and cinema enactments with all the implications of copyrights, fees, etc., and the detail work involved is more than any single organisation is prepared to face at the moment, hence the simple precautionary measure. It is known, however, that steps are being considered by some of the large cinema circuits for circumventing these difficulties by making films in their own studios for televising via special cables to their own cinemas. While this scheme has a special application it is the instantaneous transmission of selected news events which will have the greatest public appeal, and it is in this connection that the biggest problems will have to be solved.



Short Wave Section

SINGLE - SIGNAL SUPERHETS and STRAIGHT CIRCUIT RECEIVERS

By A. W. MANN

SHORT-WAVE listeners who are beginners may be divided roughly into two classes. On the one hand there is the potential enthusiast who, having listened to short-wave and amateur transmissions on a friend's receiver, has decided that he must have a receiver of his own which is capable of bringing in the short-wave transmissions. On the other hand is the new enthusiast who uses an experimental receiver of simple design and built from spare parts, none of which is specially designed to meet short-wave requirements. Consequently the over-all efficiency is low, and he feels that something better is desirable if satisfactory results are to be obtained. Due to a confusion of ideas and opinions neither really knows exactly what he requires, and is afraid to go ahead.

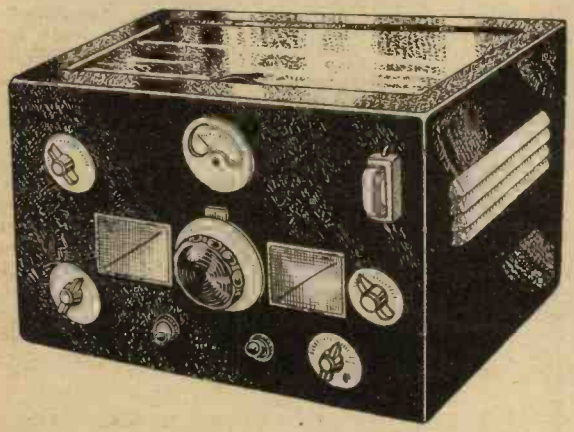


Fig. 1.—A typical communications-type superhet receiver.

Short-wave listeners whose primary interest does not centre on amateur-band reception, but who do listen on those bands to telephony conversations at intervals, will at most times hear discussions concerning communication-type receivers. Much useful information may thus be gathered concerning them. On the other hand much that is apt to be misleading or misconstrued is to be heard. In every instance, however, individual opinion based on first-hand personal experience is given, and must therefore be respected.

If, however, correspondence can be taken as a guide, a communication receiver complex is apparent amongst certain sections of the short-wave listening fraternity, who are apt to regard every other type of receiver as obsolete, and more or less useless.

This is an entirely erroneous and misguided point of view, and some discussion relative to communication-type receivers seems desirable, in order to clear the air.

Communication-type Receivers

The communication-type short-wave receiver, of which there are many excellent examples, stands undoubtedly in a class by itself. In its design are incorporated all the most desirable features which contribute individually and collectively towards outstanding performance and reliability. Efficiency and flexibility are the basic requirements, and all other considerations are of secondary importance.

For example, in one receiver the panel carries eight separate controls, in another six, and in yet another twelve controls. Ease of operation as associated with the domestic all-wave-type receiver is not the subject of consideration. Maximum performance, electrical efficiency and precision mechanism are the hall-marks of modern communication receiver design.

The crystal filter incorporated in the single signal communication-type superheterodyne receiver is by no means a new idea. The idea of employing a quartz crystal in order to sharpen considerably the selectivity of a tuning circuit was suggested at least fourteen years ago.

Apart from the fact that at that period super selectivity was not called for, the cost factor relative to satisfactory quartz crystals made the idea impracticable. About seven years ago, however, Dr. Robinson, the inventor of the Stenode Radiostat, utilised a quartz crystal filter in much the same way as at present.

Regarding the application of this system as at present applied to amateur communication receivers, however, credit must be given to Mr. James J. Lamb associated with an American publication.

The present conditions prevailing on the amateur bands can best be described as chaotic. A few years ago they were sufficiently bad to call for a super-selective receiver in order to assure some measure of dependability relative to consistent contacts. Taking into account the number of amateur operators in the U.S.A. an idea as to the congestion experienced is not difficult to imagine.

Single-signal Receiver

The single-signal receiver uses a quartz crystal filter in the intermediate-frequency amplifier and enables extreme selectivity, more appropriately expressed in cycles as against kilocycles, to be obtained.

In some instances the use of the crystal filter system enables selectivity hundreds of times greater to be obtained, as against any other method of selectivity increase.

Now this brings us to the factor which, so far as the average short-wave listener is concerned, matters most and around which many erroneous ideas centre. The degree of selectivity obtainable enables the operator to tune in a complete mixture of CW telegraphy signals which can be best described as, and is, noise, due to the complete jumbling and overlapping of signals, and by switching in the crystal filter circuit the selectivity is increased to such an extent that the separation of individual CW signals is possible, unless, of course, more than one signal occupies the same frequency.

Now in achieving such a high degree of selectivity most of the side-bands are removed, and the question arises as to how the reception of speech will be affected. The same principle applied to speech or music will result in unintelligible reception of a given transmission.

Increased Band-width

Where, however, provision is made to enable the selectivity as obtained by means of the crystal filter to be varied, it is possible to increase the band-width sufficiently to obtain intelligible speech.

For example, where series-parallel arrangements are provided in the crystal filter circuit the series position allows a cut-off of a few hundred cycles off resonance, and thus allows perfectly intelligible speech, but, of course, affects quality, whilst by means of the parallel position the crystal phase control enables an interfering carrier to be reduced, and in some cases eliminated, on one side of the desired frequency.

The foregoing gives some idea of the communication-type receiver, and the purpose for which it is designed and intended.

It will thus be appreciated that the amateur communication-type receiver is designed first to meet the exacting requirements of amateur and commercial communication.

This type of receiver can, of course, be used for short-wave broadcast, DX reception and also medium-wave reception, high usable sensitivity, independent high-frequency and low-frequency volume or gain control enabling the operator to receive many transmissions which would otherwise be over-ridden by noise.

These features, together with short and broad intermediate tuning adjustments, and push-pull output, make high-fidelity reproduction possible, exclusive, of course, of the crystal filter.

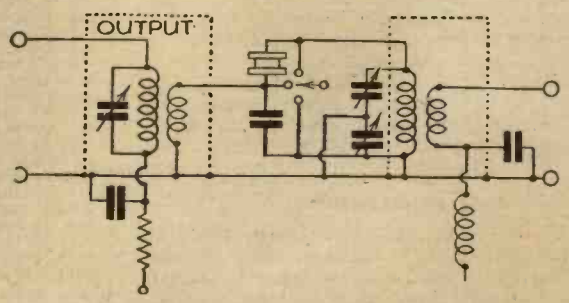
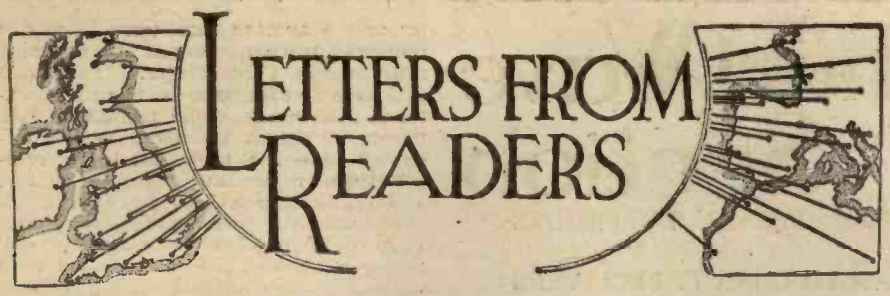


Fig. 2.—A crystal gate and variable selectivity filter.

The crystal filter cannot be used in the instance, due to the extended range of the musical frequencies as compared with those necessary for CW and intelligible speech reproduction. To sum up, the communication-type receiver as a DX short-wave broadcast and amateur proposition is undoubtedly an outstanding instrument. There is one point however, which must not

(Continued on page 127)



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).

A High-quality Amplifier

SIR,—May I be allowed to say in reply to Mr. W. F. Pirie's letter criticising my article on "A High-quality Amplifier" (1) that the .025 megohm referred to is an obvious misprint for 0.25 megohm, the printer having put the decimal point in the wrong place; and (2) that there is no mention of a .001 mfd. condenser in the whole article?

I am perfectly content to let this direct coupled circuit stand on its own merits.—NOEL BONAVIA-HUNT (Stagsden, Bedford).

SIR,—I am puzzled by Mr. Pirie's letter about Mr. Bonavia-Hunt's High-quality Amplifier.

The .001 mfd. condenser from the first anode to ground that he mentions is very plainly marked .0001 on my copy of the diagram; quite usual, surely?

Also, I thought it was generally acknowledged that it is difficult, if not impossible, to choose a condenser for R.C.C. that will result in an equal amplification of all audio frequencies.

As for the grid leak R7, doesn't this suggest a misprint and the value should be .25, not .025 megohm?

Regarding the shorting of condensers, anyone intelligent enough to study the article should be able to see the necessity of first altering the amplifier to meet the conditions. I have tried out some of Mr. Bonavia-Hunt's ideas with great success, and always read his articles with great interest.—S. R. PRATT (Swindon).

Two H.F. Stages!

SIR,—I would welcome such a receiver as mentioned in PRACTICAL AND AMATEUR WIRELESS recently, i.e., two stages or more of H.F. amplification, as I prefer straight H.F. to the superhet principle. May I add that an *H.F. unit* (two or three stages) could be operated by H.T. units for mains operation and headphone reception?—E. MAYS (Rotherham).

Radiation Interference

SIR,—J. W., of Wigan, says that the Two-station Phenomenon is an impossibility in his case, yet from the tone of his letter he seems a bit doubtful.

He can tell by making the following test: Disconnect aerial and earth from the set, then connect a pair of earphones between these; if the interference is caused by re-radiation the two stations will be heard in the 'phones. I would like to get in touch with J. W. (Wigan) as he seems to want to get to the bottom of this matter, and I know a few of the tricks that the Relay System can play.—A. G. MALINS (27, Cunard Road, Litherland, Liverpool, 21).

A Good Log from Shoreham

SIR,—Perhaps other readers of PRACTICAL AND AMATEUR WIRELESS would be interested in the following short-wave log:—

The receiver is a 1v. converter (H.F. pentode) coupled to a S.G. V. Power, A.C. mains set, listening being done on both 'phones and speaker. Both the receiver and converter are home-constructed.

13 metres: W2XE (Wayne).

16 metres: W3XAL (Bound Brook).

19 metres: W2XAD (Schenectady), W2XE (Wayne), W8XK (Pittsburg), TGWA (Guatemala City).

20-metre Amateur Band: 63 W's on 'phone; also: PA0MZ (Holland), F3JD (France), SU1CH, SU1RD, SU1KG (Egypt), CT1AY, CT1QG (Portugal), VE2BV, VE2CP, VE3NF, VE2GP, VE3GK, VE1DQ, VE1FG, VE3HX (Canada), SV1MK (Greece), LY1J (Lithuania), YR5AA, YR5PC, YR5CF (Roumania), SP1FD, SP1RX (Poland), LA1F, LA1G, LA4R (Norway), HB9BR, HB9CE, HB9AY (Switzerland), OZ1U (Denmark), VU2CQ (Bombay, India). Antenna 45ft. (approx.).

I would like to see the circuit of an improved 1v. converter, using an H.F. pentode.

Wishing PRACTICAL AND AMATEUR WIRELESS every success.—H. E. CHAMBERLAIN (Shoreham-by-Sea, Sussex).

CUT THIS OUT EACH WEEK.

Do you know

—THAT small rectifying valves are now available for chargers—delivering 12 volts at 1 amp. approximately.

—THAT the cheapest television receiver now available costs £31 10s.

—THAT the above receiver must be used with a standard broadcast receiver to provide the sound component.

—THAT the dearest television receiver now on the market costs £178 10s.

—THAT the mobile B.B.C. television vans are on view at Olympia and are being used to relay special events.

—THAT the speed of a synchronous motor is directly related to the frequency of the supply and the number of poles on the motor.

—THAT the full formula for the above speed is twice the frequency multiplied by sixty and divided by the number of rotor poles.

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 Newnes, 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.

A Reader's Thanks

SIR,—Thank you for the very useful book "Everyman's Wireless Book," awarded to me for solving Problem No. 288. Though I have been interested in the "great pastime" of wireless for about ten years, there is always something one can learn about it; "Everyman's Wireless Book" is a book "young" and "old hands" would do well to have in their library.

Wishing your paper every success.—R. J. TOSSELL (Torquay).

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.

H. M. (Clapham). The Add-on H.F. Unit described in our issue dated January 25th, 1936, should be suitable for your purpose.

A. F. J. V. (S.E.9). We have no details of the coils in question and as they are of rather old design we do not recommend you to use them in the set in question.

P. A. (Rotherham). We cannot supply you with a blueprint for the purpose and we think you would find it difficult to use more than the parts from one of the sets in view of the fact that the output valve would be overloaded.

J. M. (Malta). Any good standard superhet converter unit should be suitable.

J. McL. (Gourock). You need not worry about the point when using 'phones. Separate wires or a continuous one may be used for the L.T. wiring. It is not important. Spacing depends upon circuit design, etc. Follow the Prefect in this respect.

W. W. W. (N.9). The trouble may be due to overloading of the output valve. Use more H.T. and make certain that the correct G.B. is employed.

C. A. M. (N.14). We have no data concerning the coils in question and suggest you write direct to Messrs. Telsen regarding them.

E. N. (W.8). We would not recommend the addition of a further stage, but you might use a more powerful output valve and perhaps modify the input circuits by using more modern coils.

D. O'R. (Southampton). Write to the firm in question for details of the component and their book describing the construction of a unit for your purpose.

H. B. M. (Gidea Park). We cannot supply individual wiring diagrams, but if you obtain the parts specified, and follow the blueprint you will see all the points more clearly and it will be quite simple to make up the unit.

R. W. W. (Leigh-on-Sea). We have not yet described a set of the type you require, but hope to do so in the near future.

J. N. S. (Redhill). Write to Southern Radio, and University Radio of 82, Hampstead Road, London, N.W.1.

C. F. G. (St. Ives). We could not recommend a blueprint to use up the parts in question. No coil types are mentioned by you.

G. H. (York). The coil has obviously been damaged and the medium-wave winding must be rewound.

P. L. (Blackpool). We do not advise a higher range than 150 metres with that particular arrangement.

Leaves from a Short-wave Log

France's New S/W Network

PARIS-ONDES-COURTES, the name given to the new Paris-Colonial group of transmitters at Essarts-le-Roi, near the French capital, has been officially adopted, and the stations have now taken over the duties of the older ones located at Pontoise, The power is now 25 kilowatts, and fifteen different frequencies will be used for the broadcasts.

League of Nations Broadcast

A new schedule of transmissions was brought into operation on April 3rd, and the extended broadcasts bring four transmitters at Prangins (Switzerland) into action, namely, HBH, 16.23 m. (18.48 mc/s); HBJ, 20.64 m. (14.53 mc/s); HBO, 26.31 m. (11.4 mc/s), and HBQ, 44.94 m. (6.67 mc/s). In addition to the usual bulletin describing the activities of the league during the past week, listeners will now also hear a short musical programme. The times are as follows: On Sundays from B.S.T. 16.45-17.30 through HBH; from 19.45-20.30 through HBJ and HBQ. On Mondays a broadcast is now made through HBO from B.S.T. 01.00-01.45, and again from 08.00-08.15 (during April), and from 07.00-07.15 (during May-June). Later, from 08.30-08.45 (April) and 07.30-07.45 (May-June) the transmission is made by HBJ.

More About Pitcairn Island

In a recent transmission picked up from VR6AY the operator, Andrew Young, made an announcement to the effect that the frequency used was 14.35 mc/s or 20.09 m., and that he was able to get into touch on most days with amateur transmitters in North America and Australia. The plant is no longer the crude equipment which had been previously used, but is a modern radio transmitter which was presented to the island by an American manufacturer. Current is generated by means of a wind-driven electrical power unit.

Japanese News Bulletins

The Kokusai Denwa Kaisha, Ltd., now operates three powerful short-wave transmitters for the broadcast of the daily oriental musical programmes and news bulletins, namely, JVP, 39.95 m. (7.51 mc/s); JZI, 31.46 m. (9.535 mc/s), and JZJ, 25.42 m. (11.8 mc/s). Transmissions destined to Europe are now simultaneously broadcast through JVP (50 kW) and JZI (20 kW) from B.S.T. 20.30-22.00. Other broadcasts are carried out between B.S.T. 06.30-07.30; 13.00-14.30; 14.00-15.30; 22.30-23.30 and also from midnight to 00.30.

Madrid is on Air Nightly

Under the call-letters EAR, the Madrid-Vallecas 10-kilowatt transmitter broadcasts a musical programme every evening on 31.65 m. (9.48 mc/s), followed by news bulletins in Spanish, German, French and English. All reception reports will be verified if they are addressed to: Radio Bureau, EAR, The Voice of Spain, Post Office Box 786, Madrid (Spain).

S.W. SECTION

(*Continued from page 125*)

be overlooked. Price is a certain indication as to performance, and as we get into the higher price class even better performance is obtainable.

Now the average short-wave enthusiast cannot afford a receiver of this class, and is prepared to content himself with something less ambitious, preferring, as it were, results to ambition. He will be satisfied with a lesser standard of selectivity, and amongst the non-communication type receivers there is a wide field from which to choose. Thus a compromise can be struck.

So far as CW reception is concerned, the big and little sets compete on level terms, for whilst the former has higher sensitivity and greater range plus greater output, the little set has a very low noise level, i.e., high signal-to-noise ratio.

Whilst it is possible to bring in at good strength telephony signals which are weak on the little set, the latter can, and often does, receive weak signals which due to the prevailing noise level are missed by the big set.

General Considerations

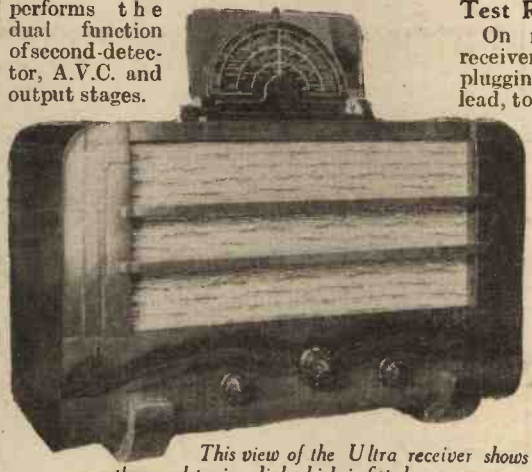
For headphone reception of world-wide short-wave broadcasting, and amateur phone on all bands, the writer favours a straight two-valve receiver in preference to a straight three in the interests of low noise and also prefers to tune his aerial system in harmonic relation which, in addition to other advantages, assures maximum signal gain.

The straight three-valve receiver, however, enables occasional loudspeaker reception of the more powerful transmissions to be obtained.

ULTRA ALL-WAVE MODEL 121

Details and Test Report of the Latest Ultra A.C. Superhet Table-model Receiver

THIS particular receiver utilises the superhet feature and is designed for all-wave operation, tuning from 16.8 to 2,000 metres. These are divided into three bands—16.8 to 50, 200 to 550, and from 900 to 2,000 metres. It is a four-valver (including rectifier) and the valves employed are Mazda types AC/TH.1, AC/VP.2, AC2/PEN.D.D. and U.U.4. It will thus be seen that the third valve performs the dual function of second-detector, A.V.C. and output stages.



This view of the Ultra receiver shows the novel tuning dial which is fitted.

The receiver is housed in a handsome oblong walnut cabinet, the finish and lines being particularly good and quite pleasing to the eye. In keeping with modern tendencies, the speaker fret follows the general lines of the cabinet and is of most generous proportions, occupying practically the whole width of the cabinet and at least two-thirds of its height.

The tuning or station indicator calls for particular attention. Its position, as shown in the illustration, is on top of the cabinet, and as it is illuminated without glare, it does—in the true sense of the word—dispense with "tuning contortions" or, in other words, a clear view of the long white indicator pointer is obtainable from all angles.

The scale is marked in both wavelengths and station names, and it is again pleasing to note that the stations shown are those obtainable at good entertainment strength, so it can be said that every name is a programme.

Controls

The three operating controls are placed along the bottom edge of the cabinet, their height being just right for the position of the hand when the forearm is resting on the table. On the extreme left is the waveband selector switch. On the extreme right is the on-off switch combined with a volume control which has a delightfully smooth action. In between these two controls is placed the main tuning adjustment which is of the "split-knob" type allowing a rapid and a very slow-motion control to be obtained, the second being particularly useful on the short waves.

At the back of the cabinet—actually on the chassis of the receiver—are sockets for the aerial and earth, pick-up, external loudspeaker (complete with muting switch for the internal speaker), and a simple adjustment for mains voltage.

The chassis is a very neat and rigid affair, the speaker being fixed to the cabinet independent of the chassis, thus allowing easy removal of either section if such unlikely steps should become necessary.

Test Report

On removing the packing from the receiver and placing it on the test bench, plugging in the aerial, earth and mains lead, to the time when it was dismantled, a matter of several weeks, the receiver was put through the most stringent tests possible, as we were determined to reproduce as nearly as possible the conditions under which it would operate in a normal household. The object being to see how the various controls stood up to continuous use. Minor defects in volume controls switches and tuning adjustments are not unknown in commercial receivers, but we can say most definitely that such trouble-makers do not appear to exist in the Ultra products—that is, if the model we had for test can be taken as a criterion.

The quality of reproduction was quite pleasing, bass and cabinet boom being entirely absent, even with the volume control over to maximum when an output is obtained which will give a comfortable reserve for most domestic requirements.

The station settings were accurate though, of course, it was found necessary to make the usual adjustments of the actual transmission to prevent any distortion due to side-band cutting through careless or inaccurate setting of the pointer by the listener.

The overall selectivity is exceptionally good and, what is equally important, the signal-to-noise ratio was such that background noises could be considered as non-existent.

Tests on the medium and long waves were simply a matter of tuning in one station after another at any time of the day, but with the short waves it was found, as one would expect, that conditions would vary from hour to hour and day to day. However, even in the heart of London we received dozens of good-volume short-wave transmissions, including the real long-distance stations, enough to convince us that the 121 is an all-waver in actual performance.

SPECIFICATION

RECEIVER: All-wave Superheterodyne, Table Model.
VALVE COMBINATION: Frequency-changer, I.F. amplifier, combined double-diode pentode, and full-wave rectifier.
CONTROLS: Three only—wave-band selector, dual-ratio tuning, and combined on-off switch and volume control.
TEST REPORT: High selectivity and accurate setting of stations on the tuning dial. Good tone reproduction without cabinet boom or undue resonances. Gramophone record reproduction adequate in volume and of pleasing quality. All controls have operated over a long period without introducing noises or other service troubles.
MAKERS: Ultra Electric, Ltd., Western Avenue, Acton, W.3.
PRICE: 12½ guineas.

Radio Clubs and Societies

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

THE EXETER AND DISTRICT WIRELESS SOCIETY

AT the meeting of this society held on March 28th, a new departure was made when Mr. H. A. Bartlett conducted a talk entitled "Questions and Answers." The questions were chosen from a recent examination paper set by the New Zealand Government for intending amateur transmitters, and each member present had a copy of the questions concerned. The answers were given by various members of the society. The blackboard was extensively used, and many interesting points arose when some of the questions called for circuit diagrams.

This is the first time this type of evening has been introduced in the syllabus of the society, and the large attendance was unanimous in its request for another at some date in the near future.

The next lecture is to be given by Mr. H. Ridge (G3HR), entitled "Telegraphs, Wire and Wireless."

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. Ching, 9, Sivell Place, Heavitree, Exeter.

THE CROYDON RADIO SOCIETY

THE annual general meeting of the Croydon Radio Society took place on Tuesday, March 29th, in St. Peter's Hall, South Croydon, and the vice-president, Mr. G. S. Vellacott, was in the chair. Presenting the balance-sheet the hon. treasurer, Mr. C. L. Amos, indicated how finances had gained on the year's working. Even more noteworthy was the fact that since Christmas the average attendance had reached a figure never attained before. In electing officers, a new chairman and vice-chairman had to be sought. Mr. P. G. Clarke, a member of several years' standing, became chairman, and Mr. R. A. Bailey, an exceptionally keen new member, was elected vice-chairman. The hon. secretary, Mr. L. F. Marshall; the hon. treasurer, hon. publicity secretary, and the auditor, Mr. A. Bateman, were re-elected. Discussing future programmes, it was decided that those on quality reproduction should be increased to 75 per cent. of the whole.

To conclude the evening members gave a number of ten-minute talks. One demonstrating his home-made cinematograph film, and another, Mr. Webster, describing his two-stage record amplifier, were particularly interesting. Hon. Pub. Sec.: E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

EASTBOURNE AND DISTRICT RADIO SOCIETY

A RECENT meeting of the above society was held in the Science Room, Cavendish Senior School, at 8 p.m. Two of the members, 3CX and 2AVQ, brought transmitters, T.P.T.G. and T.N.T. respectively. They demonstrated how oscillation could be indicated by means of a turn of wire closed with a fuse-bulb.

The next meeting will be held on April 25th, when a lecturer from Belling-Lee will describe a number of that firm's manufactures.

Hon. Sec.: J. P. Glickman, Kersal, Brodrick Road, Hampden Park, Eastbourne.

DAVENTRY SHORT-WAVE RADIO CLUB

THE first lecture of the above club was held on Friday, March 25th, the subject being Aerials and Aerial Design, which was ably dealt with by Mr. A. Robbins, who explained the types of aerials and their use.

Morse classes are a regular feature of each meeting under the direction of Mr. J. Ballard and Mr. W. Turner. The club receiver is now under construction, and it is hoped will be finished in time for the next meeting. A summer programme is now being drawn up, and it is hoped to include visits to local clubs and societies. If sufficient support from members is forthcoming it is proposed to hold a D.X. contest, for which a small prize will be given.

New members are required, and all interested readers residing in Daventry and district are cordially invited to attend the meetings at the Methodist Hall on Friday evenings at 7.30 p.m., or write or call on the Secretary, at 66, Warwick Street, Daventry, between 5 and 7 p.m. any evening. The following officers have been elected: Chairman, Mr. G. H. Wilkins (2AFN). Vice Chairman, Mr. A. H. Harris. Hon. Treasurer, Mr. A. Robbins. Hon. Secretary, Mr. L. W. Bazley.

LONDON TRANSMITTING SOCIETY

A MONTHLY bulletin has been issued by this society, a copy of the first number having been sent on to us. Apart from the usual notices concerning forthcoming events, the publication also contains useful technical information. It is circulated privately to members, the name of bulletin being L.T.S. Hon. Sec., G. Yale, 40, Raeburn Road, Edgware.

INTERNATIONAL SHORT-WAVE CLUB (BRIGHTON CHAPTER)

ON Wednesday, March 30th, Mr. Bear, of the London Chapter of the I.S.W.C., gave an interesting lecture on, and demonstration of, a low-priced communication type receiver.

The following meetings have also been arranged by the Chapter: Wednesday, April 20th, Mr. E. C. Cholot, of Messrs. Lissen, Ltd., will demonstrate and lecture on Lissen Short-Wave Receivers. Wednesday, April 27th, Mr. Ralph Stranger will lecture on "The Elements of Wireless."

Meetings are held at Seafield Dance Hall, Kingsway, Hove, every Wednesday at 8 p.m.

All local readers of PRACTICAL AND AMATEUR WIRELESS should make a point of attending the interesting meetings held by the club, to meet new friends and enthusiasts. Full particulars from the Acting Sec., C. T. Fairchild (2DGR), 1a, Dover Road, Brighton, 6.

WIRRAL AMATEUR TRANSMITTING AND SHORT-WAVE CLUB

THE annual meeting was held on March 30th, when the chairman announced that a satisfactory year's activities had resulted in an increase in membership of thirteen, bringing the total to thirty-four members. Since the formation of the club six members had obtained their full transmitting licences. These were Mr. Bretherton (G8NH); Mr. Rogers (G8OC); Mr. Taylor (G8PG); Mr. Chrostan (G8QO); Mr. Miller (G3BH), and Mr. Cumberlidge (G3CK). The club has now a dozen fully-licensed transmitters, and six members with artificial aerial call-signs.

It was decided to continue with the monthly meetings, to hold a field day in the summer, and to draw up a programme of visits to power stations, transmitting stations and places of interest.

The Chairman, Mr. Bretherton, the Hon. Secretary, Mr. Williamson, and the Hon. Treasurer, Mr. Cumberlidge, were re-elected, and Messrs. Taylor and Barlow were elected to the Committee. Hon. Sec., J. R. Williamson, 13, Harrow Grove, Bromborough.

RADIO, PHYSICAL AND TELEVISION SOCIETY

ALTHOUGH the above society caters principally for the amateur wireless enthusiast, the weekly lectures often deal with other subjects of scientific interest. An extremely interesting lecture on Chemistry was given on Friday, April 1st, while other recent lectures dealing with non-radio subjects include "Electric Furnaces," "Microscopes," and "Bacteriology." On Friday, April 29th, Mr. E. R. Corbett, of Messrs. Thomson, Alston and Co., Ltd., will deliver a lecture entitled, "The Organisation of the Rubber Plantation Industry." Any readers who are interested in "Rubber," either from a financial standpoint, or from the scientific aspect, are welcome to attend this lecture. Admission is free and without ticket; light refreshments are provided at a moderate charge.

Meetings of the society are held at 72a, North End Road, West Kensington, London, W.14, every Friday evening at 8.15. Further particulars may be obtained by writing to the Hon. Sec., C. W. Edmans, at the headquarters of the society.

Practical and Amateur Wireless
BLUEPRINT SERVICE

These Blueprints are drawn full size.
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless	..	4d. Post Paid
Amateur Wireless	..	4d. " "
Practical Mechanics	..	7½d. " "
Wireless Magazine	..	1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, P.M. to *Practical Mechanics*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS

	Date of Issue.	*No. of Blueprint.*
CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
All-wave Unipen (Peutode)	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	—	PW36B
The Signet Two (D & LF)	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PW1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen).		PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	PW87
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW46
Fury Four (SG2, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	20.9.36	PW67
All-Wave "Corona" 4 (HF Pen) D, LF, Pow)	9.10.37	PW79
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	—	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54
A.C. 1936 Sonotone (HF Pen, H.F Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four	6.11.37	PW81
SUPERHET.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS		
One-valve : Blueprint, 1s.		
Simple S.W. One-valver	9.4.38	PW88
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen) Pen)	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprints, 1s. each.		
Featherweight Portable Four (SG, D, LF, Cl.B)	15.5.37	PW12
"Imp" Portable 4 (D, LF, LF, Pen)	19.3.38	PW86
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-Wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.35	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*Apr.* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen), A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each		
All-Metal Four (2 SG, D, Pen)	*July* '33	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	—	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37.	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver (SG, D, Pen)	*Jan.* 19, '35	AW463
The Carrier Short-waver (SG, D, P)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short waver (SG, D, RC, Trans)	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462

QUERIES and ENQUIRIES

Seven-pin Contacts

"I have started building one of your receivers in which a 5-pin H.F. pentode is specified but the makers have sent me a 7-pin valve. I cannot see how this will do as in the diagram there are only 5 contacts to this type of valve. Can you, therefore, tell me what the extra 2 pins are for?"—A. F. (Redhill).

IN the 7-pin H.F. pentode for battery operation there is only one unused pin. The 7 pins on the base are used for the filament (2), grid, screen grid, and suppressor grid. This gives you one additional connection more than found in a 5-pin valve, the suppressor grid normally being internally connected. In addition the metallised surface of the 7-pin valve is joined to a further pin, thus accounting for 6 of the lower contacts. The anode is joined, in the usual way, to the top cap.

Adding an Amplifier

"I should like to add the two stage L.F. amplifier described in the S.W. section January 15th last to my short-wave one valver, but I am not certain how to connect. Could you please explain the matter simply as I am only a beginner?"—T. W. S. (Northampton).

THE circuit referred to employs resistance-capacity coupling both in the second stage and in the input. To complete this coupling to your present single valve you will need a resistance and a fixed condenser. Disconnect your 'phones from the single-valve set and connect a 30,000-ohm resistance across the 'phone terminals. To the negative side of the 'phone terminals (that is the side which is joined to the H.F. choke) a .01 mfd. condenser should be joined and the spare terminal of this condenser is then connected to the input terminal on the amplifier in question. No other alterations will be needed.

Instability

"I have made a mains set and find that as soon as I tune in the local station, which I receive at really marvellous volume, there is a form of motor-boating or instability. I should be glad if you could suggest what causes this and how it may be cured."—H. E. R. (Nottingham).

THE trouble may be due to some form of H.F. instability and we suggest that, if you have checked the layout and the trouble is not due to interaction between wiring, you will probably find that a separate smoothed H.T. feed to the detector valve would prove efficient. Take a separate lead from the smoothing choke in the mains section and include another iron-core choke in that lead, connected through the usual decoupling components to the detector anode. You may need to increase the value of the decoupling resistance in view of the separate H.T. giving you more than you are at present getting.

Quality Amplifier

"I am anxious to build a really first-class amplifier for record reproduction and am uncertain as to the best circuit to employ. Do you advise a push-pull output stage with triodes or pentodes? Should I use more than two stages, and is transformer better than resistance coupling? I can use A.C. mains supplies and at the moment I have not got any components which would be of use so that I am starting from scratch."—G. S. (Twickenham).

THE type of amplifier depends to a great extent upon the individual listener's ear. One listener prefers deep-toned reproduction, whilst another likes to hear plenty of top. As a general rule, however, we would say that a mixed coupling, that is two stages of amplifier with one resistance-capacity coupled and one transformer coupled, feeding a push-pull stage will give splendid all-round results. Tone controls may be fitted, and our preference is for triodes of the super-power class in the output stage. If you prefer pentodes we would suggest that you include some form of negative feed-back arrangement.

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 queriists.

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 Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

American Nomenclature

"I enclose a circuit which has been given to me of a receiver and there are one or two terms on it which I cannot understand. I wonder if you could tell me what they indicate. The word 'POL,' for instance, on one of the coils, and the word 'Bleeder' on the mains section are two which I cannot understand."—G. P. (Margate).

THE word "Pol" is simply an abbreviation for Police and indicates that the coil in question is used on the police or short waveband. You will also notice the letters A.B. and B.C. on the coils, and these indicate the amateur band and the broadcast wavebands. A bleeder resistance is a resistance joined across a supply in order to take away additional current or otherwise connected so that condensers may discharge when the supply is switched off to avoid a shock should the condenser be touched. The letters R.F., of course, indicate radio-frequency, corresponding to our high-frequency, and A.F. indicates audio-frequency corresponding to our low-frequency.

I.F. Trimmers

"I am making some I.F. transformers from the details in your latest book, but there is just one point about which I am a little doubtful. Should the trimmers affect results? That is, will it improve matters if I use air-spaced trimmers instead of mica types? I am anxious to make these components as efficient as possible, and should therefore like to know about this little point."—G. F. (Dunoon).

IF you wind the transformers on good quality insulators, using Litz wire, then you would certainly find that the use or air-dielectric trimmers would be worth while. If, however, you are using ordinary wooden dowel with solid wire, then the improvement obtained with air-dielectric timmers will hardly be worth the additional expense. Remember to avoid all high-resistance joints in these components if you are anxious to obtain a really good square-peak, and keep the metal can well clear of the windings.

Ganged Condenser Adjustments

"I have made a three-valver with band-pass input and am using a standard three-gang condenser. The coils are Varley and the condenser Polar with their station calibrated dial. I find, however, that no matter how I trim, the readings will not keep constant. I can get the exact setting on all stations up to Rome, and beyond that they gradually fall slightly until at the top they are about ⅛in. too low. I find exactly the same thing on the long waveband. Up to Luxembourg is O.K., and beyond this the readings fall. Does this indicate any particular fault to you?"—I. H. B. (Penrith).

IT is hardly likely that stray capacities introduced by the wiring would give you an identical fall in readings on both long and medium waves. The suggestion is, therefore, that the gang condenser has become damaged and that the capacity increases for a given movement of the dial towards the top end. Have you removed the screening cover of the condenser? If so, there is a possibility that one of the split end vanes (used by the makers for adjustment of the individual sections) has become bent, and is very close to the fixed vanes, giving an increase in the capacity in one section which is probably the aerial coil, as this would give the lowered reading on the dial. We would suggest that you let the makers examine the condenser to check this point.

Wire-wound Resistors

"For experimental purposes I need some small plug-in or similar type wire-wound resistances of various values from about ½ ohm upwards. Are there any components of this type on the market or could you tell me how to make them up?"—T. E. (N.17).

SOME very small screw-in resistors rated at 2 watts were at one time on the market and are still available from the Premier Supply Stores, whose advertisement appears in these pages. The resistors are available from .5 up to 40 ohms and have a standard screw thread suitable for use with standard flash-lamp fuse holders or similar components. The resistors cost 3d. each.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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ALL goods previously advertised are standard lines, still available. Post card for list free. VAUXHALL UTILITIES, 163a, Strand, W.C.2. Over Denny's the Booksellers. (Temple Bar 9338.)

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25 ONLY FOR SALE.—3-valve kits with valves and diagram, 12/6: 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation. —Universal Radio Co., 221, City Road, London, E.C.1.

LOUDSPEAKER REPAIRS

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

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PRACTICAL AND AMATEUR WIRELESS, 16/4/38.

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AERIAL PROBLEMS—See page 138.

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

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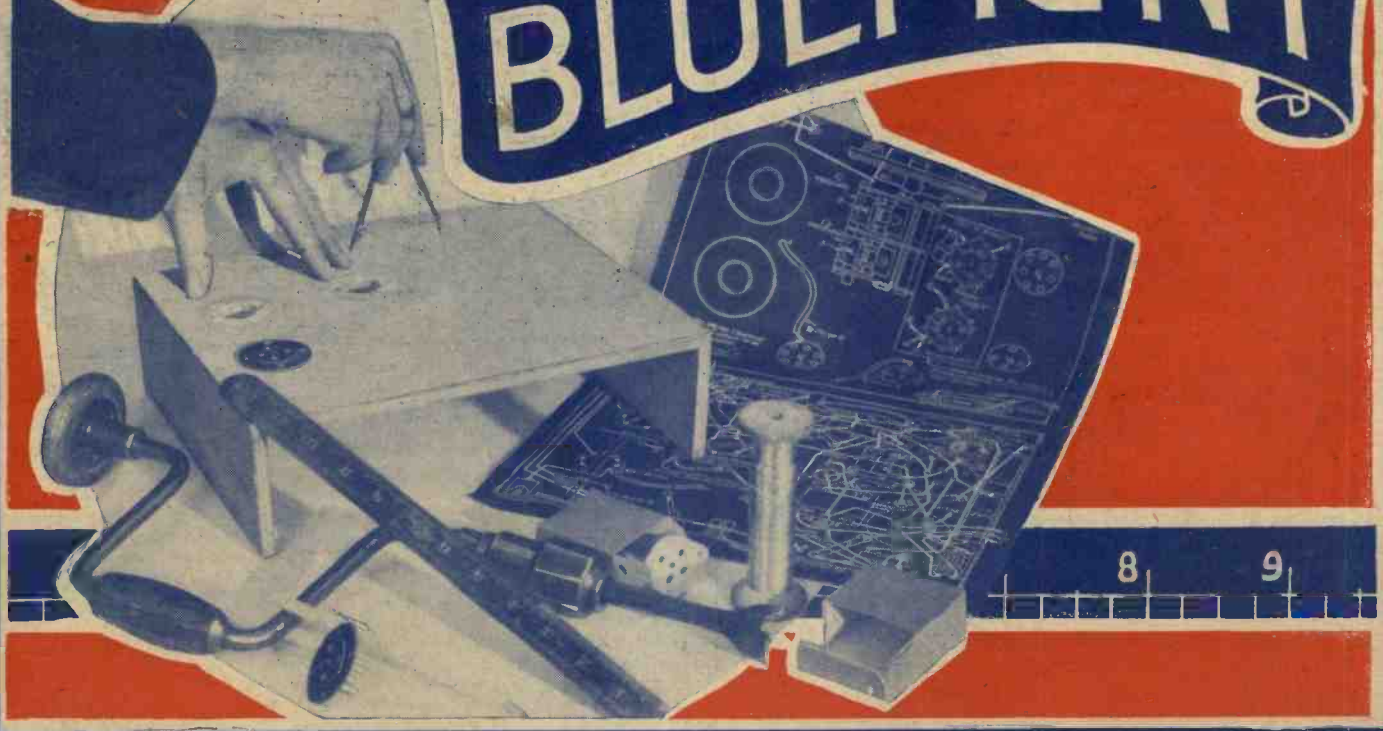
AND PRACTICAL TELEVISION

Using a BLUEPRINT



COIL CONNECTIONS—2

SEE PAGE 144

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. XII. No. 292. April 23rd, 1938.

ROUND *the* WORLD *of* WIRELESS

Coil Connections

THE beginner is often confused when making a change in the tuning circuits of his receiver, by finding that the new coil he proposes to use has a different number of pins or connections from those fitted to the older coil. Unfortunately, there is no standardisation in the method of making coil connections, and even in a three-winding medium-wave coil the reaction winding may or may not be internally connected to the grid winding. Consequently, it is necessary, if no details of a coil are available, to check through the windings in order to find the various connecting points, and in this issue we continue the short article which the Experimenters have written regarding this detailed subject. You will find various coil designs illustrated, and an explanation of the reasons underlying certain types of connection, whilst the method of using the different windings is also explained. It might be mentioned in this connection that certain old types of coil are unsuited for use in modern receivers on account of the fact that the minimum wavelength to which the medium-wave winding tuned was about 250 metres, and thus many interesting stations and broadcasts will be unobtainable. Turns could be stripped off, but this might upset the long-wave winding, and therefore modern coils should be used when the low medium-wave stations are desired.

Echo Effects

MANY conflicting reports have been received from time to time regarding the effects of echoes. In television a ghost image is sometimes seen, and according to an Australian newspaper it is now a common occurrence to hear the Daventry announcer's voice on one of the Empire programmes, accompanied by several strong echoes.

Radio and Aircraft

THE many novel radio beacons, direction-finders and other aids to navigation are being thoroughly explored with a view to finding certain definite apparatus to be fitted to aircraft intended for the forthcoming Atlantic Air Service.

Radio Clocks

IT is stated that a new type of clock is shortly to be installed at Greenwich Observatory, operated by a special synchronous motor. It is not stated, however, whether this will be used to broadcast the six pips in place of the present apparatus, although the new clock is claimed to have a very much greater degree of accuracy in time-keeping. It is intended mainly for special astronomical study.

Short-wave Interference

CERTAIN forms of interference on the short-waves are thought to be due to two stations heterodyning one another, and the resultant beat-note coincides with a different station, giving rise to signals on this new wavelength. Special laboratory apparatus is being built with a view to trying to isolate the separate signals to prove this effect and to ascertain what form the necessary interference suppressor should take.

ON OTHER PAGES

Sponsored Programmes

IN reply to the recent agitation which has been directed against commercial broadcasts in Europe, and in view of the proposed French ban on such programmes, it is stated that investigations are being made in Iceland, with a view to using the 100 kW. station at Reykjavik for sponsored programmes. It is stated that results would be as good as those at present obtained in England, and a certain amount of difficulty would be overcome from the broadcasting point of view.

St. George's Day

APRIL 23rd is St. George's Day and a special programme is to be given on the National wavelength. Entitled simply "England" it will run for sixty-five minutes; a programme which, according to the B.B.C., will try to make thoughtful and personal contact with listeners on the varying aspects of the nation, its history, the character and humour of its people, the tranquillity of its countryside and country life, its ideals and strength. Reflections by Howard Marshall will be interspersed in the typical items of English music.

Return of Philip Ridgeway

MAY 28th and June 11th will see the return of Philip Ridgeway who has not broadcast from the London studios for nearly two years. His stage activities with the famous "Ridgeway Parade" have prevented him from fulfilling broadcast appearances, but he will pay a flying visit to St. George's Hall for a variety item on June 11th and will act as Chairman at the Palace of Varieties on May 28th.

More Ultra-short Wavers

W8XOY, on 31.6 mc/s (9.494 m.), was clearly heard broadcasting a short programme in the course of which the address was given as P.O. Box 830, Akron (Ohio), U.S.A. On the same frequency, W3XIR taking a relay of WCAU, Philadelphia (Pa.), has also been logged. W3XKA, also at Philadelphia, a 50-watt station operated by the Westinghouse Electric and Mfg. Company, is working daily between B.S.T. 16.00-05.00. W3XEX, on 26.05 mc/s (11.51 m.), is the call of another 50-watter which takes the programme of WTAR, Radio Corporation, Norfolk (Va.).

Delhi Tests on 31-metres Band

VUD2, Delhi, has been heard testing out on 31.28 m. (9.59 mc/s) on week-days between G.M.T. 02.30-04.00. On the same channel, W3XAU, Philadelphia (Pa.), U.S.A., is now working daily from G.M.T. 04.00-05.00.

ROUND the WORLD of WIRELESS (Continued)

Police Portable Transmitter

IT is reported that the Viennese police are experimenting with a small portable transmitter which is slung from the policeman's shoulder, the batteries being placed in his coat pockets. This transmitter, which operates on a pre-determined wavelength, is for C.W. only, and is under 2 lbs. in weight, including batteries.

Baird's New Factory

IT has been known for some time that since the Crystal Palace fire in November, 1936, the Baird Company have been working under somewhat cramped conditions in other buildings in the Palace grounds. A modern factory replete with all up-to-date research and manufacturing facilities has now been completed in Lower Sydenham, and occupation of the building has begun. Bearing in mind the enormously increased interest in all matters appertaining to television during the last few months it is gratifying to know that the pioneer company will now have the facilities to make renewed progress in the many ramifications of the science with which they are associated.

New Station for Vatican

THE new 50-kW short-wave transmitter to be erected in the grounds of the Vatican at Rome will supersede the present transmitter, which has a power of only 12 kW. Equipped with a directional antenna, it will have a much wider coverage in all directions than the present station.

The all-seeing eye of the microscope is called in by the radio industry for a variety of purposes. Here the hardness of chassis steel is being tested at Ekco Works.

Radiogram for a Cruiser

ON the quarter-deck of H.M. Cruiser *Coventry*, at Portsmouth, recently, Alderman Miss Alice Arnold, Mayor of Coventry, presented to the ship's company a silk Ensign to replace the one given to the vessel when she was launched in 1919.

Accompanying the Ensign was a further gift, a powerful radio-gramophone, which Miss Arnold said was bought from a fund raised by the people of Coventry.

INTERESTING and TOPICAL NEWS and NOTES

Radio at Woman's Fair

RADIO, television and electricity will be demonstrated at Woman's Fair and Exhibition, to be held at Olympia, from November 2nd to 26th this year. There will be sections dealing with home making, decoration, heating and lighting, domestic science and cookery. Radio, television and electricity will feature prominently in these displays.

The Australian Cricketers

MIDLAND will provide for the National programme running commentaries in the lunch and tea intervals of the first match of the Australians' tour, that against Worcestershire on the county ground by the Severn. The match begins on April 30th. Howard Marshall will be the commentator.

Northern Music Hall

THE Variety bill on April 27th in the Northern programme will be taken from two "Halls": —the Grand Theatre, Bolton, and the Lyceum, Sheffield. From Bolton comes Terry Wilson, and from Sheffield there is an excerpt from "On with the Motley," including Max and Maisie Norris, Robert Keppel, Muriel Murray. Rosami and Elgar, young Cyril Barnes, the Rhythmakers Band, the Six Blonde Bombshells, the six Dancing Delights, and Albert Modley. The show is produced and arranged by Max Norris.

"Swing" from the Continent

REGIONAL listeners are to hear a session of Swing Music from the Continent on the evening of April 22nd. It will be played by a celebrated French Swing combination, the Quintette du Hot Club de France. The orchestra is led by Django Reinhardt (guitar) and Stephane Grappelly (violin).

Music of Holland

HOLLAND has been chosen for the tenth broadcast in the series entitled "Music of Other Countries," on April 25th, when the artists will be Glyn Eastman (baritone), Harold Fairhurst (violin) and Winifred Davey (pianoforte). Glyn Eastman will sing in Dutch a group of folk songs which he has collected during various visits when he has broadcast from Holland.

At Stoughton Barracks, Guildford, Surrey, the depot of the Queen's Royal Regiment, wireless sets have been installed in all the barrack rooms. It is interesting to note that the troops at the depot drill to the music of a radio-gramophone, installed recently. The illustration shows young soldiers in one of the barrack rooms at Stoughton Barracks listening to one of the receivers.

SOLVE THIS!

PROBLEM No. 292

Agnew had a three-valve A.C. mains receiver with an indirectly-heated output pentode stage. During an item he heard a faint click and signals immediately faded out. He connected a pick-up, but still could not obtain signals. He next connected a milliammeter in the output anode circuit and this registered no current. He suspected the mains unit, but the meter, when included in series with the smoothing choke, showed a fair current reading. He then suspected the output transformer, but on test this was in order. He therefore took the output valve to a local dealer for test, but this showed that it was quite up to standard. What was the trouble? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 292 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, April 25th, 1938.

Solution to Problem No. 291.

When Jackson added his extension lead he overlooked the fact that a fixed condenser had to be included in the filter circuit. As Jackson arranged things he was short-circuiting the H.T. supply direct to earth through the two speaker transformers.

The following three readers successfully solved Problem No. 290, and books have accordingly been forwarded to them: W. Battersby, 8, Blackledge Street, Daubhill, Bolton; C. N. Green, 7, Greenfield Gardens, Cricklewood, N.W.2; V. Harrison, 2, Westbrook Avenue, Teignmouth, Devon.

Stability in T.R.F. Circuits

Some Further Notes on the Fascinating Subject of Straight Multi-H.F.-stage Receivers

IT was, I believe, Euclid who said that "things which are equal to the same thing are equal to one another." He certainly did not know anything about earthing H.F. stages.

It is altogether too tempting to look upon a metal chassis as a common earth. That word "common" is, in fact, the cause of a lot of trouble. H.F. stages must be kept separate, but as soon as one starts thinking of the chassis as one big earthing point, those stages cease to be separate. It seems absurd that a wire from the earth end of a condenser to the earth end of a coil should be different from the use of a chassis as the connection between those two points, but the fact remains that the wire is often much better.

The limit to the amplification obtainable from a multi-stage H.F. set depends on its stability. A receiver which is completely stable the first time it is tested is open to suspicion, unless the design is exceptionally good. Only too often, stability is achieved by sacrifices in efficiency, whilst if there are signs of instability, the cures adopted take the form of reduction in amplification.

In many cases, a deliberate reduction in efficiency appears to be the only remedy; but when it is, it usually points to faults in design or layout. And as often as not, these faults are due to unsuspected electro-magnetic couplings, or "common impedance" couplings, such as the common chassis-earth. Of course, capacitative couplings can also be a source of trouble.

Coupling Loops

One trouble I experienced was due to the metal frame-work of the wave-change switch. The switches themselves were located beneath the coils; the two metal rods carrying the switches ran beneath all the coils and were riveted to the metal locator plate. Although these rods formed no part of the circuit, the set broke into oscillation if the rods were touched.

What was happening was that the two bars, with the locator plate, were acting as a loop which coupled all the circuits, and several earthed connections had to be made to the bars, adjacent to each coil.

Personally, I consider it safest to look upon each stage as a complete and self-contained unit, even to the extent of building them in separate screening boxes. As will be seen from the accompanying typical diagram, the circuits can be entirely separated, as shown by the dotted lines. In this diagram, no connection is shown between the individual "earth" lines. In fact, it is very much better not to think of them as earth lines, but simply as parts of the individual circuits. By attention to the layout it is often possible to connect all the "earth" points in a section to one terminal, mounted through the metal chassis, and then run a short wire from this terminal to the earth side of the corresponding condenser section.

Whatever the actual layout, each stage, with its wiring, should be treated as a completely separate section, and only when this has been done, should a connection be made to the chassis or bus-bar.

Component Positions

Even within each individual section, the closest attention should be paid to the positions of the components. If the accompanying diagram was any indication of the arrangement of the components, the relative positions of R2 and C2 are better than R1 and C1. The wire "Y" is merely an H.T. lead, whereas "X" is carrying H.F.

Another source of coupling can occur through the heater leads in a mains set. In a large receiver, these can be quite lengthy, and although they form no part of the radio circuit, they can cause coupling, especially as the only earthed point is way-back at the centre tap on the transformer winding.

There are two ways of guarding against such trouble. One is to remove the earth connection from the centre tap of the heater winding, and then earth one of the heater leads. To be really on the safe side, one heater socket on each valveholder should be earthed, taking great care that all the earthed sockets are connected to the same heater lead, otherwise the transformer winding will be shorted. Do not be tempted to dispense with one wire by using the chassis as a common connector.

Another method is to retain the centre tap, but to earth the heater sockets on each valve holder, so far as H.F. is concerned, by means of a .1 mfd. condenser.

The use of screened leads is to be avoided where possible. In the case of the anode leads it is usually essential that the wires should be screened and often it is wise to screen the grid leads. But remember that the screening must be earthed, so that capacity effects will exist between the screened lead and earth. It is better, therefore, that the screening should not fit tightly over the wire, otherwise the capacity will be higher than is desirable.

Still another source of common coupling which can easily occur is through the A.V.C. line, particularly if it controls more than one valve. To guard against this, each A.V.C. decoupling resistance and condenser should be contained in the section to which it belongs.

All of which may tempt readers to ask, "Is it worth it?" In my opinion, it certainly is. Quite apart from the fascination of tackling a difficult problem and finding a satisfactory solution, there is the undoubted fact that a well-designed multi-stage H.F. set can give a wide choice of programmes at excellent quality, whilst it has many points in its favour when compared with a super-het.—R. H. B.

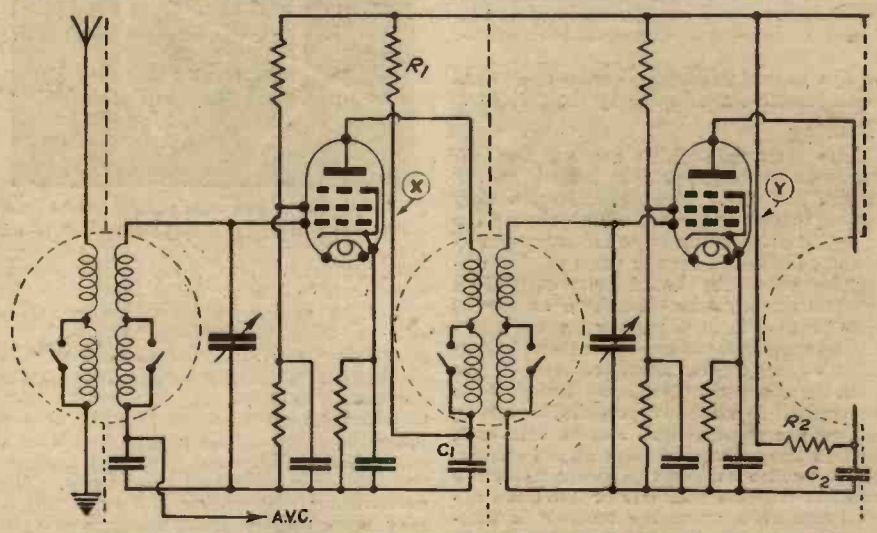


Diagram of 2 H.F. stages indicating important points in regard to layout and stability.

ON THE WAX

Brunswick and Vocalion

A POPULAR star, Connie Boswell, has recorded two old favourites, "Martha" and "Home on the Range," on *Brunswick* 02566. A novelty vocal with instrumental accompaniment is supplied by The Foursome, singing "Sweet Georgia Brown" and "Chinatown, my Chinatown," on *Brunswick* 02571. Chick Webb and his Orchestra have made a catchy recording of "The Dipsy Doodle" and "Midnite in Harlem" on *Brunswick* 02569, as also have Jimmie Lunceford and his Orchestra with "Like a Ship at Sea" and "Margie" on *Brunswick* 02570.

Maxine Sullivan, who has made a number of best sellers, appears on *Vocalion S* 137, singing a popular tune of the moment, "Nice Work If You Can Get It," from the film "Damsel in Distress," and "Easy to Love" from the film "Born to Dance." "Lights Out" and "Ragging the Scale" on *Vocalion* 576 is music in the Russ Morgan manner, whilst Harry James and his Orchestra have made two hot numbers, "One o'clock Jump" and "Jubilee" from the film "Every Day's a Holiday."

Hill Billies are always popular, and Jack Savage and his Cowboys supply two—"Sweetheart of Red River" and "Memories of Home"—on *Panachord* 25962.

USING A BLUEPRINT

A Special Article for the Beginner Explaining the Value of a Blueprint and the Best Method of Using It

IN building certain forms of apparatus a blueprint is an essential, and many hours are spent by the draughtsmen at the drawing-board making the necessary tracings. In wireless receiver construction there are hundreds of amateurs who are able to build any type of receiver merely from the theoretical diagram. But it is essential to observe a certain order in making up some receivers; just as when erecting a building certain girders must be placed in definite positions, so must certain components in a wireless circuit be placed in a given position. These positions are found by the designer of the receiver after making up perhaps a dozen different models in order to ascertain the most effective lay-out. The question of the lay-out is not always dependent upon the ease of wiring, although this naturally plays a considerable part in the finished design. It is essential to avoid interaction between certain components, and losses due to lengths of wire in some circuits must be avoided. Therefore, even if you can read and understand a theoretical circuit, it is necessary if you are going to reproduce the original design, to study a blueprint and see just what arrangement was adopted by the designer.

Tracing

The blueprints which are supplied for receivers described in this journal are all drawn full size. It is, therefore, a very simple matter to place the blueprint on the specified chassis and trace off every screw-hole or hole used for the passage of a connecting wire. As the majority of modern circuits employ what is known as chassis construction it is necessary on the blueprint to show the above-chassis and below-chassis views, and these are produced always with the above-chassis view at the top of the blueprint. It would be possible, therefore, to cut the print in half and to affix each half to the respective sides of the chassis. Many amateurs adopt this idea, placing the print in position with one or two drawing-pins and then when the receiver is completed the blueprint remains as a permanent record should wiring be modified or be in need of renovation at any time. An alternative scheme is to trace the print by placing ordinary carbon paper on the chassis and tracing off the lines with a sharp pencil. Actually, however, neither of these schemes is essential, and the method which is in our opinion the best is to place the blueprint on a large table upon which the constructional work is to be carried out and then to transfer the various details one at a time.

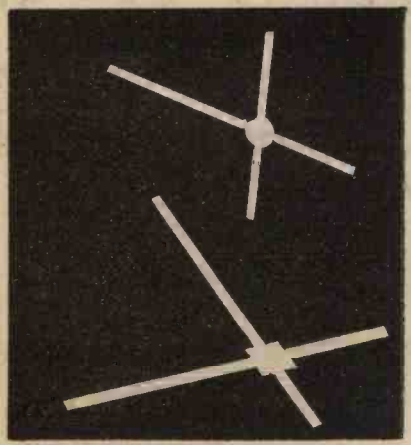


Fig. 2.—Wires which are connected or attached to each other are shown as above.

Clearance Holes

Pin the print down to avoid damage to it, and then when the work is completed

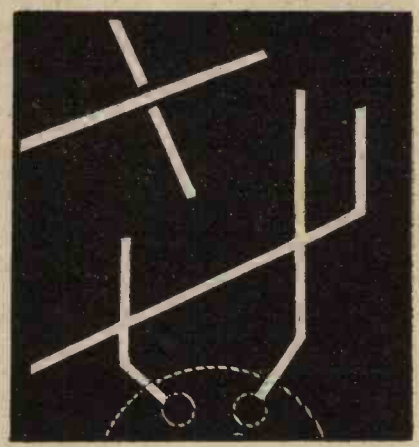


Fig. 1.—Wires which cross without touching are always indicated by one of the schemes shown above.

the print may be filed away for use on any subsequent occasion. Take first of all the large holes such as will be needed for valve-holders, coil holders and similar items. Carefully measure off the centres of these on the print and then transfer the measurements to the chassis surface. If you do not object to damaging the print, of course, you can place the print on the chassis and with a small sharp-pointed awl, may prick through the various centres and screw-holes. The perforations will weaken the print and it may subsequently suffer damage due to this, and, therefore, the process of transferring the details is desirable. It is also much more interesting, and adds to the work of construction by giving something more to do than just assembling a few odd parts and stringing them together with wire.

Having marked out the various holes, drill them to the required size, and where this is not quite clear from the print (due to the proximity of other circles on the components, for instance) the actual component should be examined and measured. All holes in the chassis, which are always numbered in sequence from one upwards, should then be drilled, and in the majority of cases a $\frac{1}{8}$in. hole will suffice. If a screened lead is indicated a $\frac{1}{4}$in. hole will have to be made to enable the larger diameter of the screened wire to pass through. The components should then be mounted, unless it specifically states in the constructional article that certain items should be left until a certain stage in the constructional work has been reached. It will sometimes be found that the components are so arranged that wiring is obscured by a large component and thus a certain part of the wiring will have to be carried out before that component is mounted.

Wiring Details

Therefore, follow the constructional article where this is available, but if it is not, a wire of the type referred to would easily be seen as it would undoubtedly be shown by a broken line—signifying that it is partly covered. In the wiring plan or blueprint the wires are shown in certain definite forms, and these are clearly indicated in Figs. 1 and 2. It should be noted that the wiring tracing does not indicate which wires are above and which below other wires and therefore it may be necessary at certain times to pass a wire beneath another already in position, but it should be adopted as a general rule that all wires should cross as nearly at right angles as possible. This rule should be followed even although it may mean making a double bend in a wire in order to get the right-angle crossing. The crossing points should also be insulated by slipping the special insulated sleeving over the wire, and this will avoid short-circuits should the wires inadvertently come into contact due to sagging. Junctions indicated on a blueprint may not necessarily be carried out at the point indicated, but at some convenient point, perhaps where a component with wire ends is attached. Make all such junctions in a really sound manner, using solder for joining the wires and making quite certain that the joint is well made and not a "dry joint." A point which often causes confusion to the beginner is what type of connection is indicated where the letters M.B. or M.C. are marked on the blueprint. These merely indicate that a wire is attached to a soldering tag or beneath a nut or bolt-head at the points indicated and are thus in contact with the metallised baseboard (M.B.) or metal chassis (M.C.). These points serve as earth return points and avoid running long leads from one such point to another, and eventually to the earth terminal.

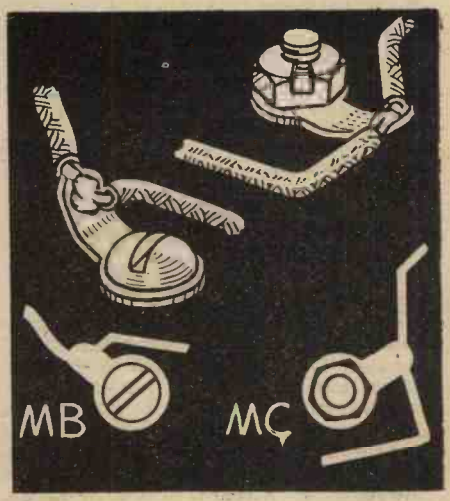


Fig. 3.—Common earth return points are joined to screws or bolts in the chassis, and are indicated as shown in this illustration.

VALVE CHARACTERISTICS—7

The Peculiarities of the Electron Stream are Dealt With in this Article.

"A STREAM of electrons flows from cathode to anode." This phrase must have been read dozens of times by the average amateur who may surely ask, "Why should they?" and "For what reason do electrons suddenly leave the atoms to which they belong and go rushing off into space."

The fact that the cathode and anode are in a vacuum has nothing to do with it; the air is pumped out of the bulb so that the electrons may have an uninterrupted journey from cathode to anode, and not to assist with their initial break away. Again, the anode is held at a high positive potential to direct the detached electrons to this electrode, and may incidentally have some small effect in helping them to break away, but the significant fact remains that electrons will leave the cathode (provided, of course, that it is adequately heated) with all other electrodes disconnected.

Fig. 1.—The hydrogen atom consists of a single electron (negative) revolving round a single proton (positive).

Fig. 2.—The nucleus of the carbon atom contains 12 protons and 6 electrons. Six free electrons complete this atom.

Electronic Theory of Matter

In order to understand the function of a valve cathode, it is necessary that some knowledge be gained of the structure of its active coating, which, in other words, means some idea of the electronic theory of matter.

Matter, be it silver, oxygen, roast beef, common salt, or anything that the reader may think of, is composed simply and solely of electrons and protons; the only difference between, say, sulphur and copper is the *arrangement* of the electrons and protons in the atom. Take the hydrogen atom as an example, which is diagrammatically illustrated in Fig. 1. It will be seen that this atom is the simplest possible, consisting of one proton and one electron. Compare this with the carbon atom at Fig. 2, which has a nucleus (or centre) composed of twelve protons and six electrons around which six *free* electrons revolve on two separate orbits. It is necessary to note particularly that a normal stable atom has an equal number of protons and electrons, although the latter may be divided into varying proportions of free (i.e., revolving outside the nucleus) and fixed electrons.

Free Electrons

The proton is the positive charge of the atom, and accounts for practically all of its mass, for it weighs about 2,000 times as much as the electron, and may be regarded as stationary in space. The electron is the negative charge and is, in other words, just pure electricity and, unlike its counterpart, is readily movable, inclined to be unstable, and possesses so little mass that it has almost negligible inertia and momentum.

Some substances have the bulk of their free electrons in their outer orbit, and those that have the maximum number possible, viz., eight, are inherently stable, as the electrons are held strongly by the attraction of the positive nucleus. Some substances have their free electrons travelling in several orbits with only one or two in the outermost orbit, such as the substance strontium, which is used as the basis of most cathode (or filament) coatings. Strontium (see Fig. 3) has its thirty-eight electrons arranged in five orbits, the outer one having two, while the middle orbit of this atom has eighteen. The result of this particular arrangement is that the outer two are easily detached, as they are relatively remote from the nucleus, and also because the dense inner rings "screen" the outer orbit to some considerable extent.

Fig. 3.—The strontium atom is very much more elaborate than the other atoms illustrated; the nucleus is made up of 76 protons and 38 electrons, while the 38 free electrons are arranged in 5 orbits. Note particularly that the outer orbit has only 2 electrons.

Free electrons are held in their orbit by a balance between two forces, the pull of the positive nucleus (gravity, if you like), and the centrifugal force due to the speed of the electron. A simple analogy is a ball on a piece of string; if the latter is held in the hand and the ball made to spin round in a wide circle, then the string represents the pull of the nucleus while the force that keeps the ball from falling to the bottom of its orbit is known as centrifugal force.

Normally, then, an atom of strontium continues to exist as a self-contained "family." On the average cathode, there would be of the order of a hundred × million × million × million atoms of this substance or a mixture to which barium and other substances have been added. When the cathode is heated the electrons, (especially those on the outer orbit) revolve faster and "spare" electrons originating from the H.T. current source are forced into the "family circle"; this completely unbalances the atom, the nucleus being unable to hold the additional electrons, particularly as the increased speed of the orbit will increase the centrifugal force and cause the diameter of the orbit to increase, and hence decreases the pull of the nucleus. All this is too much for the inherent stability of the atom (which we have already indicated to be low in the case of strontium, barium, etc.) and the "spare," and possibly one, of the normal electrons, will be flung into space.

Once having left the cathode, the electron will proceed on a tangent to its original orbit so it may leave the cathode in *any direction*. Where there is a high positive electrode, such as the anode of a valve, the electrons will be pulled into its field and pulled towards it at a velocity that increases as the distance decreases. In the absence of a high positive electrode, the electrons will travel to the most positive point, i.e., the extreme ends of the heater or the positive end of a D.C. heated filament. The loss of electrons in the atoms is made good from the H.T. current in the case of a mains valve, while in the case of a directly-heated valve, the L.T. current may be involved.

The foregoing explanation has shown what happens in an individual atom, but the same thing is happening in all the atoms on the *surface* of the cathode; atoms below the surface do not project electrons into space, but they behave in the same way and perform the very useful function of feeding the surface atoms with "spare" electrons which they, in turn, take up from the H.T. current.

GILBERT "JUNIOR" ELECTRIC HAND-DRILL

A VERY useful electric hand-drill for the amateur's workshop was recently placed on the market by The Rawlplug Coy., Ltd. This sturdily-built tool, which in use is held in the hand by a pistol-grip, is far more speedy and accurate than the ordinary breast-drill. It will drill wood or metal and takes up to ¼in. drills. Other jobs that can be done with the aid of this handy little tool are, sandpapering—by using a sand-paper disc; buffing and burnishing, and even car polishing, if a suitable polishing mop is placed in the chuck. When fixing up aerial and earth leads, the Gilbert "Junior" will save much time and trouble by drilling the necessary holes quickly and neatly through window-frames, etc. The drill, which is supplied for various voltage ranges from 105 to 250 volts. A.C. or D.C., weighs 3lbs., complete with switch, chuck and flex. The price is 35s.

The Gilbert "Junior" Electric Hand-Drill is suitable for many jobs in the workshop.

AERIAL PROBLEMS

The Advantages and Disadvantages of Various Forms of Aerial are Discussed in this Article by Radio Engineer

MANY aerials are receiving their annual overhaul and inspection, and it would appear that many will be modified or re-rigged to enable their owners to experiment to improve reception efficiency, freedom from interference, and better signal-to-noise ratios. One cannot consider the aerial input side of any receiving apparatus without coming up against that problem—which is the best type of aerial?

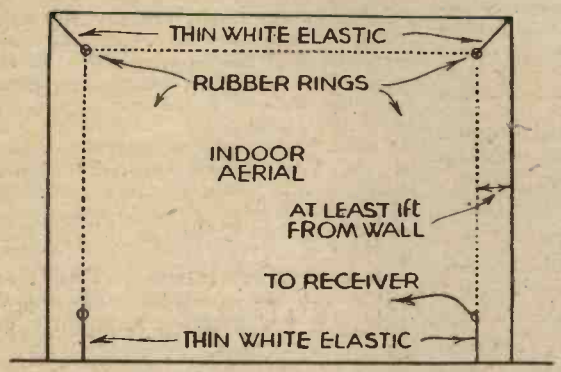


Fig. 1.—An efficient indoor aerial should be arranged as shown here.

Many might think that that is an easy one to solve, but it is not so simple as it would appear to the unenlightened. It is impossible to state *which is* the best type of aerial unless certain information is provided regarding matters which are so closely related to aerial design and erection. For example, one must have some idea of the space available, the conditions prevailing in the area of operation, the type of receiver to be used—whether all-wave, broadcast or short-waver while, similarly, some guide as to the form of reception the operator is interested in—D.X. or local—must be given.

For the purpose of this article, it is proposed to divide the various forms of aerials—good or otherwise—into classes, and examine each class in turn with the hope that all individual conditions will be covered.

In the first class let us place frame aerials, in the second indoor aerials, and in the third outside aerials, but do not think that this classification is intended to represent any order of merit.

Frame Aerials

Systems coming within this class do not appear to receive the favour they did a few years ago except, of course, in the case of portables and transportables.

As pointed out in an article which appeared in these pages during the early part of last September, frame aerials offer certain advantages which, even to-day, should not be overlooked. Their chief virtue is their directional properties which, in turn, means that they are most useful when additional selectivity or freedom from adjacent station interference is required.

Another good feature is that they are not so capable of radiating when they are used with a receiver or operator subject to that undesirable habit. Apart from these more or less technical qualifications, it must not be overlooked that the use of a frame aerial allows one to dispense with the leads and restrictions usually associated with external aerials, and this item alone was partly responsible for their great popularity.

On the other side are, of course, the disadvantages, and these can be summed up in the following remarks.

Most frames were inclined to be on the clumsy side; they did not add, so to speak, to the decorative scheme of the room in which they were used, and their efficiency was naturally well below that of an external aerial. Another nasty fault was their susceptibility to electrical interference, and the fact that the receiver, unless it was designed for use with a frame in the first place, had to have its input circuit modified. However, the frame aerial still has possibilities, and it is worthy of every constructor's consideration, as it offers quite wide scope for experimental work.

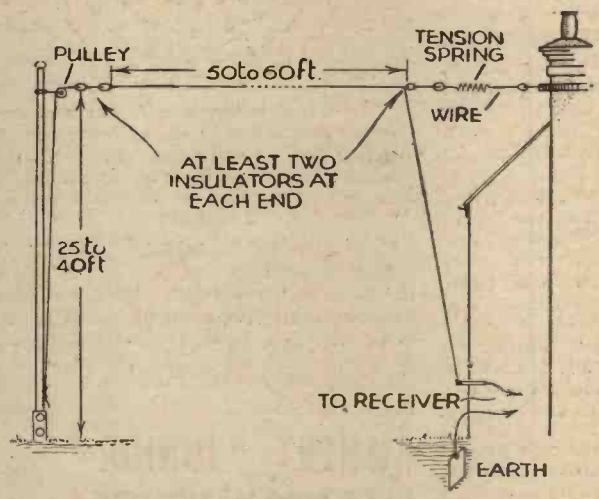


Fig. 2.—An ideal arrangement for an inverted "L" type of aerial.

Indoor Aerials

Many listeners are forced, by circumstances beyond their control, to make use of some form of indoor aerial and, while in some cases it is possible to arrange quite an efficient system, others are compelled to tolerate a poor performance from their receivers.

The chief fault with this type of aerial is the tendency to make it too small, and with too great a capacity to earth. Where conditions permit a long, say, 15 to 20 yards, horizontal length of wire being suspended in the loft of the house with a downlead coming down and well away from the outside of the house, it is possible to obtain quite a high degree of efficiency, and such an arrangement forms the most satisfactory type of indoor aerial.

When it is a question of having to fit the aerial in the same room as that housing the receiver, then one cannot do better than use the method shown in Fig. 1, where it will be seen that the wire passes round three sides of the room, so supported that it is, at least, one foot away from the walls and ceiling. It is surprising the difference in results when the wire is so placed, compared to when it is tucked down in the picture rail.

Height plays a very important part with any aerial; therefore, always remember that an indoor arrangement will be more efficient on the second or third floors than on the ground level.

Outside Aerials

The types coming in the class could be subdivided into further sections but, as space prevents each form being treated individually, it must suffice to cover their general applications. Wherever space allows the erection of an inverted L type of aerial (Fig. 2), having a horizontal portion of say, 50 feet at a height of 25 to 30 feet, this forms one of the *most efficient* general purpose forms of aerial, providing certain points are noted. For example, it is very desirable to have the horizontal portion as remote from earthed objects, such as trees and houses and overhead wires as possible, while the downlead should be so arranged that it is kept under reasonable tension and well away from walls. The actual direction will also play an important part, but as that is so often limited by local conditions, it is really a matter for experiment.

The only snag with this type of aerial system is electrical interference. If one is in a district where

(Continued on page 149)

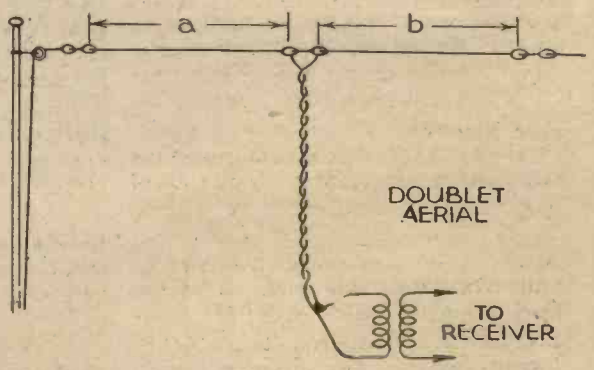


Fig. 3.—An efficient doublet aerial. Lengths a and b are equal to ¼ wavelength depending on the waveband concerned.

ON YOUR WAVELENGTH

By Thermion

The Price Factor

IN the course of conversation with a prominent component manufacturer the other day he expressed the opinion that whilst there would always be a hobby of building wireless sets, he did not think that it would remain at its present level, which is lower now than it was, say, five years ago. I challenged him on this, pointing out that the net sales of this journal were as healthy to-day as they were five years ago, and that the enthusiasm of the readers and the volume of letters had not declined. I pointed to the fact that we were selling as many blueprints as ever, that we answered as many technical queries per day as we did five years ago (an inspection of the books shows that actually we are answering more), that as many sets were being built from our blueprints, and that most of our readers were loyal supporters and had been for a number of years. He replied that the price of components was high, and that the commercial receiver was a fierce competitor. The fallacy of this argument would seem to be almost too patent to need explanation, but I give it as these views seem to be held by so many manufacturers who ought to know better.

If you consider that people build sets because they are anxious to save money, then, indeed, would home construction offer no advantages. But the fact that so many thousands of readers still build sets irrespective of price indicates that the fascination of the hobby exceeds price considerations. I frankly admit that some of our readers are compelled to consider the price question, and that they build sets partly for experiment and partly to save money, but by no means the majority of them do this. Each year there is a new generation cropping up which desires to build a "first" receiver. Like photography, wireless will always be a hobby. Many years ago people built their own gramophones, but only a very few do so to-day. I do not consider that wireless will ever follow that path. It is too fascinating, too new, too full of the possibilities of doing something better, too educational, too all-absorbing, to sink to the commonplace.

My friend then went on to the question of price, and I agreed that in some cases the cost of components should be cheaper. This journal cannot control the price of components, and I think that the main cause is that most component manufacturers are making for set manufacturers as well, who quite obviously can place larger orders with them. This may account for some of the chronic cases of slow deliveries which are brought to my notice almost daily. Some of the manufacturers have deserted the constructor upon whom they built their businesses, and have deserted them in almost a sacrilegious way. They have not the courage to desert the constructor altogether; they like to flirt with his custom in case the set business fails. The dealer has been educated to believe that there is more money in set selling than in components; hence the usual reply, "I will order it for you." Fortunately a few firms still remain who give prompt service, and are not unmindful of the valuable service which constructors render. It is still possible to make a set cheaper than you can buy one, particularly if you can assess in terms of L.S.D. that indefinable yet certain something known as quality.

The race is not always to the swift; if it were, some of the swift people who have flitted across the set market, and fortunately are no longer with us, would still be tinkering with radio and jingling their illgotten coins. Moreover, this journal has survived when so many of our older competitors have gone to the wall. The manufacturer should encourage the component market, and he can only do this by believing that the market is there.

Crystal Sets

MENTION of blueprints reminds me that the crystal set is by no means so dead as people imagine, nor is it the national instrument of the Scot. I am told by our blueprint department that the sales of our blueprint for a crystal set are consistently maintained, and that we sell many hundreds of them every year. I listened-in the other day to a crystal set, and it brought back pleasant memories of 1920, and 2MT. How many of my readers remember the Writtle Transmissions? The fact that I have not ceased to be interested in home construction should be sufficient answer to those manufacturers who think that the hobby is a passing phase.

Next on the list comes one-valvers, and then three-valvers. The two-valve set seems to be unpopular, although I cannot understand why, for it is possible to work a loud-speaker from a well-designed two-valver. Perhaps my readers might like to let me know why it is that they shun the two-valver. Set manufacturers also inform me that two-valve sets are practically unsaleable. Bearing in mind the efficiency of modern valves and components, a modern two-valve set is equivalent to a three of two or three years ago. Needless to say, there are plenty of blueprints in our list for two-valve sets.

Wanted!

ONE of my readers is particularly anxious to get hold of either bound volumes or loose issues of the first three volumes of *Amateur Wireless*, which, of course, is now merged in this journal. Any reader who has these for sale should send me a letter stating the price.

Bound Volumes

AS announced in a previous issue, the Publisher has a few bound volumes of Volumes 1, 2 and 3 of PRACTICAL WIRELESS. Whilst the stock lasts they may be obtained for 7s. 6d. each. They are, of course, very rare, and most of the issues are out of print. I am asked to say that when the stock is exhausted subsequent orders will be returned.

Prizes

I OFFER a prize of three books to the senders of what I consider to be the best letters on "My Most Embarrassing Moment in Radio."

These letters should not exceed 250 words in length, and they should be written on one side of the paper only. Professional journalists, free-lance writers and hack reporters are not permitted to enter. Mark your envelopes "Thermion's Prize."

B.B.C. Handbook for 1938

ADVICE to those with radio masterpieces hidden away in a drawer, to those seeking auditions and appointments, and to others who wish to explore Broadcasting House is contained in the B.B.C. Handbook for 1938, published on April 1.

I am interested to see in this booklet that the B.B.C. is as anxious to secure good broadcasters as are most people to broadcast. Writing for the radio presents a whole new literary field, and in its chapter on the submission of scripts and scores the Handbook expresses the B.B.C.'s willingness to co-operate with would-be radio writers.

The Handbook records the most notable events and developments in the fifteenth year of the British broadcasting service and contains a great deal of standard and up-to-date information about the B.B.C. itself. It is the eleventh of such handbooks to be published.

There are chapters on the Coronation broadcasts, on television, and the new foreign language broadcasts. The King's Coronation speech and Christmas message are printed in full.

The year 1937, an historic one for broadcasting, is reviewed at some length. It was the year of the new Charter, of thoroughly organised television, of the first broadcasts in foreign languages, of the most extensive experiments yet made in Listener Research, and of substantial increase in the network of Regional transmitters.

There were, I see, over 100,000 hours of broadcasting from the home transmitters, a figure which includes 23,779 hours of Empire broadcasting and 1,619 hours of television. The aggregate for 1936 was in the region of 87,000 hours.

The year 1937 saw the introduction and success of two notable dramatic innovations, World Theatre and the Experimental Hours. While these latter were expected to appeal only to a minority audience, the response from listeners, it is disclosed, has been enormous. The year gone by was also witness to the most comprehensive and elaborate outside broadcast ever to be heard in this country and probably in the world. The story of the organisation of this programme—which was, of course, that of the Coronation—is fully told in a special section of the handbook.

Broadcasts to schools enjoyed a record year and the number of schools recorded as listening rose, in the twelve months, from 5,000 to 6,890 in England and Wales and from 750 to 881 in Scotland.

From the lay point of view one of the most interesting sections of the handbook is that which answers the question, "What is the B.B.C.?" The full story of the Corporation's growth from the days when, as the British Broadcasting Company, it sent out its daily broadcasts from its London station in the Strand until the present time, is fully described. The structure of the B.B.C., its methods of finance, and its national position are closely analysed.

The handbook contains also licence figures and the revenue account and balance sheet for the past year, besides advice on good reception and maintenance of sets. Its price is 1s. 6d., or 1s. 10d. by post, and applications should be addressed to the B.B.C. Publications Department, 35, Marylebone High Street, London, W.1, or to the B.B.C.'s Regional offices.

Empire Exhibition

I SEE that arrangements are now complete for many broadcasts from the Empire Exhibition (Scotland), 1938, and I hope the B.B.C. will take every advantage of the varied programme material offered. Programmes from the concert hall, the bandstand and the theatre will be heard, and religious services, interviews with distinguished visitors and tours of the Exhibition should also be broadcast.

On May 3rd the Empire Exhibition will be opened in the Ibrox Stadium by H.M. the King, whose voice will be heard throughout Britain and the Empire. On the evening of May 3rd listeners to the Scottish and London Regional programmes will hear a programme entitled "Night Out at the Empire Exhibition." This will consist of a microphone tour intended to give listeners a sound panorama of the bustling scene with its various interests and amusements. Halts will be made at points of exceptional interest, such as the 300 feet high Exhibition Tower which crowns the hill in Bellahouston Park.

On four occasions the B.B.C. Scottish Orchestra, augmented to full symphony strength, will give concerts, and it is expected that on June 13th the B.B.C. Symphony Orchestra, conducted by Sir Adrian Boult, will visit the Exhibition and broadcast a concert.

Notes from the Test Bench

Centre-tapped Aerials

IN television it is now usual to use a vertical aerial with a twin feeder joined to the centre. A similar idea (with the aerial wire horizontally arranged) is also used very often for normal short-wave reception. It is important to remember that maximum efficiency will only be obtained with such a scheme when the twin feeder is properly designed and connected. A number of cases of disappointment with this type of aerial have been traced to the fact that it is overlooked that the two ends of the feeder, when this is untuned, must be joined to the centre of the aerial system at a point equal in impedance to the surge impedance of the line. By using the modern specially-designed twin-feeder for television, the value of the surge impedance of the line will be known as it is printed on the box by the makers. For those who wish to calculate the impedance of a home-made line the formula is $276 \log_{10} \frac{D}{r}$ *where D is the distance between the two feeder wires and r is the radius of one wire. It should be noted that this formula applies irrespective of any insulation that may be used to support or separate the wires.*

Speaker Magnets

AN interesting case came to light recently where a set of our design had been slightly modified to enable it to be incorporated in an existing cabinet, with a self-contained loudspeaker. Disappointing results were obtained, and some very peculiar tuning effects noticed. Quality was very poor, and it was decided to make a very systematic check of the wiring. The chassis was removed from the cabinet and switched on preparatory to the tests, when it was noted that quality was normal. Tuning was also then found to be in order and it was assumed that a loose connection had been responsible for the trouble. Upon inspection no looseness could be observed and the chassis was accordingly put back into the cabinet, when the original effects occurred. It was subsequently found that the field surrounding the speaker magnet was causing the trouble, the H.F. valve, the output pentode and one of the coils being in this field. When the speaker was moved the set performed normally, and the performance was quite good even when the H.F. valve and coil were left in the field, but the output valve was removed.

Technical Fundamentals—6

Band-pass Couplings and Receiver Over-all Selectivity are Dealt with in this Article.

THE H.F. transformer of Fig. 17 has both secondary and primary tuned, and the circuit arrangements are, by the way, typical of an intermediate-frequency stage of a superhet receiver. We will deal with the details of superhet practice later, but since the intermediate frequency remains fixed in value, the condensers C1 and C2 will be of the preset trimmer type.

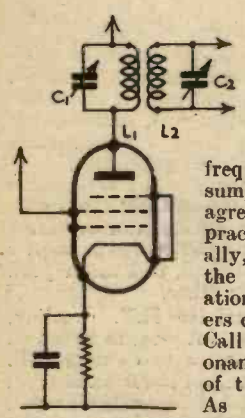


Fig. 17.—Standard I.F. transformer connections.

We will assume that both L1 C1 and L2 C2 are tuned to the same frequency. This assumption not only agrees with the normal practice but, incidentally, greatly simplifies the technical consideration of H.F. transformers of the Fig. 17 type. Call the individual resonant frequency of each of the two circuits F. As both circuits are tuned to F it may appear at first thought that the two circuits in combination will exhibit resonance at F.

If the coupling between the primary and secondary circuits is loose this will, for all practical purposes, be the case, but if the coupling is tight some very special conditions arise.

It will be obvious that if both primary and secondary are low-loss circuits, and both individually tuned to the same frequency, then, with tight coupling, the interaction between them will be considerable, and it is to be anticipated that the behaviour of either circuit will be greatly influenced by the presence of the other. The matter is a complicated one, and the mathematical equations associated with Fig. 17, simple though the circuit arrangements appear, are quite formidable. Fortunately, the practical effects produced can be stated quite definitely, and they are certainly of the greatest practical importance.

Interaction

In brief, the interaction between the two circuits is such that, with tight coupling, resonance shows up at two different frequencies neither of which is equal to F, the frequency to which each circuit is individually tuned. One of the resonant frequencies is higher than F and the other is lower than F.

With the system of Fig. 17 the higher resonant frequency will be $F/\sqrt{1-k}$ and the lower resonant frequency will be $F/\sqrt{1+k}$, where k is the coefficient of coupling. From this statement it will be seen that the tighter the coupling the greater will be the difference between the two resonant frequencies.

If the coupling is sufficiently tight to give a pronounced difference between the two resonant frequencies, and if the frequency applied to the primary were progressively increased from a value below the lower resonant frequency, it would be found that the output voltage of the secondary circuit would rise up to a peak value as the lower resonant frequency is reached, fall away as this frequency is passed, rise to another peak as the higher resonant frequency is reached, and then fall away without further rise as this frequency is passed. If both circuits are low-loss, the response curve will be markedly double peaked, as shown in Fig. 18.

An increase of H.F. resistance would have a levelling effect upon the "trough" between the two peaks. By suitable circuit design and coupling adjustment it is possible to get a response curve of the nature of that shown in Fig. 19. This curve is steep-sided and very nearly flat-topped. Here we have something of importance, because we have already seen that a characteristic of this kind will prove to be of value in tackling the difficulties practically associated with the selectivity versus quality problem.

A coupling system designed to give a response curve of the character of Fig. 19 is said to have a "band-pass" characteristic, this term implying that a band of high frequencies is handled with negligible attenuation; outside this band there is, of course, fairly sharp cut-off. In connection with band-pass systems, it must be remembered that the degree of coupling determines the "band-width" (i.e., frequency

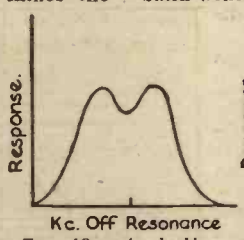


Fig. 18.—A double-humped response curve.

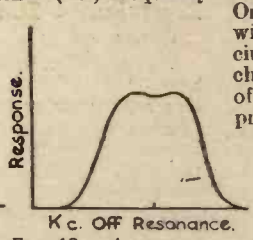


Fig. 19.—A square-peak response curve.

difference between the peaks), while the Q of the coils has a great deal to do with the extent of the troughing between the peaks.

It is to be strongly emphasised that a circuit diagram like that of Fig. 17 does not necessarily indicate a system with band-pass characteristics. Everything depends upon the degree of coupling, and the circuit diagram gives no indication of the value of this.

To appreciate the point at issue, imagine that the coupling between L1 C1 and L2 C2 of Fig. 17 is at first sufficiently tight to give a band-pass effect, and that the coupling is then progressively loosened. The first change in the characteristic will be that the two resonant frequencies will come closer together (Fig. 19) and the top of the curve will shorten. If the coupling is loosened still further there will come a point when the two resonant frequencies are practically indistinguishable from each other. The response curve will now have lost its band-pass characteristic, and will be sensibly single peaked. A certain value of coupling must be regarded as a critical value. At the critical coupling the curve is single peaked, but is, so to speak, on the verge of becoming double humped.

If the coupling is made looser than this critical value the response curve will remain single peaked, but will become sharper and sharper with reduction of coupling. The output voltage will decrease, too, this being maximum at the critical coupling. From the point of view of voltage amplitude the critical coupling is often regarded as the optimum coupling.

In any practical case, and assuming fixed coupling, an H.F. transformer of the type shown in Fig. 17 may, according to the purposes of the designer have: optimum coupling, for maximum voltage gain—over optimum coupling, for band-pass characteristics, or, sub-optimum coupling for high selectivity.

Band-pass Aerial Coupling

Band-pass coupling is not restricted to intervalve H.F. transformers. Fig. 20 shows the basic arrangement of a very commonly used type of receiver input band-pass coupling. Capacity coupling is employed. As the secondary tuned circuit will normally form the tuned grid circuit of the first valve it may be necessary to take steps to prevent the coupling condenser C forming a D.C. break in the grid circuit. A resistance connected across the condenser, as shown in Fig. 20, will effectively close the grid circuit as far as D.C. is concerned.

Sometimes mixed couplings are used. One of the practical difficulties associated with the use of variably tuned coupled circuits is that the coupling characteristics change with frequency. With the circuits of Fig. 20, for example, a given value of primary current will produce a greater e.m.f. in the secondary the lower the frequency. Mixed couplings are used when it is desired to make the combined characteristic of the coupled circuits as constant as possible from one end of a waverange to the other.

Fig. 21 shows a case of mixed capacity coupling. This diagram is a modification of Fig. 20, and shows the addition of a "top end" coupling condenser, C1, connected between the high potential ends of the two tuned circuits. C tends to be more effective at the lower frequency end of the range, but C1 evens up matters by being

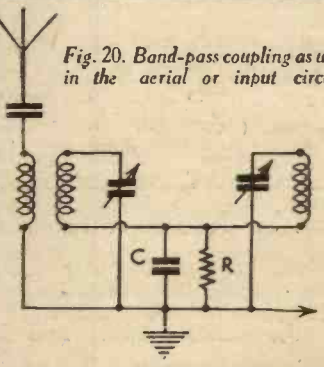


Fig. 20. Band-pass coupling as used in the aerial or input circuit.

responsible for greater secondary e.m.f. at the upper end of the frequency range. Very small capacity values are used for top end coupling condensers.

Receiver Over-all Selectivity

As far as any one receiver is concerned, the selectivity of one of the H.F. tuned

(Continued overleaf)

TECHNICAL FUNDAMENTALS

(Continued from previous page)

circuits or of one of the pairs of coupled circuits is important from the design point of view, but only in so far as it has a bearing upon the selectivity of the reciver *as a whole.*

Receiver selectivity is usually specified in graphical form. A graph is drawn showing "selectivity ratio" plotted against kc/s off resonance. The selectivity ratio at any given frequency off resonance is the ratio of the signal input voltage required at this frequency to produce a certain receiver power output, to the signal voltage required at the resonant frequency for the *same* receiver power output.

Fig. 22 is an example of such a graph. There is one particular feature about it which catches the eye, and that is the manner in which the voltage ratio scale is divided up. This merits explanation and brings us to decibel notation.

Decibels

In radio we are very much concerned with ratios expressing gains or losses, or involving gains or losses, of power.

The decibel is a unit that represents a gain or loss of power in a manner that has a very particular significance. To understand this, imagine yourself to be listening to the sound from a loudspeaker. Naturally, the greater the audio power in the speaker the greater will be the loudness of the sound. Would doubling the audio power double the loudness, as appreciated by your ear? The answer is, no. Actually, the power would have to be about ten times greater than before to give the impression of double the loudness. To double the loudness yet again the power would have to go up to about one hundred times the original value.

Take the numbers 1, 10, 100, 1,000, etc.; the common logarithms of these numbers are: 0, 1, 2, 3, etc. It becomes clear, then, that where changes of sound power are concerned, the logarithms of the ratios involved give a much better idea of the effectiveness of the power changes than do the actual power ratios themselves. The common logarithm of the power ratio is, therefore, a very useful unit for expressing

Conversion Table of Power and Voltage Ratios to Decibels

Power Ratio.	Decibels.	Voltage Ratio.	Decibels.
1	0	1	0
2	3	2	6
3	4.8	3	9.5
4	6	4	12
5	7	5	14
6	7.8	6	15.6
7	8.4	7	16.9
8	9	8	18
9	9.5	9	19.1
10	10	10	20
100	20	100	40
1,000	30	1,000	60
10,000	40	10,000	80

gain or loss. The name of this unit is the Bel.

For radio purposes it is more convenient if we consider the Bel to be divided up into 10 equal parts and take one of these parts to be our standard unit. This is the Decibel.

Thus,

Decibels = 10 × logarithm of power ratio.

It is most important to appreciate that, since the decibel is a unit of gain or loss, there must always be some datum level specified.

Although the decibel is primarily a unit of power gain or loss we can bring decibel notation into voltage or current gain or loss problems by, first, working in terms of the power change involved and, secondly, remembering that, for constant impedance, power is directly proportional to the square of the voltage or current.

Thus,

Decibels = 10 × logarithm of (voltage ratio)^2

This is the same as saying that

Decibels = 20 × logarithm of voltage ratio

Although it is very easy to convert ratios to decibel notation with the aid of a book

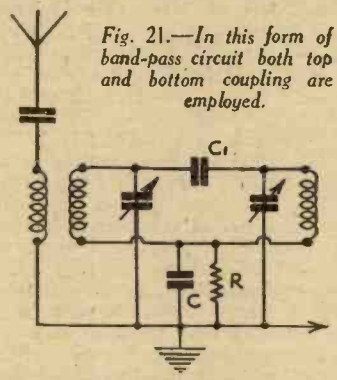


Fig. 21.—In this form of band-pass circuit both top and bottom coupling are employed.

of logarithms, the accompanying table may be found useful for rough and ready purposes.

Referring again to Fig. 22, the vertical scale is evenly divided in decibel units, and that is why the voltage ratios themselves come out at such unequal spacing. Actually, this method of plotting gives a much better idea of the selectivity performance of the receiver than that given by a graph plotted with the voltage ratios on a linear scale.

Reception Standards

We have already seen that selectivity and fidelity of reproduction are not independent, and that the whole matter is in the nature of a problem, rendered difficult by the present allocation of broadcast carrier frequencies.

Hard and fast rules cannot be laid down but it is advisable for all technically-minded amateurs to have some ideas of standards.

Let us consider real "high fidelity" first. For truly "life-like" reproduction on a good transmission the receiver would have to deal with audio frequencies ranging from 30 cycles per second up to something like 15,000 cycles per second, with no more than about 3 decibels variation up or down. As far as the high-frequency section of the receiver is concerned, this is going to mean handling sideband frequencies extending to 15 kc/s above and below the carrier frequency. A little consideration of the present allocation of carrier frequencies will show that real high fidelity reproduction without interference is going to be impossible except under very favourable circumstances. There is the possibility, however, with a local transmission if the receiver's sensitivity can be kept down sufficiently to give no audible response to the adjacent channel transmissions.

Turning now from real high fidelity to more average reproduction, we know that, even if a radio receiver falls far short of high fidelity, it can still be very pleasant to listen to.

Taking the average mains receiver, giving what we normally regard as "good quality," what would be the frequency range involved? Generally, something of the order of 60 or 70 cycles per second up to about 7,000 cycles per second, within about 5 decibels up or down. Even this range, however, is sufficiently wide to give interference trouble in some cases.

It should now be apparent, that for very long range reception considerable sacrifice of high-note response will have to be made if freedom from interference is to be secured.

Variable Selectivity

Very obviously, the maximum of satisfaction will be obtained from a sensitive, general purpose receiver only if the selectivity can be varied at will, enabling the listener to adjust according to the particular circumstances of each reception case.

It is especially useful, from the listener's point of view, if the over-all selectivity characteristic of the receiver can be varied between the limits of a fairly wide band-pass response on the one hand, to a single peak characteristic on the other.

This suggests variable H.F. coupling, and there is an important point to be noted. If the coupling between two tuned H.F. circuits is of the mutual inductance type, and the two circuits are correctly adjusted as regards tuning, then variation of the coupling will cause the response curve to change *symmetrically* about the carrier frequency point. This is not true of all types of coupling. Variation of capacity coupling, for instance, will cause the response curve to change, but it will not keep symmetrical about the carrier frequency. It will therefore be appreciated that mutual inductance coupling is particularly suitable for variable selectivity circuits.

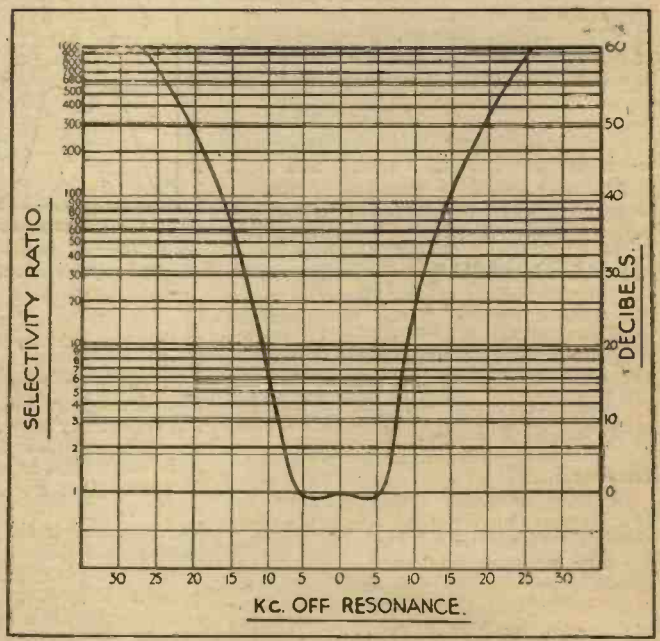


Fig. 22.—Graph showing the selectivity rating of a receiver.

A PAGE OF PRACTICAL HINTS

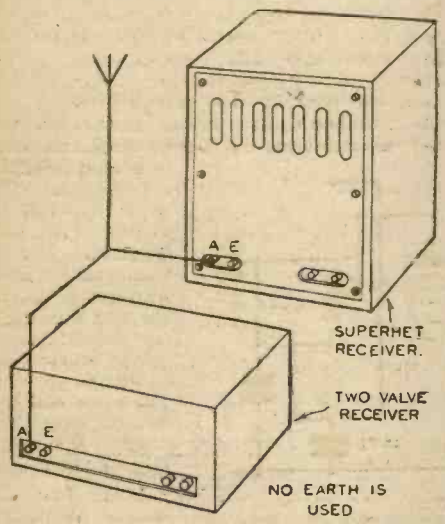
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Obtaining Regeneration on an All-wave Superhet

THE following method of "boosting" the strength of signals received on a commercial all-wave sueprhet receiver, and incidentally reducing in strength QRM, is in daily use and with good effect. In addition, a "beat" note for the reception of GW signals can be obtained on a superhet not having a "beat oscillator."



A method of obtaining regeneration on an all-wave superhet.

Many short-wave listeners have in their den a stand-by or discarded two-valve receiver of the detector-L.F. type and incorporating reaction. This is the only additional apparatus required. The writer uses a home-constructed battery operated two-valve receiver as a regenerator, and the method of connecting this to the superhet is made quite clear by the accompanying diagram.

Regeneration is obtained as follows: Switch on both receivers, leaving the reaction control on the two-valve receiver in a position well below oscillation point. Next tune the superhet to a fairly weak signal, then tune the two-valve receiver to the same frequency as the incoming signal being received on the superhet, at the same time increasing the reaction control on the two-valve receiver. This is very easily done by audible means, as the signal in the superhet will increase greatly in volume as the small receiver becomes in resonance, and as the reaction is increased. Optimum signal strength is obtained when both receivers are approximately in tune, and the reaction on the two-valve receiver is just below oscillation point. This may appear to be a somewhat lengthy procedure, but in practice it is done very quickly and easily.

The same method is used to receive CW signals on the superhet except that the reaction control on the two-valve receiver is increased until oscillation point is reached, and thus a "beat note" is obtained which will give the CW signal a good note in the loudspeaker, instead of the "mushy" note obtained on a superhet without a beat oscillator.

It should be noted that the above method may not be effective to the same extent with every combination of two-valve receiver and superhet, but greatly "boosted" signals are obtained by the writer, who is able, by this simple means, to make R4 signals into R8, and cause them to stand out clear of QRM. The method certainly deserves a trial, and has proved of great value. — MAXWELL S. BELL (Leicester).

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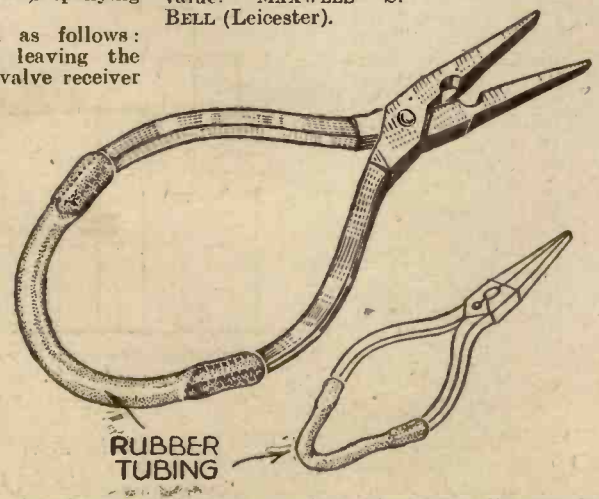
All wrinkles in future must be accompanied by the coupon cut from page iii of cover.



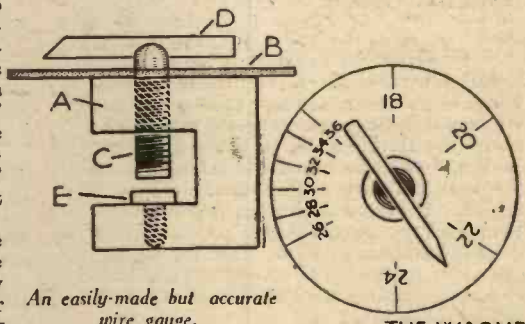
An ordinary pair of pliers can easily be adapted for self-opening by the simple method illustrated.

Self-opening Pliers

PLIERS are one of the most used tools for wireless construction, and here is a tip which saves the inconvenience of opening the jaws with the fingers on the inside of the leg. Take a piece of fairly strong rubber tubing, a little longer than the distance between the ends of the two legs when the pliers are fully open, and work each end of the tubing about ½in. on to the ends of the pliers legs, as shown in the sketch. The tubing naturally attempts to straighten out, and in doing so forces the legs apart thus opening the jaws. The flexibility of the tubing in no way effects the grip. The pliers should be eased and oiled to work smoothly if they are at all stiff.—H. R. BADGER (Sheffield, 8).

An Easily-made Wire Gauge

EVERY wireless enthusiast has no doubt at some time or other felt the want of a wire gauge. The one described here is very easy to make and it possesses a high degree of accuracy, in spite of the simple apparatus which is used.



An easily-made but accurate wire gauge.

THE WASHER CALIBRATED

The sketches show how the gauge is constructed. A piece of brass or steel, about ¼in. thick (A), is cut with a hacksaw to the shape shown, and a brass washer (B) soldered on top. A hole is drilled and tapped 0-BA, to take the screw C on the end of which is soldered the pointer D. A similar hole is drilled and tapped to take the screw E, the head of which is filed down until the screw-driver slot disappears. The screw should, of course, be tightened before filing. To calibrate the gauge, some pieces of wire having sizes from 18 to 36 should be obtained, and these inserted in turn between the screws E and C. The screw C is then screwed down until the wire is just gripped. Keeping it in this position, mark on the washer the gauge of wire and the position of the pointer in each case. This can be done with a sharp-pointed tool such as a file tang sharpened to a point. When testing an unknown size of wire it is only necessary to insert the wire between the screws, turn screw clockwise until the wire is just gripped and read off the size indicated by the pointer.—H. DODD (Workington, Cumberland).

COIL TYPES AND

Concluded from Last Week, this Article Deal Frequency Transformers and Some Simple M for an Unknown Coil -

LAST week we dealt with the general methods of connecting most types of coil of the kinds intended for use in the aerial circuit, although no reference was made to the inclusion of these coils in inter-valve circuits. Actually, the connections are almost identical in both cases, since the output from the H.F. valve can be considered as being the same in form as the output obtained from the aerial system.

The simplest type of two-range coil, such as was shown in Fig. 1 last week, can be used for tuned-grid coupling between an H.F. pentode and a triode detector by using

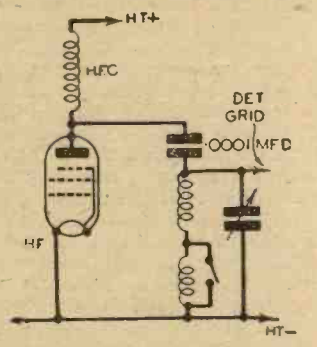


Fig. 1.—Simplest arrangement of tuned-grid coupling.

the connections shown in Fig. 1 on this page. No real difference, is there? Fig. 2 shows corresponding connections for a coil of the tapped kind, as shown in Fig. 2 last week. Again no difference.

Tuned Anode

But the same coils can be used in a tuned-anode circuit, in which case the connections do vary slightly because the coil then has to carry the H.T. current to the H.F. valve. In Fig. 3 we show tuned-anode connections for both coil types illustrated in Figs. 1 and 2. We have shown the practical connections, the circuit being one in which a gang condenser can be used for tuning. An older method was to connect the condenser in parallel with the tuned winding, which meant that one side was joined to

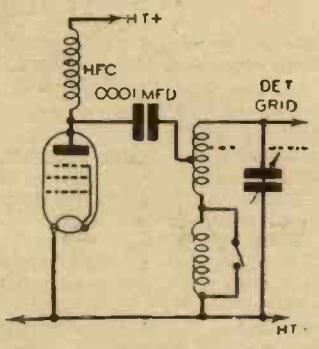


Fig 2.—A tapped coil used in a circuit similar in form to that in Fig. 1.

H.T. +; in consequence a gang condenser —with earthed rotor—could not be used.

A third common form of inter-valve coupling is by means of a so-called H.F. transformer, although this may be identical with an aerial coil of the pattern with a separate aerial winding. Tuned-transformer coupling is shown in Fig. 4, where the coil is similar to that included in Fig. 9 circuit last week. In this case, however, there is no internal connection between the primary and secondary windings. If such an internal connection existed this circuit could not be used because the H.T. supply would be short-circuited by the coil.

Better Stability

This tuned-transformer method of connection is most frequently used in short-wave receivers, and is particularly satisfactory. In general it reduces any tendency toward instability or self-oscillation. In using a coil of the type shown in Fig. 5 last week it would be necessary to employ a double-pole-double-throw switch instead of a three-point one, and to break the connection between primary and secondary windings, as shown in Fig. 5 of this article. This arrangement gives very good selectivity on both wavebands, besides minimising any tendency towards instability.

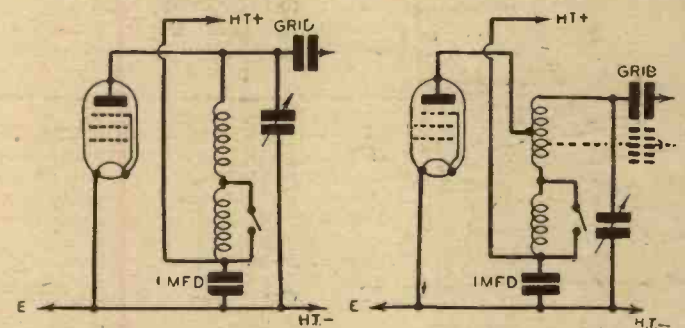


Fig. 3.—Tuned-anode coupling, using tapped and untapped dual-range coil.

Superhet Oscillator

Let us now look at the oscillator coil of a superhet. If separate tuning condensers were used for aerial and oscillator circuits it *could* be identical with the aerial and inter-valve coils dealt with before, so long as a reaction winding were included. Nevertheless, that would be unsatisfactory because of the lower wavelength (higher frequency) to which the oscillator circuit must be tuned. For this reason it is usual to wind oscillator coils with fewer turns than signal-frequency coils, although the general form and method of connection are similar. Fig. 6 shows a skeleton circuit of a simple type of pentagrid frequency changer with two tuning coils, and the oscillator coil is compared with the grid-with-reaction coil for a normal regenerative detector. It may be seen that similar windings are used, although there is no variable reaction control in the oscillator circuit, and the oscillator reaction winding is included in the H.T.-to-anode circuit. In the case of a short-wave receiver it is actually possible, and generally fairly satisfactory, to use a normal signal-frequency coil in the oscillator circuit, provided that a 35 mmfd. trimming condenser is wired in parallel with the aerial-tuning portion of the gang condenser.

Triode-Heptode Oscillator

When using a triode-heptode frequency-changing valve it is more usual, and generally better, to tune the anode circuit of the oscillator coil, leaving the grid circuit untuned. For that reason the "reaction" winding is used for the grid winding, and the "grid" winding in the anode circuit, as shown in Fig. 7. The same coil would be used, merely transposing the connections to the windings.

Apart from the aerial and oscillator coils mentioned, the most frequently used coil in a superhet is the intermediate-frequency transformer. Some constructors do not appear to realise that this is a coil in every sense of the word; it is simply a double-wound coil with primary and secondary—but no reaction. The simplest type is not tapped, and is connected as indicated in Fig. 8. One important difference is that both windings are tuned, or rather pre-tuned. We say "pre-tuned" because once the correct settings have been obtained for the pre-set condensers further alteration is not required. In this case, both windings can be considered as tuned windings, for they tune to the I.F., which

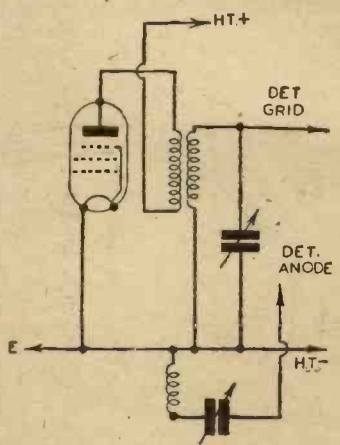


Fig. 4.—A double-wound coil used for tuned-transformer coupling. Reaction connections are also shown.

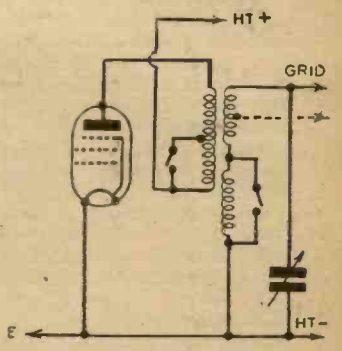


Fig. 5.—It is necessary to use a D.P.D.T. wavechange switch in a circuit of this kind.

CONNECTIONS—2

with Superhet Oscillator Coils, Intermediate-thods of Determining the Correct Connections - By the Experimenters

is generally either 110 kc/s (about 2,700 metres) or 465 kc/s (about 645 metres).

Centre-tapped I.F.

Due to the close coupling between the two windings—for they are generally fairly close together—a band-pass effect is obtained, but it is not usually strictly correct to refer to an I.F. transformer as providing band-pass tuning. It has become increasingly usual to provide centre tappings on I.F. transformers. One reason is because increased selectivity can be obtained by tapping the secondary and connecting it to the I.F.-valve grid or double-diode detector rather as illustrated in Fig. 9. The whole of both windings is tuned, but the output is taken from only one half of the secondary. This has the effect of slightly reducing the available output, but in practice this is not halved as would be imagined from purely theoretical considerations.

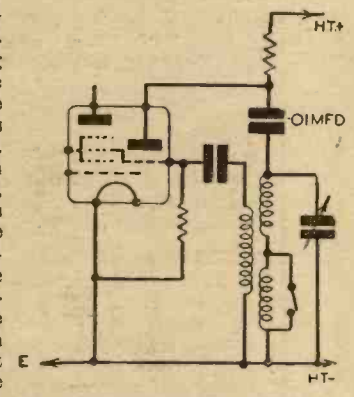


Fig. 7.—"Standard" connections for the oscillator coil used with a triode-hexode frequency-changer.

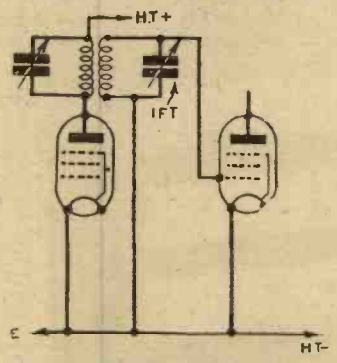


Fig. 8.—Usual connections for an untapped I.F. transformer.

It is rare that the tapping of the primary is used, even when provided, but it might be if a slight step-up effect were desired, and sometimes it is done in the interests of stability. This means that the anode of the preceding valve is joined to the tapping, the H.T. lead being taken to the "top" of the winding in the usual manner.

Variable Selectivity

Another method of modifying the I.F. transformer is by connecting a variable or pre-set condenser between "opposite" ends of the primary and secondary windings as shown in Fig. 10. This does bring the unit more into line with band-pass requirements, and the principal use of the additional condenser is for varying the degree of selectivity or—in more technical parlance—the band-width covered.

Another method of obtaining variable selectivity is by mounting one of the windings in such a manner that its position in relation to the other can be varied. For instance, if one winding were mounted on a spindle so that it could be turned to make it either parallel to or at right angles to the other, the degree of coupling, and hence the degree of selectivity, could be modified. This is done in many sets of the type described as having a variable-selectivity control. Several other systems are available for producing the same result, but they are rather too involved to come within the scope of this article.

It would be possible to describe and explain a wide variety of tuners based on those already dealt with, but they would not be of particular interest to the class of readers for whom this and last week's article are intended. We think it better, therefore, to explain a few practical points that will be more useful.

Tracing Connections

Constructors who have coils on hand often want to know how to use them after the instruction leaflet has been lost. It is not always possible for the amateur to determine the connections from an examination, but this can sometimes be done by tracing the leads from the windings to the terminals. For example, the aerial or primary winding generally consists of fewer turns than the others and might be of comparatively fine-gauge wire. There will probably be two sections, one close to the medium-wave and one close to the long-wave tuning sections. The two latter can frequently be distinguished by the slightly heavier wire and by the fact that the medium-wave winding consists of side-by-side turns. As to the reaction winding, this is often in a single section placed between the medium- and long-wave tuning windings.

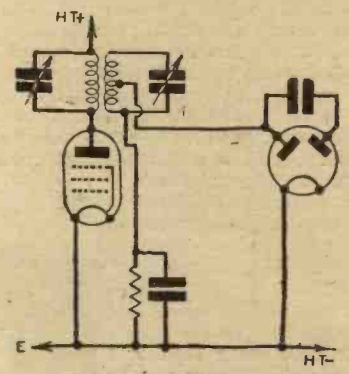


Fig. 9.—How a centre-tapped I.F. transformer can be used prior to a diode second detector.

Provided that all three windings are in the same direction (and this is usual) the top of the aerial winding can be joined to earth, the bottom of this winding to the aerial. The top of the medium-wave tuning winding will then be connected to the grid of the valve, the bottom to the top of the long-wave winding, the bottom of which goes to earth. That being the case, the top of the reaction winding should be connected to the fixed vanes of the reaction condenser, of which the moving vanes are connected to earth, the other end of the reaction winding going to the detector anode. Additionally, there will be a lead from the junction of the medium- and long-wave windings, and the wave-change switch should be joined between this and earth.

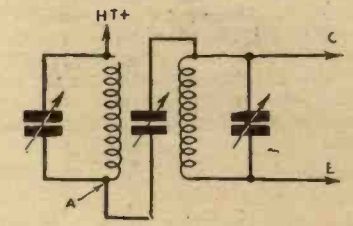


Fig. 10.—A simple means of obtaining variable selectivity by connecting a pre-set condenser between the high-potential ends of the I.F.T. windings.

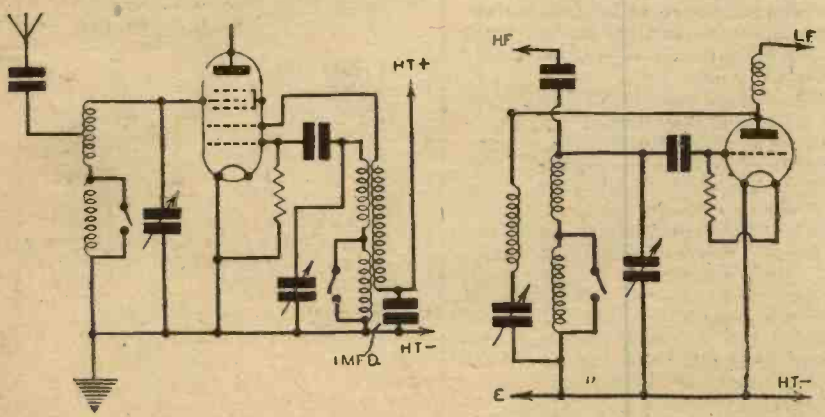


Fig. 6.—Conventional oscillator-coil connections for a pentagrid compared with those for a similar pattern of coil used in a triode detector circuit.

Ekco "Pick-me-up" Portable

Review and Test Report of a Neat A.C./D.C. Mains Portable Receiver

THE majority of portable receivers are designed for battery use, and apart from the additional weight of the batteries which are necessary, the efficiency is sometimes low, due to the fact that a minimum number of valves is employed in the interests of weight reduction. To overcome this difficulty certain types of receiver were introduced under the name of Transportables, the idea being to provide mains facilities, but with transportability, so that the receiver could be taken from one room to another with ease, or conveyed on a journey where a car could be used to facilitate transport. The latest Ekco receiver, illustrated below, is a development from this type of receiver, where the portability and lightness of the original battery receiver has been combined with the facilities of mains operation, and the result is an extremely small and efficient receiver, the actual measurements being 11½ins. by 7½ins. by 9¾ins. The name given to the set by the makers is most fitting, and it is so compact and well balanced that a child can easily pick up and handle the receiver.

General Features

The cabinet is covered in good quality black rexine, while the speaker fret is framed by a highly polished green bakelite moulding which also extends to form the main control panel on top of the receiver.

A built-in turntable is fitted to the bottom of the cabinet, thus allowing finger-touch rotation for maximum results and, at the same time removing any possibility of the table being marked during such operations. At the side of the case two sockets are provided to enable an external aerial and earth system to be used should the owner so desire, but, in common with many portables when used with an aerial, the selectivity is likely to be reduced by such additions.

At the rear of this neat outfit, one only sees the mains lead, of generous length, approximately 10 feet being provided, while in the adaptor which connects the lead to the receiver two fuses are fitted as prescribed by the Institute of Electrical Engineers.

The Circuit

In this portable a straight three-valve circuit is employed, with a variable-mu H.F. stage, supplied by a standard variable-mu H.F. pentode, a straight pentode in the detector stage, and a pentode output valve. The two-gang condenser, coils and valves are mounted on a small chassis suspended from the top of the cabinet, whilst the mains section is fitted to the bottom of the cabinet, thus avoiding all interaction and giving adequate heat dissipation. The frame aerial does not enclose the mains section, but is arranged in a special manner, thus avoiding trouble from mains hum.

On the top panel is fitted the main tuning control, which in itself is worthy of mention, the wave-change switch, volume control and a small switch which is arranged as a "local" or "distance" control. The tuning control takes the form of a flat 3in. disc which has vertical knurled sides and a transparent top of stout celluloid across which is engraved a cursor line. The station and wavelength marked scale is a fixture on the inside, so to speak, of the transparent knob. Therefore, on rotation, the cursor line sweeps over the scale, the medium-wave stations being arranged round the top half of the scale and the long-wave round the bottom half.

Test Report

After adjusting the mains selector inside the cabinet, the supply lead was plugged in and the receiver switched over to the medium waves. After allowing a few seconds for the valves to reach operating temperature we listened very carefully for any trace of hum, but as this objectionable form of interference was entirely absent, it was impossible to tell whether the set was switched on or not. This, by the way, was on A.C. mains.

The simple lines of the Ekco Portable may be seen in this illustration. The price is £8 8s. 0d.

On manipulating the volume and tuning controls it was soon evident, however, that the set was fully alive as regards station-getting abilities, while the tone was really surprising for such a compact job with a limited baffle area.

Bearing in mind that the tests were carried out in a modern steel-framed building in the heart of London, it was really amazing the number of stations received, at entertainment value, on both wavebands, and we have every confidence in stating that the P.U.148 is an outstanding example of a high-efficiency mains-operated portable.

The "local distance" switch is a useful feature as it allows the circuit to handle the input from a powerful local station without overloading the valves and causing distortion, while in other circumstances it can be used to eliminate interference between two adjacent stations.

The volume control is very smooth in action and effect, allowing just that final adjustment to be obtained which so often makes such a difference between satisfactory reception of a distant station or otherwise.

BROADCAST EVENTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, April 20th.—B.B.C. Symphony Orchestra visits the Guildhall, Plymouth.
Thursday, April 21st.—Who's Hooper, a musical comedy.
Friday, April 22nd.—Concert Party programme.
Saturday, April 23rd.—Speeches following the Luncheon at the Annual Shakespeare Birthday Celebration, from the Conference Hall, Stratford-upon-Avon.

REGIONAL (342.1 m.)
Wednesday, April 20th.—Band Waggon programme.
Thursday, April 21st.—Concert Party programme.
Friday, April 22nd.—Norwegian European Concert.
Saturday, April 23rd.—Chamber Music: Dame Ethel Smyth—a concert in honour of her eightieth birthday.

MIDLAND (296.2 m.)
Wednesday, April 20th.—Revolt in Suburbia, a comedy by Neil Tuson.
Thursday, April 21st.—Running commentary on the Woodland Pytchley Hunt Meeting.
Friday, April 22nd.—Send for Paul Temple, serial thriller, episode 3.
Saturday, April 23rd.—Choral programme of Shakespeare's songs.

NORTHERN (449.1 m.)
Wednesday, April 20th.—After Dinner programme.
Thursday, April 21st.—A Cycling Tour of the North, a talk.
Friday, April 22nd.—Sports Talk: The Cup Finalists, by Ivan Sharpe.
Saturday, April 23rd.—Reginald Dixon at the Tower Ballroom, Blackpool.

WELSH (373.1 m.)
Wednesday, April 20th.—A Welsh light programme from Bethesda.
Thursday, April 21st.—The Wedding, a Welsh dramatic feature.
Friday, April 22nd.—An Easter Parade, from the Odeon Theatre, Llandudno.
Saturday, April 23rd.—Choral programme.

WEST OF ENGLAND (285.7 m.)
Wednesday, April 20th.—Gaffer and Gavotte, 22.
Thursday, April 21st.—Dance Cabaret, from the Royal Bath Hotel Ballroom, Bournemouth.
Friday, April 2nd.—Seaview—1: Visitors, a talk.
Saturday, April 23rd.—Sonata recital.

SCOTTISH (391.1 m.)
Wednesday, April 20th.—Mair like a Dream: Memories of a Ferm Deemie.
Thursday, April 21st.—Who's Here?, a radio visitor's book.
Friday, April 22nd.—The Scottish Country, Orkney—a picture in speech and sound, from Kirkwall.
Saturday, April 23rd.—Imaginary Biography: Mrs. Grainger, wife of the Minister of Kinneff.

NORTHERN IRELAND (307.1 m.)
Wednesday, April 20th.—Organ programme from the Ritz Cinema, Belfast.
Thursday, April 21st.—Chamber Music.
Friday, April 22nd.—British Legion Sing-Song, from the Legion Rooms, Belfast.
Saturday, April 23rd.—A running commentary from the Point-to-Point Meeting of the Killultagh.

Practical Television

April 23rd, 1938. Vol. 3. No. 97.

Tracing the Trouble

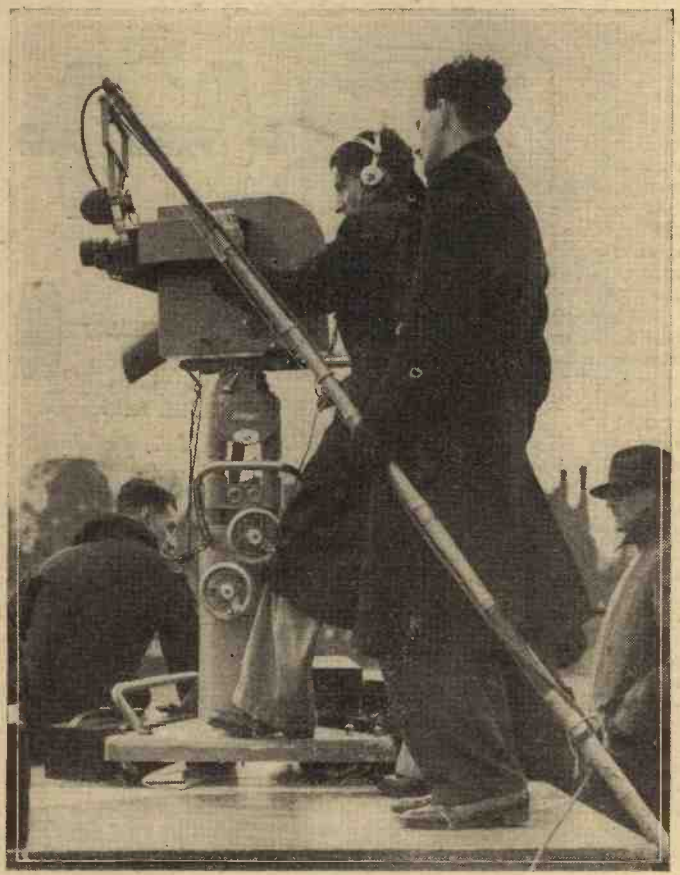
SOME of the more recent outside broadcasts of television, which have formed part of the B.B.C.'s ambitious programme planned to coincide with the advent of brighter days, have suffered from a very curious form of interference which has marred what otherwise would have been a praiseworthy effort. A good deal of investigation has been undertaken to locate the trouble, which in the picture itself took the form of pernicious flashing, coupled with a peculiar expansion and contraction of the picture area which was erratic in its timing. It has now been traced to an interaction between the incoming carrier wave working on 64 megacycles from the directional transmitter aerial array of the O.B. unit, which in turn was picked up by a receiving aerial positioned at the summit of the dual vision and sound aerials on top of the Alexandra Palace lattice mast. The proximity of the aerials caused a beating with the re-radiated carrier wave on 45 megacycles, giving a convulsive effect which to the viewer was most annoying, and to the television engineers was a big disappointment after the praiseworthy efforts to provide good programme material. To prevent a recurrence a careful search has been made in the locality of the Alexandra Palace for an alternative high site to erect another receiving aerial. From here the signals could be transferred by a special line to modulate the ultra-short-wave transmitter at the Palace. So far the spire of a nearby church has proved satisfactory, and this was employed for the Head of the River races which gave such excellent results recently. No doubt a permanent site will be found soon, and this will then remove a good deal of anxiety from the minds of the engineers engaged on this interesting and pioneering outside broadcast work.

Compensation

Although electron cameras of the Iconoscope type have proved so successful for both studio and outdoor transmissions, continual improvements are being made to overcome all the inherent defects. For example, the mosaic often exhibits a form of false brightness which occurs as patches of highlights which seem to have no real relation to the true illumination of the scene being televised. There is more than one method of compensation which can be used to neutralise this effect, but one of the most satisfactory is now used in Germany. In the main, this comprises a second form of electron tube which is provided with a secondary emission screen so arranged that separate areas can be biased differently in relation to the main collecting anode. This is fed in exact synchronism with the main camera tube, and the unwanted light patches bring about varying secondary emissions in accordance with the light distribution over the surface. These separate currents can then be passed through resistances to produce correcting voltages of just the right value for applying to the main camera outfit. In this way any picture defects are neutralised, and the final result is free from any flaws arising from this source.

Signs of Impatience

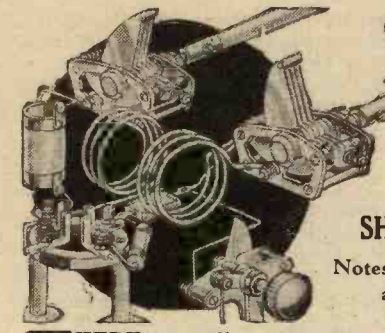
There are signs of growing impatience in the provinces over the complete lack of television facilities, and they envy the service given to those residing in the Greater London area. Other countries—Germany in particular—have been impressed by the technical success achieved by the present B.B.C. service, and in consequence have made the most ambitious plans for television development. In Germany a 10-year plan has been drawn up by the Post Office and approved by the Nazi government. This has been based on the assumption that once a person has sampled television broadcasts received in the home he will no longer be content with a sound service. With great pains, therefore, the German authorities have mapped out the country with districts which can be covered efficiently with a local television transmitting station, and when this has been erected it is proposed to close down the existing medium-wave sound station which has previously served the area in question. This may be expensive, but on the Continent the immense national value of combined sight and sound signals has been realised, and no effort will be spared to ensure that everyone will have the opportunity of seeing and hearing simultaneously with a receiving set which will not be unduly expensive. The provinces propose to agitate through various channels for the provision of a television service to meet their needs, and there is no doubt that the leading radio manufacturers will support this, for it will mean a rapid improvement in sales and enable receiver production programmes to be planned on economic lines comparable with that now undertaken with ordinary radio sets.



Television cameras at work at the finish of the Oxford and Cambridge Boat Race which was televised for the first time.

A Novel Suggestion

The attitude of some of the organisers of national sporting events, and the producers of plays, is reflected in the notice which precedes some of the B.B.C. television broadcasts to the effect that it is a copyright transmission for private reception only. We have commented on this problem several times in these columns, but a novel suggestion has now been put forward by one of England's leading showmen. He realises that television will develop rapidly, and is anxious not to have a recurrence of the earlier difficulties which arose when the B.B.C. expressed a desire to broadcast excerpts from leading plays or music-hall shows. His proposal is to the effect that each television set should be able to serve a dual purpose through the medium of two separate switches. The first switch would enable the receiver to be employed for the normal B.B.C. television broadcasts from the studio and selected outdoor events. For programme "high spots," however, such as an important race, boxing match, stage play, etc., where there is a large assembly of the public paying to watch the item, a coin would have to be inserted in a slot integral with the set. This could be sixpence, or a shilling, and would enable a second switch to be used to render the set receptive to this special broadcast. The sums collected in this way could then be applied to the payment of copyright fees, costs of providing the special transmission, and so on. Revolutionary in its application, the idea serves to indicate that the entertainment industry is alive to all aspects of television's importance.



Short Wave Section

SHORT-WAVE SUPERHET SELECTIVITY

Notes on a Variable-coupling I.F. Transformer and a Pre-H.F. Amplifier are Given in this Article.

THERE are still a great many home-constructed superhets which suffer badly from "image" interference. That is to say, the same station is tuned in at a second point on the dial at twice the I.F. Now there may be several reasons for this. The set may not possess a stage of pre-H.F. amplification, the frequency changer may be of the autodyne variety, or it may be just that the overall selectivity is poor.

If, however, the above points have been attended to, and "image" interference still persists, the trouble will most likely be the intermediate frequency, particularly if the receiver was originally designed and constructed a few years ago, as it was common then to use a very low frequency, usually 110 or 126 kilocycles. If this is the case then it is generally found that a station is equally as loud at both points on the dial, since on the short waves the ratio of discrimination is low. It will be seen then by considerably increasing the I.F. the "image" is a great deal further removed from the signal frequency, so that the strength of the "image" is very much reduced, and in a properly aligned receiver will disappear altogether. Most modern all-wave receivers use an I.F. of 465 kilocycles.

Therefore, the problem of "image" interference on the short waves resolves itself into two parts, first, using a suitable frequency and, secondly, obtaining adequate selectivity. If it is found that a short-wave home-constructed superheterodyne is using a low I.F., it is not a difficult matter for the average experimenter to rearrange the I.F. transformers both for a more suitable frequency and for high selectivity.

I.F. Transformer Adjustments

In Fig. 1 a typical I.F. transformer is shown consisting of two "honeycomb" wound coils on a small diameter former. To increase the frequency of the I.F. coils, it is simply a matter of taking off a sufficient number of turns from each coil, but a certain amount of care is necessary, as the two coils must be resonant on the same frequency. If an I.F. of 465 kilocycles is desired, the experimenter must have on hand an accurately-calibrated oscillator; it is, though, by no means necessary to use 465 kc/s, since any frequency may be used for intermediate work provided the frequency picked is not being used by a powerful broadcast station. 465 kc/s represents, approximately, a wavelength of 645 metres, so it can be said that a suitable I.F. will be between 600 and 800 metres.

The number of turns taken off each coil must be carefully counted and, so that the two coils will resonate on exactly the same frequency, it is desirable to use a simple test oscillator the circuit of which is shown in Fig. 2. The oscillator anode coil consists of 100 turns of wire, wound to a diameter of 2in., and tuned by a .0005 condenser. The valve may be a medium impedance triode. A low-range milliammeter is included in the H.T. feed for indicating resonance. The tuning range of the oscillator will be, roughly, from the top of the medium waveband up to 800 metres. Approximate calibration can be obtained from a broadcast receiver by temporarily using a tuned-grid circuit similar to that in the anode, oscillation being shown by minimum meter current.

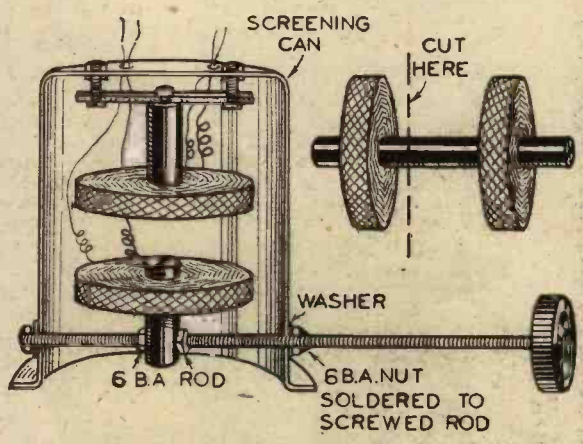


Fig. 1.—Details of a variable coupling I.F. transformer, arranged so that one coil can be rotated through an angle of 90 degrees.

When one of the I.F. coils has been stripped of the necessary turns, it should be tested for frequency across the grid circuit of the oscillator, and a careful note must be made of the exact dial reading of the anode tuning condenser for the frequency that is to be used. The second I.F. coil can then gradually be stripped of the same number of turns, and must resonate at the same position of the oscillator tuning condenser; the dip in the anode current will be quite sharp. Both coils must be tested individually, and without any trimming capacity. Small changes in frequency of each coil may be compensated for by the trimmer condensers when the I.F. transformer is actually in use in the receiver. It will be understood, of course, that any experimental I.F. transformers may be wound up and checked by the above method, for short and ultra-short-wave superhetrodynes.

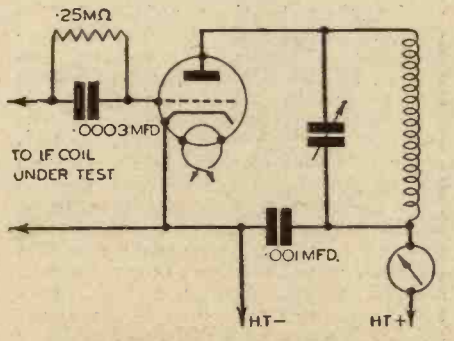


Fig. 2.—Circuit diagram of a test oscillator for checking the frequency of I.F. coils.

Varying the Coupling

When using a high I.F. it is unfortunately not always possible to get sufficient selectivity in the short-wave broadcast and amateur bands, particularly in superhet receivers using only one stage of I.F. amplification. Since most of a superhet's selectivity is obtained from the I.F. stages it was thought that a great improvement could be made by varying the coupling between the I.F. coils. How this is carried out will be seen by referring again to Fig. 1.

The two I.F. coils are separated by cutting through the former with a fine-bladed saw, care being taken not to damage the coils in any way. One coil is then mounted on its base in the usual way, and fixed by nuts and bolts to the top of the screening can; incidentally the trimmer condensers are usually mounted on the base of the coil here also. The end portion of the former holding the other coil is drilled through, and a 6BA threaded brass rod holds the coil in position by passing through both screening can and former, as shown in the diagram.

The variable coil need only be rotated through an angle of 90 degrees, therefore some form of mechanical stop must be arranged on the movable spindle. One or two other points of practical interest may be mentioned. First, the threaded rod should be fixed firmly, so that when the coil is rotated it will stay set in position. I.F. coils are usually wound with fine wire, so that the ends of the movable coil should be soldered to thicker flexible wire. The soldered joints may be firmly held in position by binding the coil round with insulating tape.

In practice, the variable I.F. stage worked out very well. It was found that the highest point of selectivity was not when the coils were at right angles, but midway between the two positions. In varying the coupling on stations that were being badly heterodyned it was possible to hear the interference drop right down in strength, also it was possible to detect the cut-off in the top frequencies, showing that the channel width of the I.F. stage was considerably narrowed. The distance between the two I.F. coils when in the same axis was half an inch.

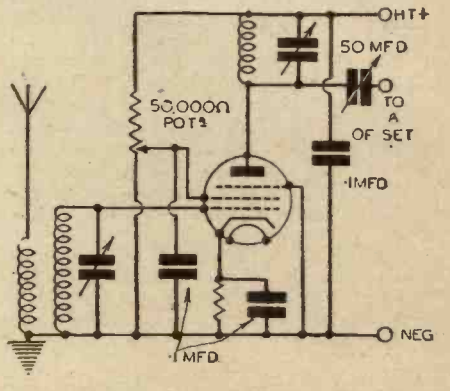


Fig. 3.—Circuit of a pre-H.F. amplifier for a short-wave superhet.

(Continued from previous page)

Selectivity

Just what selectivity it is possible to obtain in kilocycles it is difficult to say, since this will depend on the number of I.F. stages used. But with two I.F. stages and variable coupling a very high degree of selectivity is possible. It will be seen that the I.F. transformers can be linked together mechanically very easily, and a control knob brought out to the front of the set.

It may be remembered that variable I.F selectivity is a recent feature of modern communication type receivers. Another feature of these communication type superhets is to separate the pre-H.F. stages from the receiver proper. The preselector, as it is called in America, is built as an entirely self-contained unit with two H.F. stages and power supply. Although it is not necessary for the home constructor to go to this extreme, as was pointed out earlier, one stage of H.F. amplification is required in a superhet if "image" reception is to be overcome. Where a separate self-contained H.F. stage is added to a superhet a great deal more amplification as well as selectivity is obtained than is usual where the H.F. stage is built into the receiver.

Adding a Pre-H.F. Stage

Fig. 3 shows a suitable circuit for adding a pre-H.F. stage to a short-wave superhet. Both the grid and anode circuits are tuned, and the two tuning condensers can be ganged. A 50,000-ohm potentiometer is used to obtain the screen voltage of the H.F. pentode, as the exact voltage will vary for different valves. Also, any tendency towards oscillation may be checked by adjustment of the screen voltage. The output condenser should be quite small and a maximum capacity of 50 micro-microfarads will be ample.

To obtain complete immunity from "image" reception on the short waves is difficult with a superheterodyne receiver because it involves so many points, including the tracking up and ganging of the various circuits, but with the help of the information given above it should be possible to reduce this interference to a negligible quantity.

AERIAL PROBLEMS

(Continued from page 138)

such troubles are very pronounced, it may be necessary to fit one of the many forms of screened downleads now obtainable, as this section of the aerial is chiefly affected by such interference.

Vertical Aerials

In many cases it is not possible to obtain any reasonable horizontal length and one is forced to use a vertical length, terminating in some form of mastless aerial fixed to the chimney stack or other prominent point. Providing electrical interference is not present, quite efficient results are often possible but, again, much

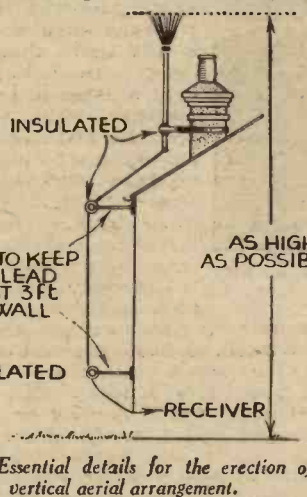


Fig. 4.—Essential details for the erection of a vertical aerial arrangement.

depends on keeping the downlead well clear of the house, and securing the maximum possible height. (Fig. 4).

Doublet or Dipole Aerials

This type of aerial arrangement, shown in Fig. 3, has come right to the fore with the increasing popularity of short and all-wave receivers, as it is a system which lends itself to efficient reception on all wavebands, but it must not be overlooked that maximum efficiency will only be obtained on one particular band, according to the lengths of "a" and "ab." Another very pleasing feature of this type of aerial is that it is very effective in areas where man-made static interference is troublesome; in fact, it might be looked upon as a reliable interference-free aerial system, providing it is possible for the horizontal portions to be erected at a height of, say, 25 feet or more, so that they are out of the field of such electrical disturbances.

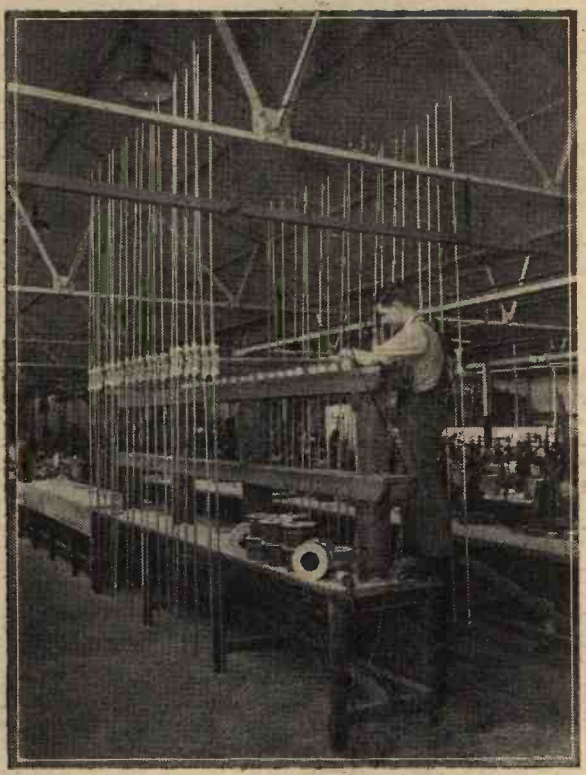
TELEVIEWS

Increasing Picture Brightness

MANY and varied are the ideas now being tried in an attempt to produce a picture brightness for big-screen television which is comparable to that in any modern cinema. The pictures which have already been shown at private demonstrations have exceedingly good quality and are really outstanding in the measure of brightness portrayed, but it is still felt that an improvement in this last-named direction is essential to meet the varied contingencies that may arise. Details of one promising scheme have been made known recently and the idea is said to have been conceived originally by Sanabria, whose name was well to the fore in America when large pictures on a low-definition standard were being featured in that country. The scheme is based on an electronic operated device modulating the intense beam from an incandescent lamp in such a way that there is a storage effect from the light point of view, as is given by the principles of operation of the Iconoscope. The light beam is passed through polarising elements in much the same way as a Kerr cell nicol prism combination, but instead of modulating via the cell a magnetically operated cathode-ray tube, with a crystal screen, is interposed so that the screen is in the path of the beam between the polarising elements. When this screen is charged positively it is arranged that no light passes through the combination, but the electrons in the scanning beam of the cathode-ray tube neutralise the charge on each element to an extent dependent on the beam intensity which in turn is governed by the incoming television signal. The degree of neutralisation will regulate the amount of light passing through each element and reaching the screen, which is, of course, remote from the complete unit.

Good Work

COINCIDENT with the news announced a few weeks ago that the Epsom Grand Stand Association has refused to give permission to the B.B.C. for the purpose of televising the Derby race, many writers voiced the opinion that as far as the authorities organising outside events were concerned, permission to broadcast them by television would be refused in the bulk of cases. That this black outlook for television's O.B. future has in no way materialised is a matter for congratulation to both sides. Clear reasoning has apparently won the day over a gross misconception of the true facts, and the plea put forward that a television broadcast would upset receipts is surely without foundation. The rugby match between England and Scotland can now be added to the long list of successful outside television broadcasts, and in this case viewers saw the King quite clearly when he stepped from the stand on to the field on his way to shake hands with the players. Now we have the news that the Cup Final is to be televised; the one game of the year that has such a universal appeal to all football enthusiasts. The B.B.C. are to be congratulated on their efforts to provide viewers with programme items of interest outside the four walls of the studio, and continued expansion on these lines will stimulate public interest in set purchases in a way that could not be accomplished by other means.



The Belling-Lee television aerials being assembled in their factory.

Television Aerials

FOR maximum performance and freedom from interference a reflector aerial system is desirable for modern television reception. The erection of such an aerial is facilitated if one of the special Belling-Lee aerials is employed. This consists of a metal pole with a right-angle fitting, at each end of which the receiving aerial and reflector are erected. The accompanying illustration shows some of these aerials being assembled in the Belling-Lee factory, and it is possible to see a large number of these in the London area erected at the top of well-known buildings. For instance, the new Odeon in Leicester Square carries one of these aerials at the top of the tower, and the special twin-feeder runs to the basement where a splendid picture is obtained free from interference.

Television News

ON several occasions it has been proposed to harness the principles of television for the dissemination of news in moving letter form. In 1929 Baird went so far as to coin a word—Telelogoscopy — for a scheme he had developed for transmitting printed news by television, emphasising at the time that it was admirably adopted for transmitting unorthodox characters such as Chinese, Japanese, etc. Furthermore, it formed a rapid means of communication which was much simpler than the transmission of actual scenes, for there was no graded light and shade to worry about, but merely black and white contrasts. It is now learnt that Peck, of America, who has always been a staunch believer in mechanical methods of picture synthesis and reconstitution, has developed equipment for giving a news service via signals transmitted over a wired circuit. The bulletins or messages are typed on a transparent ribbon which is fed through a scanner so that the light-beam variations penetrate the ribbon and influence a photo-electric cell, where they are converted into television signals which, after amplification, are passed into the wire circuit. A light-modulating source working on Kerr cell principles and a mirror drum scanning unit act as the picture reconstituting device at the receiving end, and these are built into a ground-glass frosted cabinet.

Children's Hour

ON April 25th young members of the Croydon Bunny Club Concert Party will meet in a B.B.C. studio to give fifteen minutes' entertainment. A dialogue story, "Worzel Gummidge Again," will follow and young listeners to the London Regional Programme will hear another adventure of the radio scarecrow with Hugh E. Wright in the name part. The Zoo Man concludes the afternoon's transmission.

On April 26th Part 4 of the serial story, "Brother Blackfoot," will be read by Howard Marshall. Part 2 of "Peter Simple," a play for most ages, will be heard on April 27th, followed by the Children's Hour Edition of the "Radio Gazette."

London's contribution to the Hour on April 29th will be made by John Morgan, the Farmer, who will give one of his broadcasts about the countryside.

PROGRAMME NOTES

"Beef Production"

IN the feature "For Young Farmers" on April 28th (West of England programme) a young farmer from Dorset will give her views about "Beef Production" on the average mixed farm, and J. L. Congden, of the Somerset Farm Institute, Cannington, will offer his comments.

Lisbon Musician's Visit

FREITAS BRANCO, who is Director of Lisbon Radio, and a well-known Portugese musician, will be the guest-conductor of the B.B.C. Midland Orchestra on April 24th. The programme, which will be broadcast from the Concert Hall, Bournville, will consist of Portuguese and English music.

"Old Mole"

MOLECATCHING as a profession is rare nowadays, but on April 26th, J. A. Brock, one of the few surviving molecatchers in the West Country, will be interviewed by Harry Cox, the naturalist. For many years Mr. Brock has been making his living by selling to farmers the tails of moles, and the secret of this hard but valuable work will be revealed. Mr. Cox, who has made a special study of bird life, has his observation hut on Brean Down.

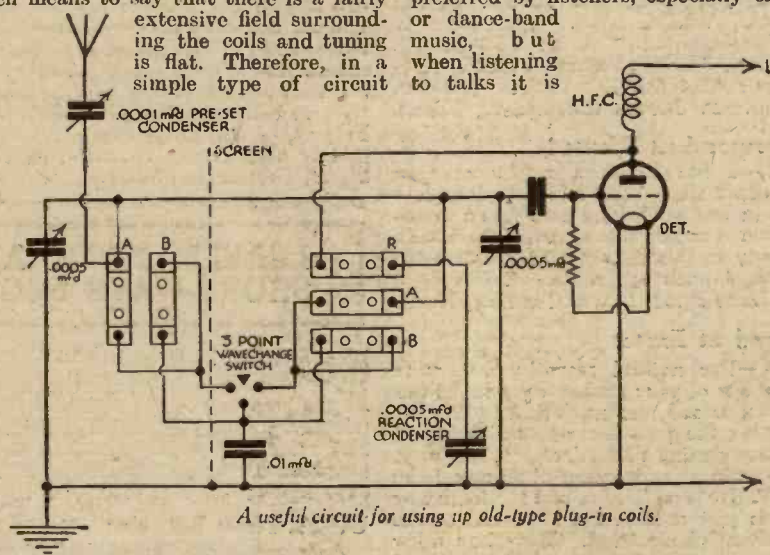
Dance Cabaret from Bournemouth

DANCE Cabaret will be broadcast from the Pavilion Ballroom, Bournemouth, on April 26th, when Sim Grossman and his Dance Band will play

The British Long-Distance Listeners' Club

Plug-in Coils

A MEMBER has been clearing out his junk-box and has found a complete set of the old-time two-pin coils. He says that they are in very good condition and he wonders if they could be used in a modern receiver. Unfortunately, this type of coil has a high-efficiency factor, which means to say that there is a fairly extensive field surrounding the coils and tuning is flat. Therefore, in a simple type of circuit it would be found exceedingly difficult to separate even the two London transmissions. To use these coils, therefore, we would suggest a band-pass circuit, and to ensure that no interaction occurs between the sets of coils they must be arranged at right-angles and also separated by a metal screen. The accompanying illustration shows a suggested lay-out for a detector stage with the band-pass circuit, the coils marked A being for medium waves, those marked B being for the long waves, and the coil marked R for reaction. Bottom coupling is recommended and the coils should be placed on each side of a vertical screen in exactly the positions indicated in the diagram. In these circumstances there is no reason why the arrangement should not give quite a creditable performance in spite of the age of the coils. A No. 40 or 50 should be used for A, No. 100 or 150 for B, and No. 60 for R.



A useful circuit for using up old-type plug-in coils.

Tone Control

PRACTICALLY every modern receiver which is on sale has a tone control fitted, the reason being that no two listeners agree as to the type of reproduction which is best. The home constructor may, of course, avoid the use of a device of this type by designing his receiver or amplifier to give the required frequency response, but it is often asked what form of control should be fitted for the purpose of adjusting tone. It should be repeated again that practically all forms of tone control operate by cutting off certain frequencies, the most usual being the higher tones. The effect of suppressing these frequencies is to give a more balanced reproduction, but it is obviously carried out at the expense of real quality. Usual values for this type of control are a fixed condenser of .01 mfd. in series with a variable resistance of 10,000 ohms, the two components being connected across the loudspeaker. In some cases, however, it may be found that the bass response of the receiver is too heavy and an unnatural deepness may be given to speech. This form of reproduction is often preferred by listeners, especially on organ or dance-band music, but when listening to talks it is desirable to introduce a bass cut-off to give more brilliancy to the voice. It is possible to do this by using the same two components, but they must now be joined in series with the loudspeaker, and the condenser and resistance should themselves be joined in parallel. This means that H.T. will be prevented from passing through the speaker and so to the anode of the valve and accordingly the speaker must be fed from an output filter circuit or by means of a standard output transformer (1 to 1 ratio). For a comprehensive tone-control system the two components may be wired to a multi-switch so that they may be connected in series or parallel, and joined in series or in parallel with the loudspeaker.

American Broadcasting

WE often hear of the comparison drawn by listeners who pick up the American broadcast stations, and when comparing the artists who are heard in that country it must be remembered that the programmes are still run by private individuals and thus competition enables the programmes to be brightened. The amount of advertising material which is now included in the programmes has been considerably reduced and it is interesting to note the remarkable accuracy with which the programme times are planned. Seldom are complaints made regarding items over-running the allotted time and accordingly having to be cut. Programmes are available for 18 hours of the day, and 37,000,000 radio receivers have been built up. Apparently the Americans do not want State ownership of broadcasting, censorship of programmes, limitation of station service, or taxes or licences for radio listening.

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).

Our Simplest S.W. One-valver

SIR,—A few words of praise for your one-valve simplest short-waver. Recently between 7 and 9 a.m. I covered four continents with it on 20m. Here is my log for those two hours.

SA3HC (North Africa) CN8AV (French Morocco), LA3B, LA4R, LA1F (Norway), ON4PK, ON4BG (Belgium), F3HL, PH0EO, SM7QD-W1-2-3 and 9, VK2AD (Australia), and ES5D (Esthonia)—and all these stations with a tired accumulator, which, incidentally, was my reason for using the one-valve set. I generally use it as an adapter, but now I have constructed a small unit consisting of one switch, one valve-holder, one terminal strip, and battery leads, so that when I want to change from adapter to one-valver I simply plug the adapter into the unit and connect 'phone leads and batteries. —E. Cox (Eastleigh).

Circuit Tester

SIR,—I should like to draw your attention to the Wrinkle published in your issue dated March 19th, entitled "A small D.C. Generating Unit."

The majority, if not all, bicycle generators supply alternating current and not direct current. This naturally affects the choice of suitable measuring instruments, since moving coil and polarised moving iron instruments will not function on alternating current.—FRANK WEBB (York).

SIR,—In reply to the criticisms of my Wrinkle, I would point out that the generator which I have in my possession is certainly a D.C. model with brushes, etc., and D.C. meters will of course work with it.

I bought it second-hand some time ago, and it has no mark of identification on it. But a friend of mine says that he thinks it is of German manufacture.—R. N. AMERY (Willaston).

Received on a P.W. Two-valve S.W. Set

To The Experimenters

SIRS,—A few weeks ago I wrote to you with reference to my 2-valve S.W. set, and which now, thanks to your helpful advice, is working splendidly, as you will see by the accompanying log.

Stations received during March, 1938. All 20m. 'phone. Aerial used: 66' inverted "L." All reception on 'phones.

CANADA AND NEWFOUNDLAND: VE1-SB, FG, BB, GI, CF, GP, BK, LI, BQ, CR, EL, IT, VE2-CP, LP, CO, FO, PA, GP, BV, HY, CC, CH, W, AQ, EE, BK, AE, XB. VE3-LF, CI, ACK, JV, QL. ABD, NF, GK, KC, MD, PM, HY, VE4SS, VE9AL, VO6J, VO6D. VP2AB, VP6TR. AFRICA: CN8-AR, AV, MU, AL, MB, AM, AJ. SU1-LD, RH, KG, KB, GP, RV, RD, SU2TW, FT4AN, AI, FA3HC. VQ4KTB, ZE1JA. S. AMERICA: LU1BA, LU9PA. YV5A-Z, AK, YV4AV. CO2-EG, KC, RA, JG, JJ, LY, WM. CO7-VP. CX, PY1GJ, PY2-CK, LM, KP, PY4CP, PY5AQ. XE1GW, XE2HB, BJ. HH2X. U.S.A: W5ECO, W6AM, GRL. (All other W divisions omitted.) ASIA: VU2CA, CQ. KA1-BH, ZL, ME. VS2AK, VZ2EZ. AUSTRALIA: VK2-BQ, ZC. VR6AY (Pitcairn Island).—P. JACOBS (Goodmayes, Essex).

Correspondent Wanted

SIR,—I have been a reader of your paper since 1932, and am pleased to see you are publishing articles on transmitting. I should like to get in touch with anybody in this district who is interested in this branch of radio.—J. G. PICOT (18, Castle Road, Luton, Chatham, Kent).

Logged at Exeter

SIR,—I've noticed recently that quite a few of your readers have heard the Pitcairn Island station, VR6A!

During the past few weeks I've logged a station signing VR6AY, almost regularly, at varying times between 06.30 and 08.00 G.M.T. He is on 'phone, and the frequency used is just outside the H.F. end of the American 'phone band. Have any other of your many readers logged this station? Other DX of interest I've logged lately on my O-V-1, includes: 14*mc* 'phone.

XZ2EZ, FI8AC, XU8RB, VQ4KTB; ZS1AX, '6AJ; ZE1JB, '1JR, '1JA; FR8VX, VU2CQ, VS2AK; KA1BH, '1ME, '1HF; PK1MX, '4DG; K6OQE, '6NZQ, 6KMB, '6JLV; K7FBE; VK2AHA, '2YL, '2XU, '2GU, '2VV, '2BV, '2BZ, '2BQ, '2NY, '2OJ, '2ADE, '2HV, '3XD, '3KX, '7LG; VE5OT, '5ACN, '5ES, '5EF, '5ABD, '5BF, '5QF, '5AC; W6EJC, '6AH, '6LR, '6MZD, '6GRL, '6CQI, '6SZ; W7FP, '7COV, '7BVO, '7ALZ, and 7PEO.

I hope this log will interest fellow readers, and I hope to see many more DX logs published in your very fine magazine.—"SILENT DX'ER" (Exeter).

Helping Hand Wanted

SIR,—I would like to get in touch with a S.W.L in the Dartford-Greenhithe-Gravesend district. Preferably some one experienced and of about my own age, 16 years. The trouble is, every short-wave set I make suffers from hand-capacity, so I should like a little friendly advice. I've got a fair amount of S.W. gear, so if anyone likes to call after 7 p.m. on Mondays or Fridays, or will write a letter, I shall be greatly obliged.—E. HATCH (149, Charles Street, Greenhithe, Kent).

CUT THIS OUT EACH WEEK.

Do you know

—THAT certain American receivers have a special resistance included in the mains lead and are only suitable for use on 110-volt supplies.

—THAT in cases of the above they may be used on higher voltage mains by removing the cord and fitting a standard resistance.

—THAT in many cases of H.F. instability the trouble may be cured by screening the anode cap and associated lead.

—THAT in other cases of such instability it may be found essential to enclose the entire valve in a metal box, even when the valve is metallised.

—THAT a screened anti-noise aerial system will enable greater volume to be obtained, owing to the fact that the volume control may be further advanced without introducing the interference or background noises.

—THAT a dipole aerial with special feeder will cut out a large proportion of interference and background noise.

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 Newnes, 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.

LEAVES FROM A SHORT-WAVE LOG

New Station in Ecuador

FRENCH listeners report the reception of broadcasts from a station at Quito (Ecuador), giving the call sign HC1GQ, on 32.7 m. (9.175 mc/s). They have been heard on Tuesdays, Thursdays, and Sundays between G.M.T. 02.00-03.30.

U.S.A. News Bulletins

An interesting feature of the Schenectady (N.Y.) programmes is a news bulletin broadcast daily (except Saturday and Sunday) for the benefit of American citizens throughout the world, at G.M.T. 22.00 through W2XAD and W2XAF, on 19.56 m. (15.34 mc/s), and 31.48 m. (9.53 mc/s), respectively. At G.M.T. 23.30, the same stations also give out "Last Front Page News" in the English language. W1XAL, Boston (Mass.), may also be picked up on week-days on 25.45 m. (11.79 mc/s) at G.M.T. 23.00 for its special news bulletin contributed by the *Christian Science Monitor*, an important daily journal in that city.

More Ultra-short Wavers

W9XER, Kansas City (Mo.), on 31.6 mc/s (9.488 m.). No fixed schedule. Address: Midland Broadcasting Company, Kansas City (Mo.), U.S.A. W9XPD, St. Louis, on same channel, relays the radio programmes of KSD and operates from G.M.T. 13.00-17.00 daily. Address: Pulitzer Publishing Co., St. Louis (Mo.), U.S.A. W5XAU, Oklahoma City, relays WKY, from G.M.T. 16.00-18.00; 22.00-23.00 and from 03.30-04.30 daily. Power: 100 watts. Address: WKY, Radiophone Company, Oklahoma City (Okla.), U.S.A. W9XHW, Minneapolis, a 50-watter also working on 31.6 mc/s, is on the air daily from G.M.T. 13.00-16.30 Address: Nicollet Hotel, Minneapolis (Minn), U.S.A.

Vatican City to Shortly Change Wavelengths

It is stated that as soon as the directional aerials have been installed HVJ, Vatican, will abandon one of its present channels to work on 19.84 m. (15.12 mc/s); 25.55 m. (11.74 mc/s); 31.41 m. (9.55 mc/s) and 49.75 m. (6.03 mc/s). The call will remain: Citta del Vaticano.

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.

NORTH-WEST IRELAND AMATEUR RADIO SOCIETY

READERS residing in Londonderry will be interested to know that the above society has just been formed in that town. The chairman is Mr. J. J. Hargan (2DHB), 4, Chapel Road, Waterside, Derry, and the hon. sec., Mr. Syd Foster, 2, Florence Street, Park Avenue, Derry.

EALING AND DISTRICT SHORT-WAVE CLUB

AT the general meeting of the above club, on Wednesday, March 30th, the hon. sec., Mr. W. Colclough (2CKL) tendered his resignation. He regrets this had been forced on him by the lack of support and apathy of the members, especially after so many months of hard work organising and directing the club affairs.

EXETER AND DISTRICT WIRELESS SOCIETY

AT the meeting of the above society held on Monday, April 4th, Mr. H. Ridge gave a very interesting talk on "Telegraphs, Wire and Wireless."

Mr. Ridge illustrated his lecture by many excellent slides, and very fully described modern methods of communication by land line. Many early types of instruments used were illustrated and discussed and the speaker took his audience right through the early days of sounders to the present high-speed teleprinter machines. A movie film has also been promised for exhibition to the society within the next few weeks and this should prove equally interesting.

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. Cling, 9, Sivell Place, Heavitree, Exeter.

CITY OF BELFAST Y.M.C.A. RADIO CLUB

THE above club have been having a very successful time during the last few months, the membership has increased by over 25, and there are now 16 transmitting members and 13 A.A. licences in the membership.

We have now a very fine clubroom supplied with both A.C. and D.C. 220v. mains, and this enables all the members to construct and try any type of A.C. or D.C. apparatus. A very fine morse instruction class is held on Monday, Wednesday and Thursday nights, also on Saturday afternoons, instruction being given by the licensed members of the club.

The monthly meeting is held on the third Wednesday of the month, and club night is every Wednesday. All members are supplied with a key which admits them to the club at any time of the day, and the club is open to all members of the Y.M.C.A. association. The subscription is 5s. per year for those over 18 and under 18, 3s. 6d. per year.

Hon secretary, Frank A. Robb (GI6TK), 60, Victoria Ave., Sydenham, Belfast, Northern Ireland.

THE CROYDON RADIO SOCIETY

A LOUDSPEAKER night concluded the Croydon Radio Society's session on Tuesday, April 5th, in St. Peter's Hall, Ledbury Road, S. Croydon. Of very great interest was the Society's new test baffle, invented by the Technical Adviser. Briefly, it could accommodate two loudspeakers at once, and a large flap moving across the outside, covered up either hole. Also this action of blocking out either loudspeaker automatically disconnected it from the circuit. After comparison on Mr. Menage's oscillator, orchestral passages and the B.B.C. Theatre organ, Mr. Winkworth's, Dr. R. A. Bailey's, Mr. Bardgett's and the Technical Adviser's entrants all reached so high a standard that opinion alone found preferences. Concluding, the Chairman, Mr. P. G. Clarke, took the opportunity of reflecting on the past session's very enjoyable meetings. If suitable support were forthcoming next session, the Society need have no fear for the future. The re-opening date is the first Tuesday in October, but in the meantime the Society will be pleased to give information concerning its activities to readers of PRACTICAL AND AMATEUR WIRELESS. Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

RADIO, PHYSICAL AND TELEVISION SOCIETY

AN interesting lecture was delivered to the above Society on Friday, April 8th, when Mr. E. W. Selwyn, B.Sc., of Messrs. Kodak, Ltd., spoke upon "The Optics of Photography."

The lecture, which was fully demonstrated by means of lantern slides, dealt mainly with the lenses employed in cameras, the various forms of distortion produced, and the methods used by the lens manufacturers to overcome them. Some very interesting slides were also shown of the testing of lenses.

At question time a variety of questions dealing not only with the subject of the lecture, but also with other branches of optics, were asked, and all the questions were answered in an exceedingly interesting manner.

In view of the interest taken in a recent lecture on "Aerials," by the President of the Society, a booklet dealing with the subject matter of this lecture has been prepared by Dr. C. G. Lemon, and is now on sale price 3d., or price 4d. post free. Copies may be obtained by writing to the secretary or to Dr. Lemon at the Society's headquarters.

Meetings of the Society are held every Friday evening at 8.15 during the winter months at 72A, North End Road, West Kensington, W.14. Readers interested may obtain further particulars from the secretary at the above address or alternatively they are invited to call at the Society's headquarters any Friday evening at 8.15, without formality.

THE WORTHING AND DISTRICT SHORT-WAVE CLUB

THIS club is now meeting regularly every Wednesday evening at 7 o'clock at Alpine Nurseries, Durrington Lane, Worthing, and membership is open to all short-wave enthusiasts under the age of 21.

Several very interesting meetings have now been held since the inaugural meeting on March 23rd, and the programmes have consisted mainly of demonstrations of members' short-wave receivers, and discussions regarding same. Offers of help in the way of lectures, demonstrations, etc., would be gladly accepted.

It has been decided to attempt to keep a record of the varying conditions on the short waves, and the assistance of other clubs in various parts of the country would help considerably. All applications for membership and any other correspondence should be addressed to the hon. secretary, Mr. G. Lambourne (2DQI), 16, Angola Road, Worthing, Sussex.

WEST HERTS AMATEUR RADIO SOCIETY

THE April meeting of the above society was held at the residence of Mr. A. Birt (2BTV), King's Langley. An interesting evening was spent, including a demonstration of duplex working on 5 and 40 metres. A talk was also given by Mr. R. Pegg, of Chesham, concerning the properties of an absorption wavemeter. A very efficient and careful explanation was made, and much useful knowledge was gained.

During the discussion on matters of general interest, the question of directional frame aerials was raised, but 2BTV stated that after numerous experiments he found that antennæ of this description were not very successful.

A. Sterne, publicity manager, 11, Station Road, Berkhampstead, Herts.

LONDON TRANSMITTING SOCIETY

AT a meeting of this society held on April 10th, it was decided to accept the kind offer of the Golders Green Radio Society to co-operate in their 40-metre field day on May 1st. We should be pleased to hear from members wishing to take part. Further progress has been made on our new transmitter, and we are now building a communication receiver. We recently welcomed 2C[illegible] as a new member.

Membership of the society is free and badges and fixture cards are supplied. All members must produce a transmitting licence on joining. Please enclose stamp for reply to G. Yale, 40, Raeburn Road, Edgware.

Practical and Amateur Wireless BLUEPRINT SERVICE

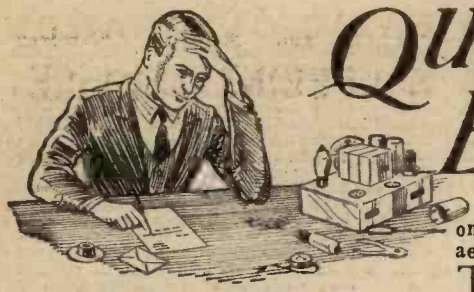
These Blueprints are drawn full size.
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless..	..	4d. Post Paid
Amateur Wireless..	..	4d. " "
Practical Mechanics	..	7½d. " "
Wireless Magazine	..	1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, P.M. to *Practical Mechanics*, W.M. to *Wireless Magazine.*

Send (preferably) a postal order to cover the cost of the Blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS	*Date of Issue.*	*No. of Blueprint.*
CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
All-wave Unipen (Pentode) ..	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	—	PW36B
The Signet Two (D & LF) ..	20.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	20.5.37	PW39
Hall-Mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))..	*June* '35	PW1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen).		PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The " Colt " All-Wave Three (D, 2 LF (RC & Trans)	5.12.36	PW72
The " Rapide " Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78
1938 " Triband " All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	PW87
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW46
Fury Four (SG2, D, Pen).. ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)..	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's " Limit " All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
All-Wave " Corona " 4 (HF Pen) D, LF, Pow)	9.10.37	PW79
" Acme " All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)..	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	—	PW35C
D.C. Premier (HF Pen, D, Pen)..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW33
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
" All-Wave " A.C. Three (D, 2 LF (RC))..	—	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56



QUERIES and ENQUIRIES

Making Band-pass Coils

"Being desirous of making coils suitable for a battery band-pass 3-valver, I should like to know whether coils of this type have ever been described and illustrated in your paper, or, if not, whether you know of any handbook or publication where data and information on the subject may be found."—W. J. (St. Neots).

BAND-PASS coils are exactly similar to any standard coils, but the method of coupling them may differ. It is possible to couple them by means of a condenser across the "top" or across the "bottom" of the coils, and in some cases a special winding is included on the coils and the windings are coupled together to provide inductive coupling. In our latest book, "Coils, Chokes and Transformers," you will find constructional details of these and various other coils and some special screened coils for use in band-pass circuits are included. The price of the book is 2s. 6d. from your local bookseller or 2s. 10d. from this office by post.

Band-spreading

"Can you tell me what capacity condenser to use as a band-spreader for the Premier 3-band short-wave coil and a .0002 mfd. tuner?"—R. D. (Ilford).

THE capacity for a band-spread condenser should be extremely low, but there is no definite value which may be adopted. You may, for instance, use a dial with your .0002 mfd. tuning condenser which is divided into 10 sections, and then use a .00002 mfd. (20 mmfd.) band-spreader so that a complete rotation of the latter will cover each section of the tuning condenser. On the other hand, you could use a 40 or 60 mmfd. condenser with a good slow-motion dial without difficulty. In general, we prefer the low capacity (20 mmfd.) condenser and adjust this frequently with a minimum adjustment of the main or band-setting condenser.

H.F. Choke Design

"I am going to make an H.F. choke but am not quite certain of the main details or features which have to be attended to in this type of component. I wonder if you could outline these and give me a rough idea of the best type of construction."—H. E. W. (Leeds).

FOR the ordinary broadcast band you need a high inductance with a minimum self-capacity. This means that you need a lot of wire and that the total winding should be split into sections. You can make up a former with spacing discs to form small spools, or use a ¾in. diameter former and pile wind the wire in the required sections. Assuming a ½ to ¾in. diameter former, use about 500 to 700 turns of 28 enamelled wire for the medium and long-wave circuit.

Aerial Design

"Can you tell me what wire to use for the lead-in, and also for the earth. Does it need to be the same wire from the inside of the room to the aerial terminal. I am only a beginner and am starting with a one-valver, so I wish to make the best aerial-earth system?"—T. E. (St. Helier).

THE lead-in from aerial to aerial terminal should be of the same material as the aerial proper, and furthermore it is desirable, for maximum efficiency, that this should all be one unbroken length of wire. If you are forced to cut and join the lead-in make a really sound soldered joint, and afterwards paint it or wrap with insulation tape to prevent corrosion. The aerial should preferably be of the 7/22 stranded enamelled wire type, or, alternatively, a well-insulated copper-stranded wire. The earth should also be insulated, and of similar heavy-gauge wire, and it should not be permitted to come into contact with anything, from the point where it leaves the earth terminal until it is connected to the earth plate or tube.

Overloading and Distortion

"I find that my amplifier gives a nasty rattle to my loudspeaker on certain notes. It is especially noticeable on organ music and dance music when I get above a certain volume. I have had a good look at the loudspeaker, but I cannot see where the trouble comes from, and I wonder if you can give me any hints on tracing the trouble."—O. I. (S.E.5).

A DISTORTED speech coil former could give rise to the trouble by permitting the speech coil to come into contact with the sides of the gap on certain frequencies. On the other hand, it must not be overlooked that an overloaded output stage will often produce a form of distortion which sounds very much like a mechanical rattle in the loudspeaker. We suggest that you reduce volume when receiving organ music or other items in which there is ample bass and note whether the distortion is present. If not, and you think it may be due to excessive movement of the cone, connect the speaker to a tapping on the mains transformer primary (so that 5 to 10 volts A.C. are applied to the speaker) and this will provide adequate movement at 50 cycles to enable you to judge whether the speech coil touches the gap.

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 Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Frequency Changer

"I am not quite clear regarding the obtaining of I.F. current in a frequency changer of the pentagrid, heptode and similar types. Perhaps you could briefly outline how this is obtained and isolated from the remaining currents. Also, could you explain what the conversion conductance is?"—T. F. (Bognor).

IT will be realised that a change in voltage on the grid of a frequency changer will bring about a change in anode current that is the sum of the I.F. current, the oscillator current, the image current, and sundry odd harmonic currents, but these are all waste except the I.F. current.

Conversion conductance is expressed by a simple figure, thus conversion conductance of .6 would mean that the valve undergoes a change in I.F. anode current of .6 milliamp. when 1 volt H.F. is applied to the signal grid.

French Television

"I have heard that experiments are shortly to be undertaken with television broadcasts from the French capital, and wonder if you yet have any news of times or other data concerning these proposed transmissions."—G. E. W. (Dover).

THE aerials for this work are situated at the summit of the Eiffel Tower, and it is stated that on weekdays there will be transmissions from 3.30 to 5 p.m., with a studio programme on Sundays from 4 to 6 p.m. It is certain that efforts will be made to receive these French television pictures in this country, and it is quite likely that South Coast resorts will be successful in obtaining results, especially if directional aerials are employed, beamed in the direction of Paris.

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.

G. A. E. (Hove). The intermediate frequency was quite definitely 126 kc/s. Your modern coil is therefore useless.

K. S. (Gainsborough). The aerial should be removed entirely. You will then find the effects will not take place, and a vertical aerial may be erected for future use.

I. M. (N.W.10). A converter would be preferable, but you must rearrange the aerial circuit of the receiver to a straightforward scheme to enable maximum results to be obtained.

T. I. S. (Yarmouth). Relay interference is no doubt responsible. Ask if neighbours experience a similar trouble.

T. E. C. (Farnborough). We are proceeding with the design but cannot give you any details regarding publication date at the moment.

A. R. T. (Warrington). We could not give all the necessary details in a reply, and suggest you obtain our latest book, "Coils, Chokes and Transformers," in which the information is given.

A. F. H. (E.10). The circuit is quite in order. Are you using a mains unit to operate the set? If so, this is the cause of the trouble.

J. W. (Losfwithiel). The station in question does not broadcast on a short wavelength, but the signal you heard was an harmonic.

S. M. (Farnham). We have not described a four-valver of the type mentioned, and suggest the Prefect S.W. Three with the addition of an H.F. stage.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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BANKRUPT Bargains.—All new goods. Phillips 1938 A.C. all-wave chassis, complete less only cabinets, £5/12/6. Decca 1938 5v. all-wave A.C./D.C. transportables, 5gns. Decca A.C. 5v. all-wave 1938 superhets, £5/10/0. Philco 3v. all-wave 1938 battery sets, £4. Brunswick 6v. 1938 4-band superhets, 7gns. Lotus 4v. A.C./D.C., 57/6. Plessey 4v. battery superhet chassis, complete valves, speaker, 57/6.—Butlin, 6, Stanford Avenue, Brighton.

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Practical and Amateur Wireless, April 30th, 1938.

SPECIAL SHORT-WAVE NUMBER

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

a GEORGE NEWNES Publication

Vol. 12. No. 293. April 30th, 1938.

AND PRACTICAL TELEVISION

Building the HURRICANE ALL-WAVE THREE

INSIDE:

MAKING AN ECONOMY ONE-VALVER

A TWO-VALVE S.W. CONVERTER

AN ALL-WAVE TUNER

HOW TO RECEIVE THE SHORT WAVES

ETC. ETC.

A 2-VALVE S.W. CONVERTER SEE PAGE 163

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. XI. No. 293. April 30th, 1938.

ROUND *the* WORLD *of* WIRELESS

Short-wave Reception

AS a result of the increasing interest in short-wave reception, we have devoted this number to articles dealing with this subject. In addition to the general articles regarding the best method of receiving short waves and other material we also include constructional articles for three separate sets—a three-valve all-waver, a single-valve plug-in coil set, a two-valve converter and an all-wave tuner. Thus every reader should find something of interest in this issue to assist him in obtaining the short-wave stations. It may be emphasised that it is not necessary to build a short-wave set for this purpose if you already possess a good broadcast receiver with H.F. stages. The converter enables you to receive the short-wave stations on the broadcast set and in effect it converts the set into an all-wave instrument. The increasing use of directional aerial systems is bringing more stations within the range of simple sets in this country, and the Americans especially are now very well heard on certain wavelengths. Naturally, although a one-valver will enable you to hear these under favourable conditions on a pair of headphones, a good multi-valve set is essential if you wish to put them on the loudspeaker, and for consistent reception under all conditions a superhet is undoubtedly the best type of receiver.

Scottish Reception

THE deputation which was recently mentioned in these pages has now met the officials of the B.B.C., and Sir Noel Ashbridge made it clear that the B.B.C. had been studying the difficulties in the area in question and remedies were already being applied.

Wavelength Changes

THE International conference which ended at Cairo a fortnight ago has drawn up certain recommendations with regard to changes in wavelength of European stations, but these will not be made until a further conference is held in Switzerland next year.

Short-wave Radiations For Growth

FURTHER experiments are being carried out in certain foreign countries with a view to ascertaining the reason for the increased growth which results when plants or seeds are subjected to short-wave radiations. It is anticipated that there may be some effects upon human life due to short-wave radiations from broadcasting stations.

How Many Sets?

SOME readers are in the habit of using two receivers—one for distant and one for local reception. Manufacturers are reported to be interested in this suggestion, and also in the problem of the number of different types of receiver which are suitable for sale under modern conditions. It is held by many dealers that there are too many different types of receiver, with the result that customers are confused and hesitate to choose a set.

ON OTHER PAGES

Summertime Changes

IN accordance with policy certain changes will shortly be made in the time and programme schedules of the B.B.C. These are due to the fact that it is considered that the majority of listeners prefer outdoor activities in the fine weather and thus listening time is reduced. Band Waggon is one of the popular items which it is stated will be cut out during the summer months.

Cheetah Speed

IT is claimed that the cheetah is the fastest four-footed animal in existence, and on May 6th a tame cheetah, which was recently brought to England by K. C. Gandar Dower, the famous Cambridge athlete, will race at Harringay on the Greyhound track. The race is a private one and is staged purely to enable the B.B.C. to relay the spectacle by television, and viewers will see how, even with a start of 40 yards in 450, the cheetah can overtake the fastest greyhound. John Snagge will give a commentary on the broadcast for listeners.

"Jeu de Cartes"

ON May 13th (in the London Regional programme) Clarence Raybould will conduct the B.B.C. Orchestra in the first broadcast performance of Stravinsky's ballet suite, "Jeu de Cartes," which was first produced at the Metropolitan Opera House, New York, in April, 1937. "Jeu de Cartes" (A Game of Cards) is described as a ballet in three deals, and the characters in the ballet are the chief cards in a game of poker. This work was first heard in this country at a Courtauld-Sargent concert in October last.

"A Night Out"

VARIETY, Dancing, Sport and Pictures will be represented in "A Night Out," a composite feature of various forms of entertainment (in the West of England programme) on May 6th. Variety will be relayed from a well-known theatre; Sim Grossman and his Dance Band will play from the Pavilion Ballroom, Bournemouth; a commentary on Speedway Racing will come from the Knowle Stadium, Bristol; Walt Disney's Silly Symphony, "Little Hiawatha," will be heard from the Hippodrome, Bristol.

Marconi Memorial

A COMMEMORATIVE monument in marble is to be erected in the grounds of the proposed Rome Exhibition in 1942, and Signor Mussolini ordered the civic observance of the birthday of the late Marchese Marconi. It will be recalled that this occurred on April 25th, 1874, at Bologna. In addition to these honours the Royal Academy of Italy will award a prize every other year for the outstanding discovery in the practical application of electro-magnetic waves, and the University of Bologna has founded Marconi scholarships.

ROUND the WORLD of WIRELESS (Continued)

INTERESTING and TOPICAL NEWS and NOTES

Sunday Television Programmes

ON May 1st a James Bridie play will be seen and, a week later, it is hoped to televise the new Vic-Wells ballet, "Checkmate." "Richard II" is in the programme for May 15th.

Increase in Wireless Licences

ACCORDING to figures published recently, 692,662 wireless receiving licences were issued last month, a net increase of 29,380. There were 8,590,750 licences in force at the end of the month, compared with 8,127,630 a year ago.

Anna Neagle, the British film star, with Herbert Wilcox (left) and Stuart Robertson, Miss Neagle's brother, during the rehearsal for "Star Gazing," which was recently heard in the Regional and National programmes.

Splendid Response to Wireless Appeal

DONATIONS sent by listeners in response to Mr. Christopher Stone's broadcast appeal on behalf of the British Wireless for the Blind Fund have reached the huge total of £23,041. The money was received at the offices of the National Institute for the Blind in more than 50,000 postal packages. Although the appeal was made as long ago as Christmas Day, occasional gifts continued to arrive till the latter part of March.

London Music Festival

LISTENERS will be interested to know that Arturo Toscanini will conduct the B.B.C. Symphony Orchestra in a series of six concerts in the Queen's Hall during May and June, beginning on Thursday, May 19th, at 8.15 p.m.

A special feature of the series will be the performance at two consecutive concerts of Verdi's "Te Deum" and "Requiem Mass," for soloists, chorus and orchestra. These works will form the programme of the concert on Friday, May 27th, and will be repeated on the following Monday (May 30th). The B.B.C. Choral Society will take part in the performances, and the soloists, who have been specially chosen by the maestro, will be: Zinka Milanov, Kerstin Thorborg, Helge Roswaenge and Josef Manowarda.

The Davis Cup

TENNIS players among listeners will be interested to learn that arrangements are being made to broadcast a commentary on the Davis Cup contests to be staged at Wimbledon on May 7th, 9th and 10th.

The usual procedure will be followed, the games being described by one or more commentators. Whenever intervals of major duration occur in the play, the commentator will transfer listeners to a studio in Broadcasting House. By this means, no loss of entertainment time is involved, as the musical programme is specially designed to be elastic so that the studio announcer can return listeners to Wimbledon at any especially exciting point in a match.

Australian Short-wave Transmission Schedules (May, 1938)

VK2ME (*Sydney*), 31.28 m.: Sundays, Sydney time: 4 p.m.-6 p.m., 8 p.m.-midnight; G.M.T.: 06.00-08.00, 10.00-14.00. Mondays, Sydney time: 1.30 a.m.-3.30 a.m.; G.M.T.: 15.30-17.30.

VK3ME (*Melbourne*), 31.5 m.: Nightly, Monday to Saturday (inclusive), Melbourne time: 7 p.m.-10 p.m.; G.M.T.: 09.00-12.00.

VK6ME (*Perth*), 31.28 m. Nightly, Monday to Saturday (inclusive), Perth Time: 7 p.m.-9 p.m.; G.M.T.: 11.00-13.00.

New Radio Play

ANTHONY McDONALD will produce on May 5th a new play by a Birmingham author. In "Unborn Tomorrow" J. Alex Pemberton deals with a man's unrealised ambitions as to occupations he might have followed. Thus there appear to the mind of Mr. Gordon in succession a tram conductor, engine driver, author, explorer, industrial magnate and Prime Minister. Lester Mudditt, of Kettering, is to play the part of Mr. Gordon.

Light Entertainment from Birkenhead

THE Argyle Theatre, Birkenhead, must have provided more amusement for listeners than any other "hall" in the country. In the Northern and main Regional programmes on May 4th listeners will be able to hear preparations for the broadcast in the early afternoon and the broadcast itself in the evening. It is not possible to say what items will figure in the bill, but listeners may be sure of an enjoyable forty minutes.

Opera

RICHARD STRAUSS'S "Elektra," which has not been heard in London for thirteen years, will be broadcast in its entirety from Covent Garden on May 9th in the Regional programme, conducted by Sir Thomas Beecham. On May 11th the first act of Wagner's "The Flying Dutchman" will be broadcast, under the direction of Erich Kleiber, who will be making his first appearance this year at Covent Garden.

Midland Variety

THE latest addition to the number of independent theatres in the Midlands which provide contributions to variety broadcasts is the Embassy, Peterborough, a new and commodious theatre which has installed a Hammond organ. The principal attractions in the bill during the week beginning May 2nd are to be Pickard's Chinese Syncopators and Jack Daly (entertainer). The broadcast will be on May 4th.

SOLVE THIS!

PROBLEM No. 293

Atkins had an old set which did not tune down low enough to receive Radio-Normandie on the new wavelength. He decided that instead of altering his coil it would be simpler to reduce the capacity of his normal tuning condenser (.0005 mfd.) and, accordingly, he connected a .0002 mfd. fixed condenser in series with it. He still found, however, that he could not get down low enough. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 293 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 2nd.

Solution to Problem No. 292

The cause of the trouble in Agnew's set was a broken-down bias resistance in the cathode lead of the output stage. This had open-circuited, and consequently the H.T. circuit to the valve was incomplete, which accounted for the fact that no anode current was recorded by his meter.

The following three readers successfully solved Problem No. 291 and books have accordingly been forwarded to them: F. Hughes, 75, London Road, Gloucester; W. White, 254, Greenwrythe Lane, Carshalton, Surrey; C. A. Whitehead, 25, Lovat Street, Liverpool, 7.

The "Economy" S.-W. One-valver

Constructional Details of a Simple Short-wave Receiver Designed Especially for the Beginner

AS the name implies, this little receiver has been built to provide a very economical little set which may be built by anyone, and the work involved in the construction is so small and simple that even a child may build up the set in an hour or so. No soldering is required, and the completed receiver may be relied upon to provide really high-class results on the short waves. Obviously, headphone reception only is given, but should it be desired, an amplifier could be added at some future date to enable a loudspeaker to be operated. As may be gathered from the illustrations, the set is of the simplest baseboard and panel type, the panel being of metal to avoid hand-capacity effects, and the baseboard a simple piece of fairly stout plywood. The dimensions of the latter are 8in. by 6in., and the thickness should be about ⅜in. or ½in. The panel is 8in. by 5in. and is attached to the baseboard by three screws along the lower edge. If thinner wood is employed for the baseboard it will be found difficult to attach the panel without it collapsing.

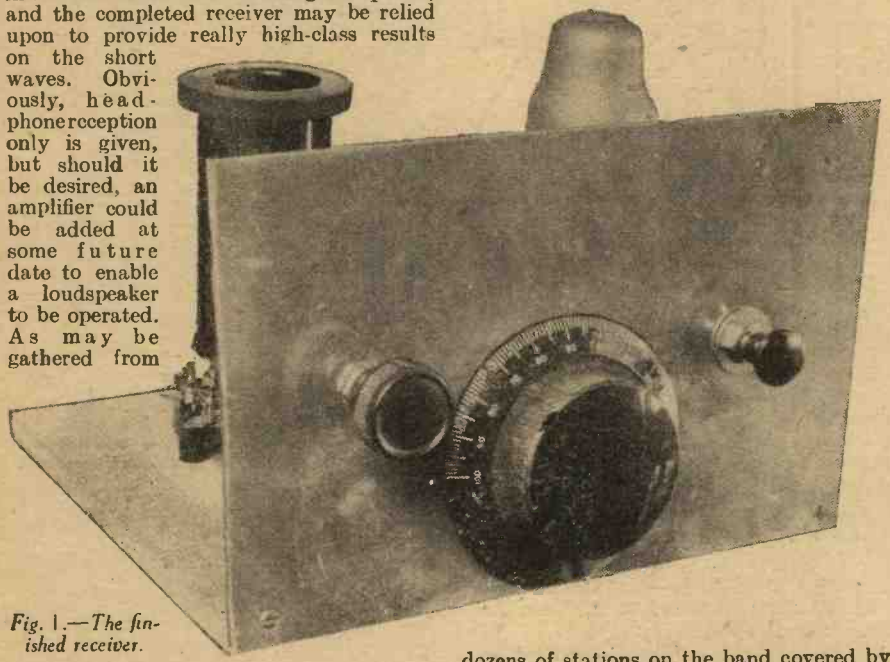


Fig. 1.—The finished receiver.

The circuit is the simple reacting detector, which has been proved time and time again to offer the most satisfactory results in normal circumstances. Whilst it is admitted that it is not so good as a properly operated electron-coupled arrangement, or a super-regenerative detector, these special circuits require special care in construction and operation, and are not, therefore, ideally suited to the beginner. A standard 6-pin plug-in coil is specified, and the various components which are recommended are very low in price, as may be gathered from the price list of components on this page. The coils are available to cover all ranges from 9 up to 2,000 metres, and thus, it is possible to tune to various wavelengths as desired.

The Circuit

The tuning condenser specified is of the low-loss short-wave type, and will cover quite a small band on each coil, so that tuning difficultics need not be expected provided that it is borne in mind that short waves are not so simple to tune as the standard broadcast wavelengths. Tuning is exceedingly sharp—in spite of the low capacity employed, and some idea may be gathered from the fact that the smallest coil tunes from 9 to 15 metres with the special condenser, whilst the second coil covers from 12 to 26 metres. There are dozens of stations on the band covered by this second coil, and the selectivity is adequate to separate Wayne (W2XE) on 19.65 metres from Schenectady (W2XAD) on 19.57 metres. Of course, it must be remembered that these stations will not be heard every night, as conditions on the short waves are very variable, but under good conditions, and with a good aerial, these stations afford good volume in the early evening.

The wiring should be executed by following carefully the wiring diagram on page 160, and it will be seen that there is actually very little to do. Screw down the valve- and coil-holders, and drill the panel from the details given in Fig. 3.

LIST OF COMPONENTS

One .00016 mfd. S.W. Condenser, Premier, 2s. 3d.
.0003 mfd. Reaction Condenser, Premier, 1s. 6d.
One 6-pin S.W. Coil-holder (baseboard mounting type), Premier, 2s. 3d.
One 4-pin baseboard-mounting S.W. Valve-holder (V7), Clix, 1s. 9d.
One .0003 mfd. Tubular Condenser, type 451, T.C.C., 1s. 0d.
One 3 megohm Grid Leak, Dubilier, 1s. 0d.
One S.W. H.F. Choke, type S.W. 68, Bulgin, 2s. 0d.
Two Terminal Blocks, type S.W. 47, Bulgin, 2s. 6d.
One On-Off Switch, type S.22, Bulgin, 1s. 3d.
One Metal Panel, 8in. x 5in., Peto-Scott, 2s. 6d.
One Wooden Baseboard, 8in. x 6in., Peto-Scott, 1s. 3d.
Connecting Wire, flex for battery leads, screws, etc., 2s. 6d.
One H.L.2 metallised valve, Tungsram.
One 66-volt H.T. Battery.
One 2-volt L.T. Accumulator.
One Pair 4,000 ohm Headphones.
Set of 6-pin S.W. Coils—according to the wave-ranges desired, Premier.

Screw down the two terminal strips at the rear of the baseboard and mount the components on the panel before attaching this to the baseboard. Use thick bare wire for wiring—say 20 or 22 gauge bare tinned copper, and make quite certain that all connections are tight. Remember to turn the loops in the ends of the connecting wires in the same direction as the nut is turned to tighten, and then the ends will not be pushed out when the nuts are placed in position.

Testing Out

Use good quality flex for the battery leads and attach these as indicated, with good wander plugs at the ends. Connect the L.T. − and L.T. + plugs to the two terminals on the accumulator marked with the negative and plus signs (connecting − to − and + to +), and plug the H.T. − and H.T. + plugs into the two sockets of the 66-volt H.T. battery so marked. Attach a pair of headphones to the 'phone terminals and connect the aerial and earth leads and the set is ready for use. Remember, however, that as this is only a one-valver you cannot expect to receive America on a foot or so of wire. Use a really good aerial and earth connection. The aerial should be high but not too long—say 30 feet inclusive of lead-in. If more convenient, you can use a vertical wire, suspended about 18ins. or 2ft. from the walls and supported rigidly. The earth lead should be of heavy gauge *covered* wire, and should be taken by the most direct route to the nearest earth point. Athough a water-pipe may be used, it should be of the mains type—not one coming from a tank in the house. If possible use a large buried mass of metal—a proper earth tube is better—or an old pail, for instance. Keep this moist in order to provide maximum results. The large dial controls tuning, and the left-hand control is for reaction. This must be used with care and should only be advanced slowly until a rushing noise is heard in the 'phones. At this point slacken off slightly and turn the tuning knob. If a whistle is heard it will indicate that the reaction is too far advanced and it should be turned back still more. As soon as a signal is received the reaction control may be adjusted to build it up to the desired volume. Do not expect, however, to bring up signals to loudspeaker volume with a single valve, and if it is

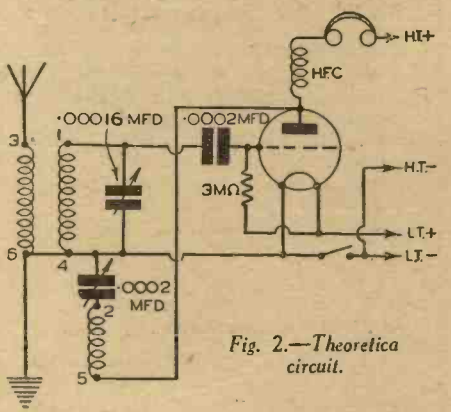


Fig. 2.—Theoretica circuit.

(*Continued overleaf*)

THE "ECONOMY" S.W. ONE-VALVER

(Continued from previous page)

found that before the signal is of adequate volume the set bursts into oscillation you must remember that that particular station does not offer entertainment value. With use, however, it is often found that the reac-

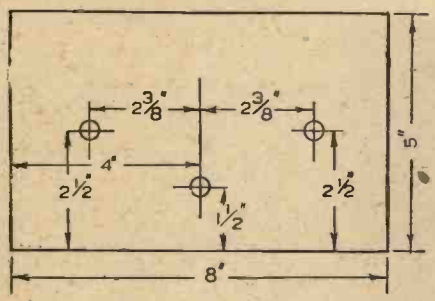
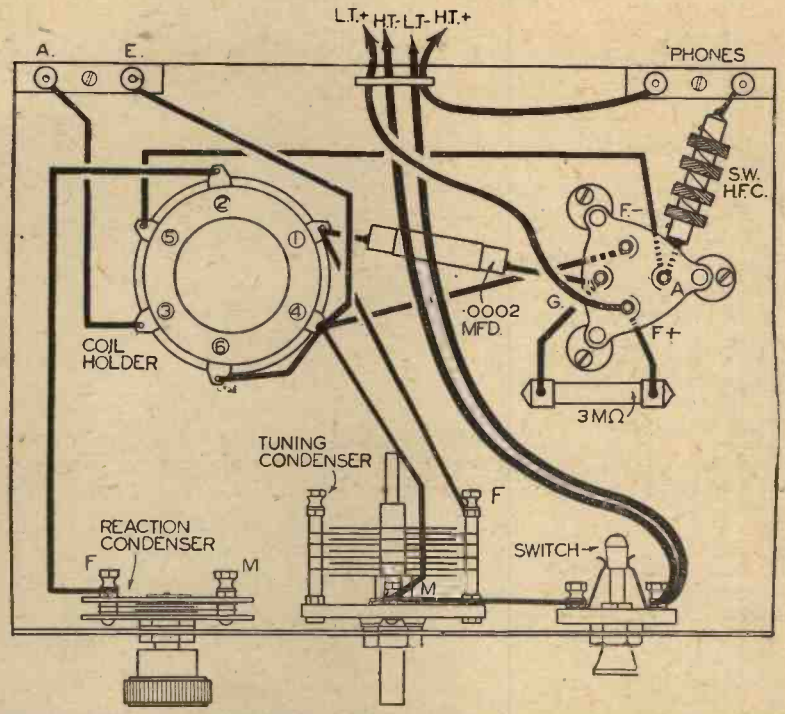


Fig. 3.—Panel-drilling dimensions.

tion control, properly handled, will bring up a signal to quite a large volume, although naturally distortion sets in after a point. Remember, therefore, to use this control with care and do not expect to put every station on the loudspeaker. The set is designed for headphone use, and as such it will give splendid results when properly handled. As previously mentioned, the use of the metal panel will avoid hand-capacity effects, and other erratic tuning difficulties sometimes found with the simpler types of receiver. If subsequent amplification is desired, an ordinary L.F. amplifier may easily be added, either as a separate unit or on a larger baseboard.

WIRING DIAGRAM



Important Broadcasts of the Week

***NATIONAL* (261.1 m. and 1,500 m.)**

Wednesday, April 27th.—Military Band concert.

Thursday, April 28th.—Variety programme from Holborn Empire.

Friday, April 29th.—The Gang Show: variety programme.

Saturday, April 30th.—Wembley Cup Final Commentary, and Commentary during the first match of the Australian tour, from Worcester County Cricket Ground.

***REGIONAL* (342.1 m.)**

Wednesday, April 27th.—Commentary on the Two Thousand Guineas Race at Newmarket.

Thursday, April 28th.—Scrapbook for 1928.

Friday, April 29th.—Madam Butterfly, Act 1 (Puccini), from Sadler's Wells Theatre.

Saturday, April 30th.—B.B.C. Ballroom: Dance music programme.

***MIDLAND* (296.2 m.)**

Wednesday, April 27th.—A Programme of gramophone records: Harmony House.

Thursday, April 28th.—Variety from the Grand Theatre, Derby.

Friday, April 29th.—Stoke-on-Trent Schools' Music Festival.

Saturday, April 30th.—Music in the Air: vocal programme.

***NORTHERN* (449.1 m.)**

Wednesday, April 27th.—Norway: a feature programme tracing Norse influence on Northern England.

Thursday, April 28th.—Forty-seventh Annual Manx Music Festival, from the Palace, Douglas.

Friday, April 29th.—Hark Forrard! West Cumberland variety programme.

Saturday, April 30th.—£ s. d. A study in shopping.

***WEST OF ENGLAND* (285.7 m.)**

Wednesday, April 27th.—A recital of Handel's music from the Church of St. Mary.

Thursday, April 28th.—Variety from the Palace Theatre, Bath.

Friday, April 29th.—More Musical Memoirs from the Diary of Lavinia Dowsett.

TELEVISED DRAMA

Works by W. B. Yeats, J. Van Druten, Eugene O'Neill, and James Bridie are to be included in forthcoming television programmes. W. B. Yeats' play, "The Shadowy Waters" will be seen in the evening programme on May 4th. Leonora Corbett will appear in "There's Always Juliet," by John Van Druten, in the evening transmission on April 27, which will be repeated in the afternoon on May 2nd. James Bridie's "Tobias and the Angel" is scheduled for May 1st, and for the afternoon of May 6th. On May 11th, Eugene O'Neill's exciting drama, "The Emperor Jones" will be televised in the afternoon and will be repeated in the evening programme on May 13th.

Saturday, April 30.—Sports Special: a feature for fans.

***WELSH* (373.1 m.)**

Wednesday, April 27th.—Blwyddyn Arbennig yn fy Mywyd—a talk.

Thursday, April 28th.—The College Weekly Concert from the Powis Hall, University College of North Wales, Bangor.

Friday, April 29th.—Siartiaeth ym Maldwyn, a feature programme on Chartism in Montgomeryshire, by Tom Hughes Jones.

Saturday, April 30th.—Music by Welsh composers.

***SCOTTISH* (391.1 m.)**

Wednesday, April 27th.—Scottish Music of To-day: orchestral programme.

Thursday, April 28th.—The Making of the Exhibition: A sound impression of the construction of the Empire Exhibition (Scotland) 1938.

Friday, April 29th.—Harry Gordon in Inversnecky Calling!

Saturday, April 30th.—Backstage at Bellahouston—A last look round, by Alastair Borthwick.

***NORTHERN IRELAND* (307.1 m.)**

Wednesday, April 27th.—Organ recital from the Cathedral Church of St. Patrick, Armagh.

Thursday, April 28th.—Orchestral programme.

Friday, April 29th.—Ulster Agriculture and the British Empire Exhibition, by Sir Basil Brooke.

Saturday, April 30th.—Orchestral concert.

The "Experimenters" Explain How to Receive Short Waves

This Article Does Not Deal with Short-wave Receivers as Such, but with the Use of Converters and Adapters as Additions to Various Types of Broadcast Receiver

by The Experimenters

OUR subject is one that has been dealt with at length in previous articles in these pages, but in treating it again we have in mind the thousands of new readers and the fact that this is, after all, a special all-short-wave number. Consequently, the more ardent of our readers must excuse us if part of this week's article is devoted to matters in which they are well versed.

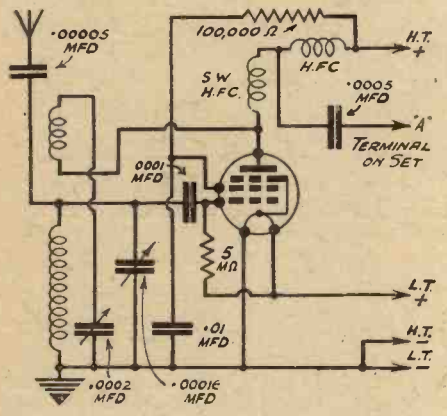


Fig. 1.—Circuit of a typical autodyne (single valve) S.W. superhet converter.

But even though we are dealing with a familiar subject, it is one which is constantly changing as improvements are made in design and in components. For example, a common method of receiving short waves on a broadcast set a few years ago was by means of an adapter which replaces the detector or second-detector valve of the receiver. Later than that was the method of using a superhet converter in conjunction with a "straight" set having at least one stage of H.F. amplification; the most common circuit for the converter was one using an S.G. or H.F. pentode valve in an autodyne arrangement, as shown in Fig. 1.

Autodyne Pros and Cons

That was all right as far as it went, and is still used with fair success. But there are many disadvantages, the most important of which is that the circuit is not particularly selective. Another is that all short-wave signals are received at two positions on the tuning scale, one above and one below the signal frequency.

Largely to offset these disadvantages are the important advantages of simple construction and extreme ease of operation. Additionally, the converter unit can be made from standard parts and by using a valve of a pattern that will probably be on hand as a spare.

It will be as well briefly to describe the principle of this so-called autodyne converter, for the explanation will be useful when we come to consider more advanced systems. The valve is wired purely and simply as a detector with reaction, with the exception that in the anode circuit there is an additional choke of the "broadcast" type, and that a lead is taken from the junction of the two chokes to a fixed condenser, the other side of which is joined to the aerial terminal of the broadcast set. Reaction is so adjusted that the valve is in a state of continuous oscillation, and the broadcast set is left tuned to the bottom of the long-wave band. The oscillations beat with those of the signal to be received, producing the intermediate frequency. This is equal to the difference in frequency between the oscillations generated by the converter and the frequency of the signal.

Intermediate Frequency

When the broadcast receiver is tuned to, say, 900 metres, the equivalent frequency is about 330 kc/s, and so the converter must be tuned to a frequency higher or lower than that of the required signal by this amount. Actually, it would be possible to tune the receiver to almost any other wavelength, because the output or anode circuit of the converter is only tuned very approximately by the broadcast H.F. choke. At the same time, best results are generally obtained with the autodyne circuit when the I.F. is not higher than about 450 kc/s, whilst it is important that the I.F. should not correspond with the frequency of a transmitter if interference is to be avoided.

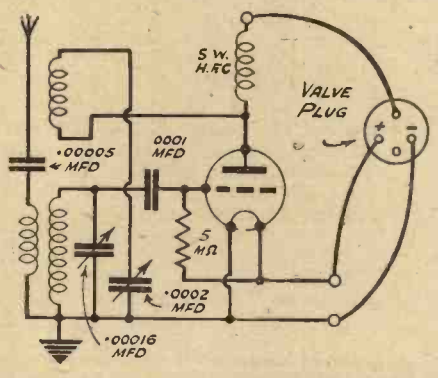


Fig. 2.—An S.W. adapter circuit which replaces the detector and preceding valves (if any) in the broadcast set.

The Adapter

Before dealing with more advanced types of superhet converter, let us look at the adapter. This again is in the form of a single-valve receiver with reaction, but in this case it is used exactly as a receiver. In other words, it is not caused to generate continuous oscillations. It might be more readily understandable if it is pointed out that the adapter is essentially a single-valve receiver and that the portion of the broadcast set used with it serves as nothing more than a low-frequency amplifier. The adapter takes the place of the detector valve in the broadcast set, as will be understood from Fig. 2, which shows the circuit of the adapter and, in skeleton form, part of the receiver L.F. circuit.

Connection is generally made between the two units by means of a valve plug adapter, this being placed in the detector valve-holder of the broadcast receiver after taking out the normal detector valve. By this means the L.T. and H.T. supplied to the detector valve-holder in the set are automatically applied to the valve in the adapter, any decoupling and L.F. coupling circuits remaining in use.

For Battery or Mains

The circuit given applies to a battery-operated set, but almost identical connections can be used when the receiver is of the mains-operated type, by replacing the four-pin adapter plug by a five-pin one, and connecting the centre pin to the cathode terminal of the valve-holder in the adapter. It will be obvious that the aerial lead must be transferred from the set to the corresponding terminal on the adapter, but the earth connection can remain unchanged, since it is completed through the filament or cathode circuit.

Using a Pentagrid

A more-advanced type of converter circuit than that dealt with above and shown in Fig. 1 is desirable to-day, and one such efficient arrangement is fully described on other pages. In that case, separate first detector and oscillator valves are used, whereas some constructors would prefer to use a single-valve frequency-changer of the pentagrid or triode-pentode pattern. A circuit is given in Fig. 3, and from this it will be seen that the principal difference between the pentagrid circuit and that shown in Fig. 1 is that there are two tuning circuits. These can consist of ordinary short-wave coils of the four-pin type, and

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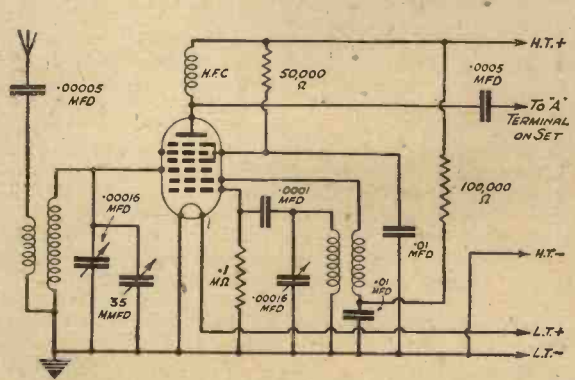


Fig. 3.—A converter circuit using a pentagrid frequency-changer.

THE "EXPERIMENTERS" EXPLAIN

(*Continued from previous page*)

tuning can be carried out by means of a two-gang .00016-mfd. condenser, with a 35 m.mfd. trimmer in parallel with the first section.

The output is again fed to the aerial terminal of the broadcast set, which is left tuned to a fixed frequency or wavelength as before. Oscillation is maintained in the frequency-changer by the close coupling between the two windings of the four-pin coil used for the oscillator section, and it is therefore necessary only to tune the gang condenser to select various transmissions. Once the required station has been tuned in, fine tuning can be effected by means of the trimmer.

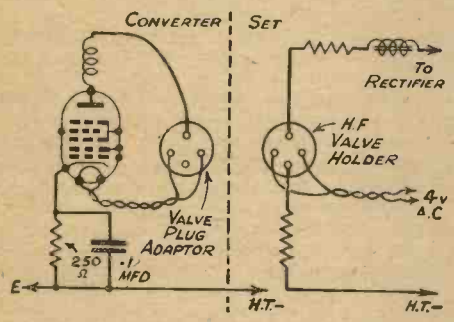


Fig. 4.—How an A. C. converter can be fed with H. T. and L. T. from most existing H. F.-type A. C. receivers.

Use With Main Sets

When it is desired to employ a converter of this or similar type with a mains receiver, certain difficulties are almost sure to present themselves. For instance, if the set is of the D.C. or A.C./D.C. type the extra valve cannot draw its H.T. and L.T. current from the broadcast set. The reason is that the power-supply circuits are designed and adjusted to suit the original valves only. In consequence, it is nearly always necessary to build a small mains unit into the converter itself. The leads to this will be joined to the common mains supply, along with those to the broadcast set.

Even when the receiver is of the A.C. type difficulties may be encountered, because there might be insufficient "reserve" of H.T. and L.T. current to feed the extra valve. In the case of the majority of home-built receivers this will not apply, but the point might be of great importance if the set is a ready-made commercial model. If there is sufficient "spare" current, the connections can be made as shown in Fig. 4; if not, a separate small mains unit will be required for the converter, as when dealing with a D.C. receiver. With the arrangement shown the adapter plug-socket is placed in the H.F. valve-holder, the H.F. valve being replaced in the adapter socket. Only a small current output will be needed, but an H.T. voltage of about 200, at 20 mA, and an L.T. supply of 4 volts 1 amp. will be needed. This means that a mains transformer and rectifier will be essential.

Converter with Superhet

Queries are often received from readers who want to use a short-wave converter in conjunction with a broadcast-type superhet. Unfortunately, it is not always easy to advise on this point, for superhets are sometimes inclined to be rather "ticklish." You see, there already is one frequency-changer in the superhet, although it is used for medium and long waves only. It is often feasible to include a pair of short-wave coils in the original set, making provision for bringing these into circuit in place of the broadcast coils. In this case it is important that a special oscillator coil be used, and that this should be suitable for use in an all-wave set having a .0005-mfd. gang tuning condenser. It is also important that the two short-wave coils be suitable for the intermediate frequency at which the set is designed to operate. Suitable components are obtainable, but the alteration should not be attempted in the case of a commercial receiver. Even if there were sufficient space to accommodate the extra coils and change-over switch many complications would arise due to the difficulty of reaching the wiring.

Double Frequency-changer

In general, the most satisfactory system with a superhet is to use what is known as a double frequency-changer; one is in the set and the other is in the converter. This means that the latter must have two valves, one for frequency-changing and one to act as an I.F. amplifier. A general

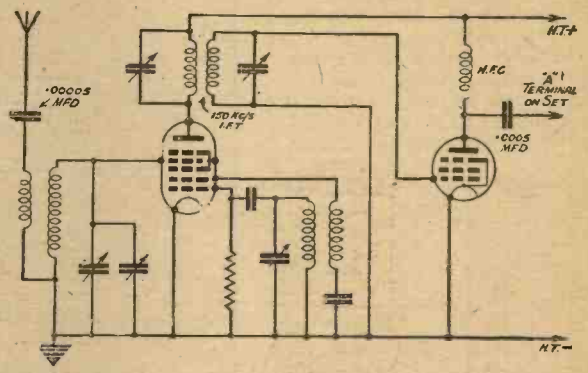


Fig. 5.—Skeleton diagram of a converter for use with a broadcast superhet. It incorporates both frequency-changer and I. F. valves.

circuit is given in Fig. 5 to show the idea. When this system is adopted the broadcast superhet should be pre-tuned to 2,000 metres, all further tuning being carried out on the converter. It will be seen that a 150 kc/s I.F. transformer is used between the converter frequency-changer and the converter I.F., an H.F. choke being used in the anode circuit of the latter. The trimmers on the I.F. transformer should be carefully adjusted so that the tuning matches up with that of the input circuits of the set; this is done by tuning them until maximum signal strength is obtained on a signal toward the middle of the wave-band covered by the converter.

NOTES AND NEWS

Stereoscopic Television

WITH further reference to the recent notes on the German stereoscopic television system, we may point out that it is identical electrically with that now radiated from the Alexandra Palace, but instead of the odd and even line scanning being undertaken in one tube to bring about a final interlace of the one scene, the vision modulation is really made up from alternate pictures, each having slightly different optical characteristics. At the receiving end is a set employing a cathode-ray tube as the picture reconstituting device, so that the two sets of electrical images are made visible on the tube's screen, the viewing being undertaken indirectly, for the tube is mounted vertically, and an inclined mirror in the set's lid shows the picture as a reflection. There is a fundamental difference between this set and a standard one, however, for between the tube and the mirror is interposed a patented device. This takes the form of a "grating," which is said to be formed of alternate transparent and opaque strips. It rests on the top of the receiver cabinet in the place taken usually by the Triplex glass mask of the present-day set. When looking at the reproduced television picture in the mirror, therefore, this grating is said to permit one eye to see only one of the two alternate images, while the other eye observes the second image. Just as the brain blends the two eye images together with normal sight, so the same action takes place with this stereoscopic scheme of Zworykin's, and the illusion of a complete television picture in three dimensions, or having depth, is conveyed to the person looking-in. The scheme has the appearance of being quite sound and practical, and will, no doubt, pass through the normal phases of development, to be applied eventually to high-definition television services.

The American Viewpoint

A NOTICEABLE difference between English and American television practice is that the latter, as a rule, employ synchronising pulses which are inadequate from the dual standpoint of amplitude and time duration. This will only reduce the measure of tolerance in the design of television receivers, and in consequence the limits now set by the B.B.C. standard are to be preferred to any reduction which would tend to destroy the marked steadiness which now characterises most manufacturers' sets. Furthermore, with the background illumination being transmitted directly there is a constant level for black and the frame and line synchronising pulses. The synchronising pulse level corresponds to zero radiated power from the transmitter and in consequence the tops of these pulses remain at a definite voltage level in the receiver detector output circuit. This means that to separate the picture components of the signal from the synchronising pulses, a simple type of amplitude filter circuit will prove quite satisfactory.

Music of Finland

BERNARD ROSS (baritone) and Enid Payne (pianoforte) will be the artists in the eleventh of the series entitled "Music of Other Countries," devoted to music of Finland, on May 3rd.

The "Cyclo" Converter

An Efficient and Simple Two-valve Unit Suitable for the Beginner or Advanced Constructor, is Described in this Article

AN inexpensive alternative to a first-class all-wave or a complete short-wave receiver is a good S.W. converter, which allows any receiver embodying pre-detector amplification to receive the worth-while programmes now being transmitted on the various short-wave bands.

It is not for me to enlarge on what the short-waves have to offer you; that is done elsewhere in these pages, but I would like to say that if you have already tried a converter or adapter, and have given up the matter through dissatisfaction, provided that your local conditions are average, have another try with the unit described below, and I am sure you will alter your views.

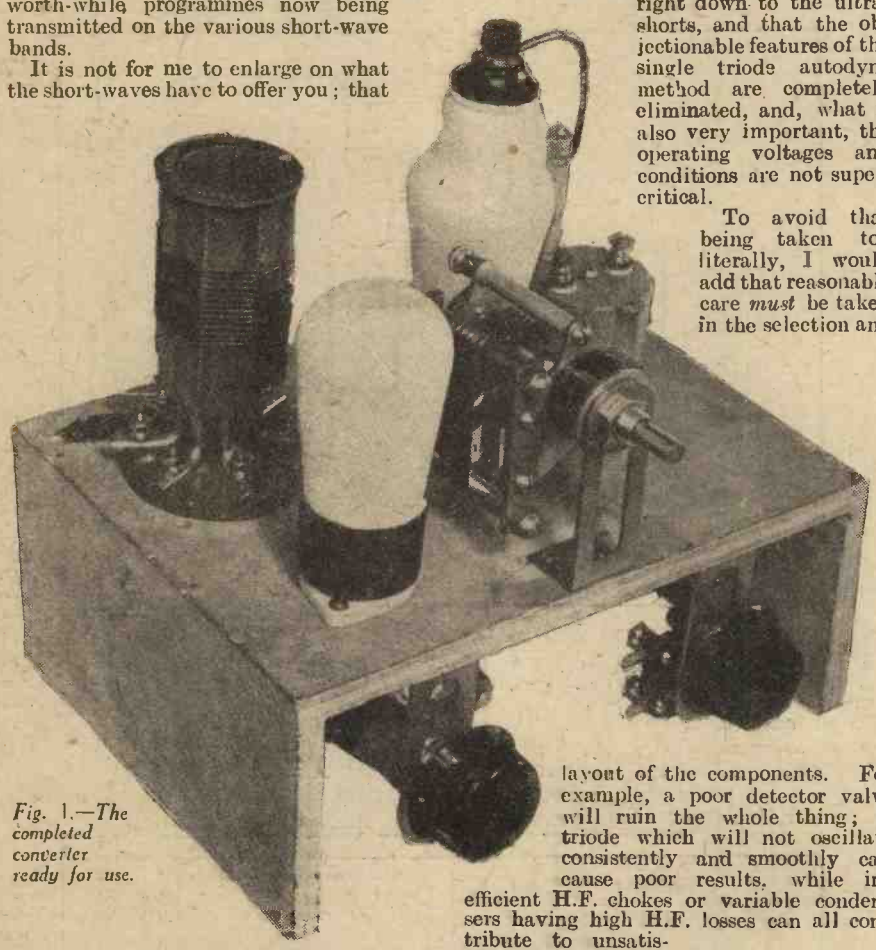


Fig. 1.—The completed converter ready for use.

To use two valves may seem to many as both unnecessary and extravagant, especially in view of the heptodes and triode-hexodes available, but the trouble is that these valves are not lying spare in everybody's den, whereas those employed in the circuit are quite likely within the reach of all who might be interested in the circuit.

The Circuit

It will be seen from Fig. 2 that an ordinary triode and screened-grid or "straight" H.F. pentode are required. The first acts as a local oscillator in a similar manner to the oscillator section of a normal superhet receiver, while the second is used as a S.G. detector, the complete arrangement combining to form a very efficient *superhet* unit, the wave-range of which is governed by the coil employed.

By using a separate oscillator valve, it will be found that the efficiency holds good right down to the ultra-shorts, and that the objectionable features of the single triode autodyne method are completely eliminated, and, what is also very important, the operating voltages and conditions are not super-critical.

To avoid that being taken too literally, I would add that reasonable care *must* be taken in the selection and layout of the components. For example, a poor detector valve will ruin the whole thing; a triode which will not oscillate consistently and smoothly can cause poor results, while inefficient H.F. chokes or variable condensers having high H.F. losses can all contribute to unsatisfactory performance. Therefore, watch those points and, where possible, adhere to the original specification.

The variable condenser C1 is wired in series with the aerial to allow the selectivity to be varied, and to control the damping which might be imposed on the grid circuit by certain aerial arrangements. If an aerial of excessive length, or one having a high capacity to earth, is employed, it is possible that the first valve will be damped to such an extent as to prevent it acting as an oscillator. However, C1 will take care of any normal arrangements, but do see that your aerial is at least of average efficiency.

The three windings shown, namely, the aerial coupling, the grid and reaction coils, are all wound on one former, the necessary connections being made to the terminals of a six-pin valveholder into which the specified coil—Eddystone—fits.

For the 40 to 94 metres a type 6R coil is required, this being identified by a Red spot on the top flange, while for the 22 to 37 and 12 to 26 metres, a Yellow spot and a Light Blue spot coil are required respectively. An additional feature of the design is that the specified coils can also be obtained to cover higher wavebands, for example, the type 6BR covers all the usual trawler transmissions.

The grid circuit is tuned by the variable condenser C2, and it is this control which acts as the station selector, no tuning adjustments being made on the broadcast receiver which has to be used in conjunction with the converter.

The only other control is that provided by C3, which allows the degree of reaction or regeneration to be varied until the triode is oscillating smoothly. If all operating conditions are satisfactory, it will often be found that it is not necessary to alter C3 once it has been set for any particular coil, so that operation is reduced to one knob control, i.e., C2.

Construction

To assist in the assembly, and to keep various leads reasonably short, the complete unit is built on a very compact chassis which has a metallised surface to provide the required degree of screening and a common earth point.

The valve and coil holders should be fixed in position to start with, and the filament and grid circuits wired according to the plan.

After this mount the two H.F. chokes,

(Continued overleaf)

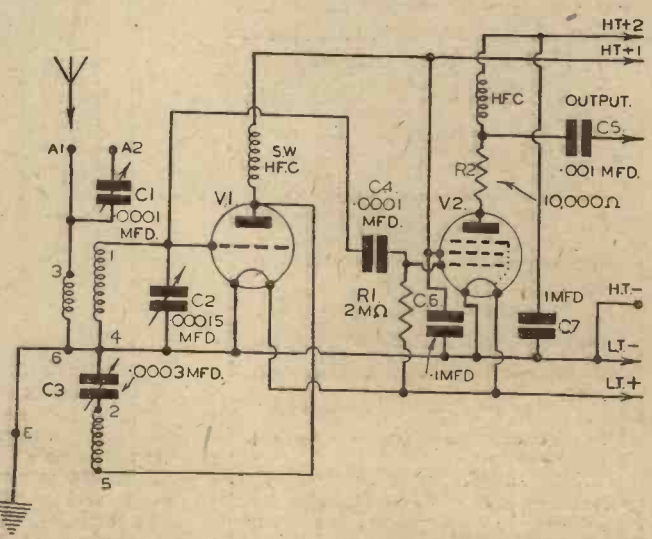


Fig. 2.—Theoretical circuit of the two-valve converter.

THE "CYCLO" CONVERTER

(Continued from previous page)

taking care to notice that the short-wave type is used in the anode circuit of the oscillator, while the screened one is in the detector anode high-tension feed. Actually, the first one is mounted underneath the chassis and the second on top, so no mistake should be possible. The fixed condensers C5, 6 and 7 can now be secured, and the resistance R2 fastened to the anode side of the second H.F. choke. When all wiring has been checked, the brackets can be screwed down to hold the three variable condensers, these, in turn, being mounted in their respective positions.

A word here may be necessary regarding the J.B. Special S.W. condenser C2. This model is designed for three or single-hole fixing, the latter being obtained by screwing on a little attachment provided with the component. See that it is securely fastened, and that all condensers are really firm on their brackets.

The aerial and earth socket strip can now be fixed, and then the remaining wiring completed, not overlooking the lengths of flexible wire required for the battery and output connections.

Operation

First of all the battery leads must be connected to suitable voltage supplies. The same batteries that are used with the broadcast receiver will do, providing that *in the receiver* the *H.T. and L.T. negative* are common with the *earth*. This arrangement is practically universal, so there is little likelihood that any alterations will be necessary.

The *earth* connection can be left on the receiver but the aerial must be removed and connected to the appropriate socket on the converter, while the receiver should be switched over to the *long waves*, and the tuning condensers set to, say, somewhere near the bottom of that wave-band.

When the valves are plugged into the converter, the output lead from C5 can then be connected to the *aerial* terminal of the *broadcast* set, and the complete arrangement is ready for use as soon as the receiver is switched on.

The reaction control C3 must be adjusted until a faint rushing sound is heard in the speaker or 'phones. The noise should not be too fierce or too weak. It is a matter for experience and adjustment, though one soon knows by practice if the circuit is "alive."

If the tuning control C2 is now rotated *slowly*, the rushing noise will continue until a station is heard. Should the noise stop, gently adjust C3 until a setting is found for the complete movement of C2. It may be necessary to reduce C1 or increase slightly H.T.1.

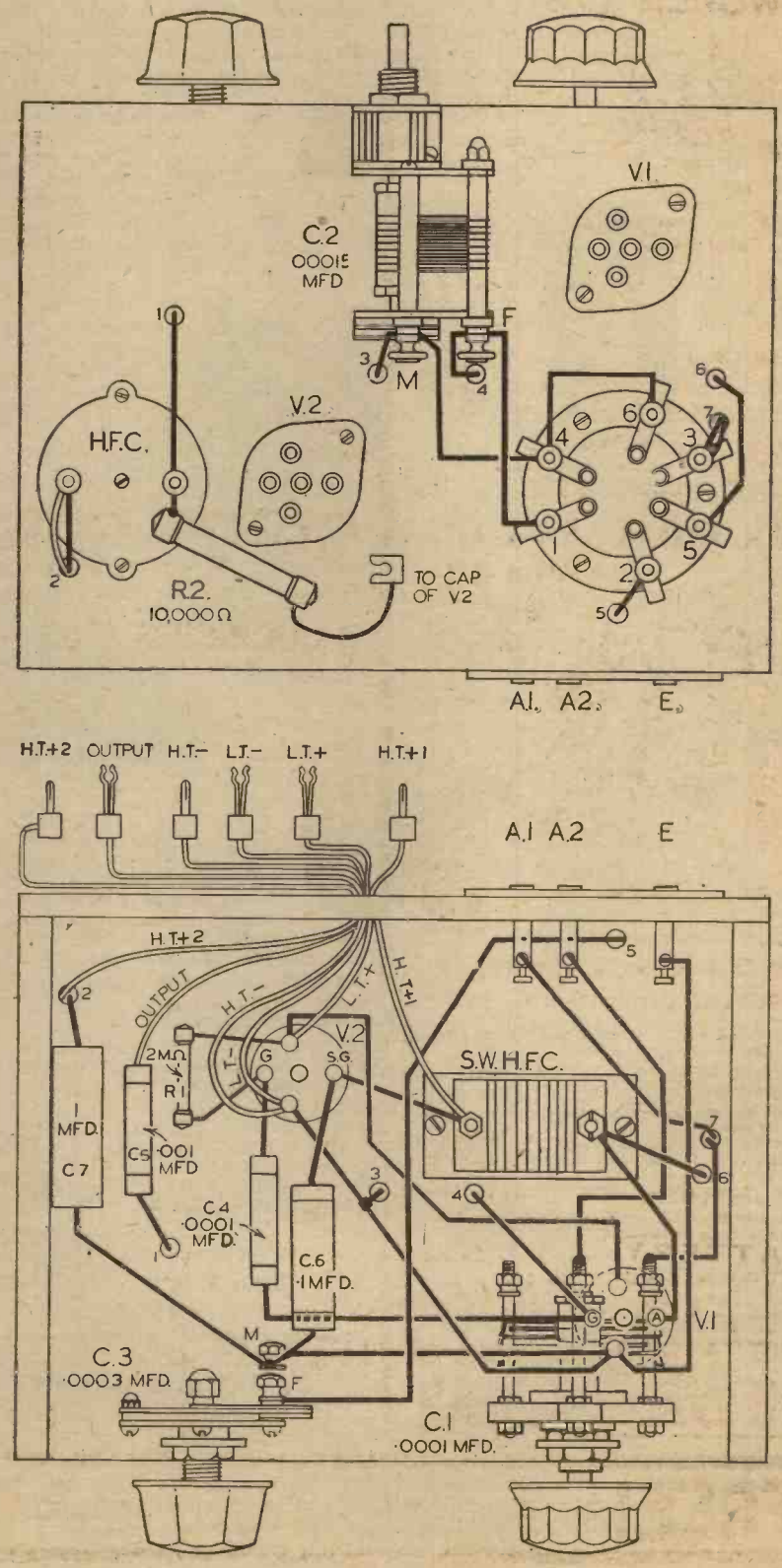
When a station is tuned-in, don't touch C3, but you can experiment with the reaction control on the receiver, although a shade too much of that will make the whole circuit hopelessly unstable.

One of the main secrets of S.W. tuning is the manipulation of the tuning control. This must be adjusted *very* slowly, otherwise it is possible to pass over several stations without even knowing that they are there.

LIST OF COMPONENTS

1 Clix socket strip A, A1, and E. (7d.)
2 Clix S.W. 4-pin valveholders, Type V.5 (10d. each.)
1 J.B. S.W. special .00015 mfd. variable condenser. (5s. 9d.)
1 J.B. Dilecon reaction condenser, .0003. mfd. (2s. 6d.)
1 Dubilier 10,000 ohm resis. 1 watt. (1s.)
1 Dubilier grid leak, ½ watt, 2 megohm. (6d.)
3 Component Mounting Brackets, Peto-Scott (4d. each.)
1 Bulgin screened H.F. Choke type HF9. (4s.)
1 Bulgin S.W. H.F.Choke type HF3. (2s.)
1 Eddystone 6-pin coil holder, type 969 (and coils to match for wavelength desired). (2s. 3d.)
1 Eddystone variable condenser, .0001, type 900-100. (5s.)
1 T.C.C. fixed condenser, 1 mfd. type 341. (2s. 3d.)
1 T.C.C. fixed condenser, .1 mfd. type 341. (1s. 4d.)
1 T.C.C. fixed condenser, .001 mfd. type 451. (1s.)
1 T.C.C. fixed condenser, .0001 mfd. type 451. (1s.)
1 Peto-Scott chassis, 8in. x 6in. with 3in. runners. (3s. 6d.)
1 Tungsram valve, LD210.
1 Tungsram valve, HP210.

WIRING DIAGRAM



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9 to 2,000 metres.

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COMPLETE KIT. Comprising above but including 5 pairs 6-pin coils 9-2,000 metres, 59/6, or 5/- down and 12 monthly payments of 5/3. 4 Matched Valves FREE. **2/6 DOWN**

1-VALVE SHORT-WAVE KIT

Complete 1 Valve Receiver Kit, including 3 coils; 12-94 metres and pair of super-sensitive headphones, 27/6 cash, or 2/6 down and 11 monthly payments of 2/6. VALVE FREE.

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List Value £5 : 10 : 0 BARGAIN **75/-**

VALVES FREE

UNIQUE All-World reception—12-94 metres. Variable Mu H.F. pentode, leaky grid reacting detector, pentode output and valve rectification. Slow motion bandspread tuning. 3 calibrated scales 0-180, 0-180, 0-10. For A.C. Mains 200-250 volts, 40-100 cycles.

KIT comprises every part for assembly, including 3 pairs 4 and 6-pin coils (12-94 metres), wiring and assembly instructions. Cash or C.O.D., 75/- or 5/- down and 12 monthly payments of 7/6. 4 Matched Valves FREE. **5/- DOWN**

New 4-valve BANDSPREAD Battery SHORT-WAVE KIT

List Price £4 : 17 : 6 BARGAIN **42/-**

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12-94 metres, will bring a lifetime of fascinating short-wave entertainment. Complete Kit, including 3 6-pin coils. List value, £4/16/6. BARGAIN 42/- cash or 2/6 down and 12 monthly payments of 4/-.

Four Matched Valves FREE. **2/6 DOWN**

IN STOCK—TROPHY 3's

These popular B.T.S. Receivers available for Cash, C.O.D. or easiest of easy terms.

BATTERY MODEL £5:15:0

Cash or C.O.D., or 7/6 down and balance in 15 monthly payments of 8/3.

A.C. MODEL £6 : 6 : 0

Cash or C.O.D., or 7/6 down and 15 monthly payments of 9/-.

EXTRA COILS

Type SL/1 (6-13 metres) (for Television)	3/3
Type SL/4 (40-98 metres)	3/-
Type SL/5 (70-200 metres)	3/3
Type SL/6 (150-350 metres)	3/6
Type SL/7 (300-550 metres)	3/9

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KIT 1 Cash or C.O.D. 32/-

Comprising Specified N.T.S. 2-gang Condenser, N.T.S Hurricane S.M. Dial, Peto-Scott Steel Chassis, L.F. Transformer and Fixed Condenser, less Valves and Coils

OR YOURS FOR **2/6** DOWN.

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EVERY PART GUARANTEED MATCHED, PROVED, TESTED.

THESE ARE THE ITEMS IN KIT 1

Any part available separately. Orders over 10s. sent post and C.O.D. charges paid.

	s.	d.
1 Peto-Scott ready drilled chassis, with valve and coil-holders fitted	5	6
1 N.T.S. Hurricane 2-gang condenser and distance pieces	5	0
1 Peto-Scott L.F. super transformer	4	6
1 50,000 ohms potentiometer with 3-pt. switch	3	0
4 ½-watt resistors, 10,000, 30,000, 150,000 ohms, 5 meg.	1	4
6 tubular condensers, (2) .0002, (1) .005 (3) .1 mfd.	3	0
1 .01 mfd. fixed condenser	1	0
1 Peto-Scott special 1 mfd. condenser	1	6
1 N.T.S. Hurricane slow-motion dial	2	0
1 .0001 mfd. reaction condenser	2	0
1 .0003 mfd. reaction condenser	2	0
Connecting wire, flex for battery leads, plugs, etc.	2	6
KIT "1" CASH OR C.O.D.	£1 12	0

SPECIFIED VALVES

COMPLETE SET OF **3** Cash or C.O.D. **5/6** POST FREE

Or available with Kit 1 for 2/6 down and 12 monthly payments of 3/5.

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ONE-SHOT INDUCTORS

Type 9/MW 178-580 metres per pair 5/6.
Type 9/LW 900-2,000 metres per pair 6/6.
Type 9/32 15-43 metres per pair 5/-.
Type 9/83 24-70 metres per pair 5/-.
Type 9/81 9.5-27 metres per pair 5/-.

N.T.S. 6-PIN COILS

Medium Wave (190-550 metres) per pair 4/6.
Long Wave (900-2,000 metres) per pair 5/6.
Short Wave, three wave ranges (15-43, 24-70, 9.5-27 metres), per pair 4/-.

Add 1/12th of cost of required coils when forwarding deposit for desired kit.

KIT 2. Complete Kit with 3 specified valves and set of 10 N.T.S. Hurricane coils, 57/6 or 4/9 down and 12 monthly payments of 4/11.

HURRICANE FINISHED RECEIVER

Complete Receiver, employing Kit "1" with 3 Specified Hurricane Valves, housed in Peto-Scott recommended Cabinet, less coils and phones. Rigidly tested before despatch. Cash or C.O.D. or 6/- down and 12 monthly payments of 6/-. **£3:7:6**

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Peto-Scott recommended steel Hurricane cabinet, or with drilled panel. Cash or C.O.D., 15/-. or add 1/3 to Kit deposit and monthly payments. **12/6**

HEADPHONES

N.T.S. recommended lightweight type. per pair *Post 6d.* **3/6**

K.B. REJECTOSTAT RECEIVER CHASSIS

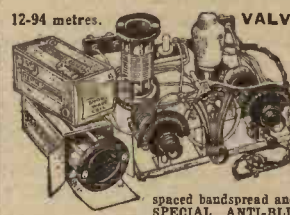
Model 540, 5-Valve Superhet. A.C. and D.C./A.C. models. "Fototune" illuminated dial. Station names and metres. Waverange 200-2,000 metres. Complete chassis with power pack with B.V.A. Valves and high fidelity 8in. cone speaker mounted on silk-fitted baffle board. Less cabinet. Bargain £4/4/0. Yours for 5/- down and 15 monthly payments of 6/9. Fully tested. Ready for use. Leaflet on request.

ECONOMISE WITH THIS —"3-in-1" SHORT-WAVE KIT—

RECEIVER—ADAPTOR—CONVERTER

List Value 37/6 BARGAIN **25/-**

12-94 metres. VALVE FREE



ADAPT3 or converts your battery set for short-wave reception, or may be used as one-valve Short-wave Receiver. Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Air-spaced bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 Calibrated scales.

KIT comprises every part for assembly, including 3 4-pin coils, wiring and assembly instructions. Cash or C.O.D. Carr. Pd. 25/-, or 2/6 down and 11 monthly payments of 2/9. **2/6 DOWN**

SPECIAL OFFERS

GRAMOPHONE UNITS

NEW, comprising Motor and Pick-up, Cosmocord Model. For A.C. Mains, 100-250 volts, 50 cycles. Highly sensitive pick-up. Automatic Stop and Start, patented speed regulator, 12" plush covered turntable, needle cups. Dimensions 12" x 14". Usual Price 59/6. BARGAIN, Cash or C.O.D., 39/6.

PICK-UPS. Cosmocord highly sensitive type. Complete with rest. Usual price 17/6. BARGAIN, Cash or C.O.D., 7/6.

P.M. SPEAKERS. Fresh consignment of well-known makes, including R. & A. Rola and Magnavox, for Power or Pentode output. 8in. cone. List value, 35/-. BARGAIN, 9/11 each.

MAINS SPEAKERS. Rola, 6½in. cone, 2,500 ohms field. Pentode Output. 10/6 each.

GANG CONDENSERS. Polar type 3 and 4-gang; .0005 mfd. each section, for straight circuits, shielded, with trimmers. 2/11 each.

RESISTORS. ½ watt, all values, 4d. each, 3/6 doz. 2-watt Resistors, 8d each.

4-VALVE A.C. BANDPASS BROADCAST Chassis. Complete with all valves, engraved dial, 200-2,000 metres, pick-up sockets, 3 watts output, fully tested. £2/19/6.

BATTERY S.G.3 Chassis, 200-2,000 metres. Pentode output, less valves, 19/6.

JACKS AND PLUGS. B.T.S. Single and Double Circuit Jacks List (2 3 each), 1/- each. Jack Plugs, 1/- each.

TRICKLE CHARGER. 2v. ¼ amp. Model, Metal Rectifier. 10/-.

STEEL CHASSIS. Ready drilled for 1-9 valve-holders Electrolytics and mains transformer. Size 15in. x 9in. x 3in. grey enamel finish, brand new. Bargain, 2/- each (22/6 per doz. Carr. paid).

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BRAND NEW **ALL-WAVE 5 valve**

A.C. SUPERHET RADIO/GRAM CHASSIS

Complete with 5 Valves, Knobs and Escutcheon less Speaker

BARGAIN **£4:17:6**

Cash or C.O.D. Guaranteed Tested.

List Value £8 8s.

Tour the World on this modern 6-stage All-wave Receiver, 18-50, 200-550, 900-2,000 metres. Automatic volume and tone-controls, Wave Change and Gramo. Switch. Illuminated station-named Dial. Output 3 watts. For A.C. Mains 200/250 volts, 40/ 80 cycles. *Chassis size* 10½ x 11½" *wide*, 8½" *deep. Ready for instant housing in your own cabinet.* 7/6 *down, balance in* 15 *monthly payments of* 7/11, *or with Matched Speaker* 27/6 *extra; or* 7/6 *down and* 17 *monthly payments of* 8/9. **7/6 DOWN**

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Practical Television

April 30th, 1938. Vol. 3. No. 98

The Television Telephone

NOT content with showing how efficient is the telephone cable link between Berlin and Leipzig for normal seeing and hearing purposes, the Germans are now undertaking tests to ascertain how many long-distance telephone calls can be conducted simultaneously over the ninety miles of television cable. This cable is of the co-axial type with a wide frequency acceptance as far as signals are concerned, and the first experiments have enabled thirty telephone calls to be undertaken on the line at the same time. This is a most promising start and officials of the British Post Office are watching the developments with keen interest. The British co-axial cable now being laid through the centre of the country is still waiting its "field tests," due to the fact that all the relay stations at approximately eight-mile intervals are not yet complete. Work is proceeding steadily, but if it was contemplated that all Britain should be put on a television telephone service, then it would involve the laying of approximately eleven million miles of special underground cable. This is, of course, out of the question, and what will happen eventually is the establishment of a number of booths at selected points in the big cities where the amenities of simultaneously talking and viewing will be possible at a predetermined charge.

Interference Investigations

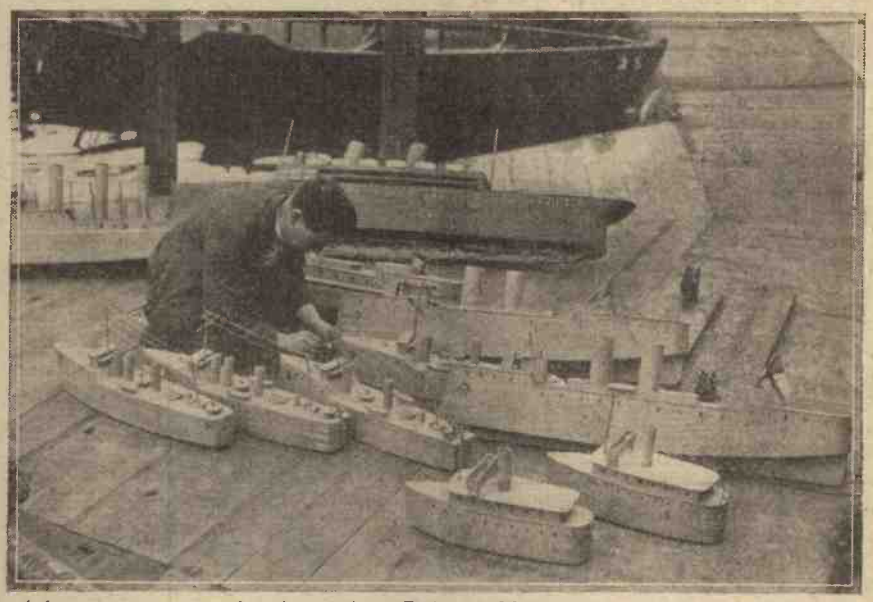
THE degree of success associated with television reception, especially at points distant from 50 to 75 miles from the Alexandra Palace station, is bound up very materially with the level of the interference signals in the immediate locality of the receiver being used. Even if the strength of the received television signal is adequate both to hold the picture in synchronism and give sufficient modulation on the cathode-ray tube, it often happens that the picture seen on the screen is marred because of the white specks of interfering signal which distribute themselves at either irregular intervals or as a mesh pattern. Very material improvements have been made as a result of better aerials, and feeder cables, coupled with a sounder knowledge of aerial location so as to be outside the interference field, but this has not cleared the trouble in the more obstinate cases. At first the bulk of the interference was thought to emanate from electrical medical apparatus such as diathermy equipment, and also the ignition systems of motor-cars, but further experiment has shown that there is still another source of trouble. This has been traced to the radiation of oscillations and/or the harmonics of these oscillations from short-wave receiving sets of the superheterodyne type. These sets have been built to receive the television sound transmissions on a carrier frequency of 41.5 megacycles (7.23 metres), and the radiation has been strong enough either to ruin or spoil very materially the observed television picture. Yet another source of interference is the short-wave set working between 13 and 30 metres which has no radio-frequency amplifying stage. Harmonics from sets of this type are capable of setting up stronger interference than an ultra-short-wave set, and may even cover distances of three or four hundred yards. With the increasing popularity of short-wave listening it is essential that this position be regularised, otherwise it is likely to cause difficulty in the development of the younger art of television. An improved standard of performance with short-wave sets of the cheaper type would of course meet the case, and no doubt this will be watched carefully by those manufacturers who at the present moment market sets of the short-wave type, as well as television receivers.

Comparative Tests

AT the Ideal Home Exhibition at Olympia the public were given the opportunity of comparing the performances of modern domestic television receivers working under similar conditions of signal distribution. In one of the largest co-operative television efforts which has been planned so far, six leading manufacturers—Baird, Cossor, G.E.C., H.M.V., Marconi and Murphy—worked in conjunction with the B.B.C., the Marconi-E.M.I. Co., and prominent film companies so as to provide a complete insight into the television art at the present stage of development. For this purpose an area of approximately 14,000 square feet of space was arranged on the second floor of the Empire Hall, and a glass-walled studio, covering a floor space of over 2,000 square feet, showed exactly how the television programmes are produced. For this purpose one of the latest Emitron cameras, together with sound and lighting equipment, were used under service conditions which simulated as near as possible those prevailing at the Alexandra Palace. Furthermore, the B.B.C mobile television unit transmitted programmes from Olympia to Alexandra Palace for re-radiation to all viewers with receiving sets. Linked up with the line and radio television transmissions were about three dozen of the latest types of commercial set ranged along a "Televiewers Parade" so that individual set performance could be compared or contrasted one with the other. The scheme gave the public a vivid impression of the quality of the light reproductions in miniature on the set screens of what was happening in the television studios. The interest which this has created is enormous, and the huge crowds which filed around the exhibit testified to the popularity of this feature.

Difficulties with Films

THE cinema industry is once more reviewing the situation which has arisen because of the degree of competition which it is stated is brought about by the B.B.C. television service affecting the patronage of cinemas. The Cinematograph Exhibitors' Association are firmly of the opinion that the televising of news reels is detrimental to their trade interests. They maintain that the B.B.C. should pay a rental charge which is as high as the proportion of the public which they serve, bearing in mind the fact that clubs, road houses, etc., give shows to their patrons as part of the amenities of their service. There is even talk of cinema exhibitors boycotting the films released by those companies who now supply the B.B.C. with news reels, short-feature films, etc. That such a situation had to arise is a matter of deep regret, for as we have emphasised so often in these columns, it is a matter for co-operative working, and not antagonism. It is said that the B.B.C. are prepared to prefix the televising of films with an announcement to the effect that they are not available for public viewing, but this is only likely to create a more complicated situation. No doubt wiser counsels will prevail all round, and the outcome should be a healthy form of co-operation with all the major differences settled amicably.



A famous war-time episode—the attack on Zeebrugge Mole—was re-enacted on April 23rd, for a television broadcast. The "battle" took place on the duck pond at Alexandra Palace, London, N., and although the production was entirely in miniature, the television cameras were so arranged as to give a realistic full-scale appearance on home television screens. Our illustration shows the miniature fleet being prepared for a rehearsal.

ON YOUR WAVELENGTH

By Thermion

Automatic Tuning

A NORTHAMPTON reader thinks that we published our recent article about Automatic Tuning with our tongues in our cheeks. He is under the impression that radio has got to the stage when sets have to be sold by ballyhoo, because the manufacturers have a very low impression of a British subject. For the price of automatic tuning he says, they could have given us pre-H.F. stages, console cabinets, or noise suppressors, and a host of other worth-while things. He thinks that the British radio manufacturers do not play square with the public. For example, Mr. Smith buys a new set and a month later the manufacturer brings out a new model which may be radically different, or it may only have a new style dial. Mr. Smith's set is no longer new. In another case Mr. Smith may pay £15 for a set, only to find a month later that a London store is selling off as "de-controlled" or "shop soiled" the same model for £9. This reader thinks it is the duty of this journal to remedy this state of affairs. I wish it were within our power to do so, but unfortunately the law is against me visiting each manufacturer with a large spanner which I should find necessary to penetrate their skulls before I touched the seat of knowledge. Members of the public have it in their own hands to buy what they think is good value. There is nothing to stop any member of the public waiting for a set to be de-controlled and thus saving many pounds.

Funny

C. A. W., of Liverpool, says that a young fellow came into his shop recently and asked him for a tubercular condenser! Quite evidently he was referring to tubular condensers, and was confusing it with that peculiar valve disease known as *current consumption*, or else he was mistaking the perforations for a sign of disease. Another customer, he says, complaining of the performance of his set, said: "I can get the *Original* all right, but the *Natural* can only just be heard, although the *Illuminator* is all right." I presume that he was referring to the eliminator, Regional and National.

Defective Parts

IF you place a wireless set in the hands of a dealer and he charges you for replacements, insist upon having the defective parts returned as evidence of good faith. One or two readers have been charged for new valves, transformers, condensers and resistances when they have not been changed.

The Attack on Television

A CERTAIN Sunday newspaper does not like television. For two weeks running it has been attacking the B.B.C. on the matter. One individual in an interview with the newspaper is reported to have said "I think the B.B.C.'s expenditure on television from the listeners' licence money is a crime." This manufacturer ought to know that it is the Government's wish that the B.B.C. should improve the television programmes and encourage the new science, and it was more or less forced to do so against its will. Where the crime comes in I do not know, unless we consider the three years' delay as a crime. Television entertainment is on the same footing as radio telephony entertainment. The listener is expecting it, and the B.B.C. must carry out the listener's wishes. We pay 10s. a year to be entertained with our wireless sets, and unless television is radiated by the B.B.C. we shall be tied to "blind" broadcast matter for the rest of our days. Radio must eventually be a complete form of home entertainment, and if in so doing it becomes a competitor to the film trade that cannot be helped. You cannot stop progress. Television is inevitable, as I have said on so many occasions before. It has been hampered by the caprices of the Government, the radio trade, cranks, lack of money, inspired criticisms, ignorant criticisms, and the insouciant remarks of the flibbertigibbets who haunt newspaper offices earning their miserable pence for their equally miserable lines. I hope someone will extirpate these miserable crawling creatures who have a few items of knowledge and regurgitate them like ruminative quadrupeds which chew the cud in the field. There is too much hack journalism, too many people who imagine that it is clever to be able to write, too many people who regard anything and everything as items to display their "style." These writers regard the Coronation or the Cup Final or Television as themes to enhance their reputations as writers of "powerful" articles. I hope they will soon be banished from the ranks of respectable journalism.

Absurd Conductors

SOME conductors are in a somewhat similar class. It is not sufficient for them to act as human temponomes, and wag the baton; they must throw themselves into a frenzy, roll their eyes, prance about the platform, sling their arms about, distort their bodies after the lines of a Grecian dancer, contort their cracked faces, distend their nostrils, cut funny capers, and in every way conduct themselves as insane acrobats with their bands as foils. The band is the opportunity for them to show what creatures they are. What need is there for them to act as though they have the palsy? What purpose does it serve? Do they fondly think that their irritable waggling of their hands at the brasses is extracting the music from them? I am willing to bet that a temponome, stuck up in place of the conductor, would produce a more pleasing result.

Listening Barometer

THE B.B.C. announces that the Variety Listening Barometer places "Monday at Seven," the production broadcast at the same hour on the same day each week, among the half-dozen programmes with the biggest audiences. Staticians will be interested, I am sure, in the following details:

During the twelve-week period of the Barometer, "Monday at Seven"

was broadcast on the National wavelength on all but one Monday.

Among the two thousand log-keepers the average weekly audience for "Monday at Seven" was nearly 72 per cent., the lowest being 67 per cent. and the highest 78 per cent.

Analysis showed that an exceptionally small proportion of listeners who began to listen to the programme switched off before the end; and the audience grew steadily as the weeks passed.

The audience was greatest in the tenth week; it was lowest in the twelfth week when the production took place on Boxing Day. Except for "Inspector Hornleigh," all the performers on that occasion were children.

The report shows that "Monday at Seven" draws its audience from men and women in all Regions, and its appeal appears to be equally great to both. In the early weeks listeners in the youngest age group (sixteen to twenty) did not listen to the show in such numbers as older listeners did. Only in the tenth week did the proportion of "under twenties" reach that of the other age groups.

In spite of all this, I understand that this feature will shortly be cut out of the Monday programmes!

Scouts' Wirelessman's Badge

I UNDERSTAND that it is the intention of the Boy Scouts' Association to remodel the conditions for the Wirelessman's Proficiency Badge for Boy Scouts.

The new conditions are as follow:

(1) Have an elementary knowledge of how a thermionic valve works as:
(a) H.F. Amplifier
(b) Detector,
(c) L.C. Amplifier
in a wireless set, and also how a "Westector" works.

(2) Know the function of condenser, resistance, inductance, reaction and mains rectifier, transformer.

(3) Know how to cure hum; or How to build a cheap mains eliminator.

(4) Know how to locate and cure a simple fault in a wireless set.

(5) Show a working knowledge of moving-coil loudspeakers, both permanent magnet and mains energised types.

(6) Draw a simple diagram showing the way to connect up a stage of "resistance coupled" L.F. amplification and another to illustrate the connections of an "L.F. Transformer," and show a knowledge of the principles involved.

(7) Read a technical diagram, and interpret all the symbols ordinarily employed.

(8) Have assembled a simple wireless receiver which works satisfactorily, and know all the distress signals.

(9) Know the methods of charging and looking after accumulators.

I am sure readers of this paper will be interested in the standard which is being set by the Association for this particular badge.

Notes from the Test Bench

Lubrication

A NUMBER of readers still seem to be under the impression that radio components with moving members may be oiled to provide smooth action. Several receivers which have been received for servicing have been found to have the condensers flooded with thin oil, and it must again be emphasised that oil is an insulator, in addition to being a lubricant, and therefore where electrical connection is made to a moving metallic part which relies for continuity on friction, oil must not be used. The contact surfaces should be clean, and if for any reason some form of lubrication is found necessary colloidal graphite or similar material should be employed, but even so a minimum of the material should be applied to avoid setting up a high-resistance contact. If valve legs or similar parts are rubbed with emery cloth to clean the surface, great care should also be taken to remove every particle of metallic dust, using a soft brush for the purpose.

AC-D.C. Sets

SEVERAL cases have been brought to our attention where listeners have received shocks from handling Universal mains sets. It must be remembered that on an A.C. supply the usual type of Universal receiver will have one side of the mains in direct contact with the chassis, and by reversing the mains plug the chassis may be made either "live" or "dead." On D.C. mains, however, it may in some cases be found impossible to use the receiver without the chassis being "live" and it should therefore be handled with care. The best plan is to use a large rubber mat, or even several thicknesses of cardboard upon which to stand whilst the set is being handled.

Iron Losses

IT may be again pointed out that iron should be excluded from a normal constructional job. A case where an iron chassis was used recently came to our attention, the set having been reconstructed on this and failing to give its original performance. When rebuilt on aluminium, everything was in order. Even the undue inclusion of many iron screws or bolts to affix certain components can give rise to various peculiar effects in some types of circuits.

Famous Film Star's Appearance

I AM informed that on Sunday evening, May 1st, the last concert of the season in aid of the Centenary Rebuilding Fund of the School for the Blind, Swiss Cottage, is being held, when a host of celebrities have promised to appear. Among them is Mr. Leslie Howard, the world-famous film star, who is now making a film of Bernard Shaw's "Pygmalion" in London.

Among the celebrities who are compering the programme are Melbourne Inman, Tom Webster, and Sutherland Felce. Three bands will make an appearance during the evening: Bert Firman's famous orchestra from the London Casino, George Elrick and his Music Makers, and Troise and his Mandoliers, the famous radio broadcasting band. Artistes who have also promised to appear are Miss Gladys Cooper, Sir John Martin Harvey, Carlos Ames, Thorpe Bates, Ernest Butcher, Constance Carrodus, Gus Chevalier, Richard Coke, Peter Cotes, Laelia Finneberg, Richard Goolden ("Mr. Penny"), Mona Grey, Tommy Handley, Samuel Kutcher, Lupino Lane, Ethel Levey, Norman Long, Vera Lynn, Dinah Miller, Chief Os-ke-non-ton, George Parker, Michael Redgrave, John Rorke, Madame Clara Serana, Rudy Starita, Frank Titterton, Albert Whelan, The Choir of the School for the Blind, conducted by Sinclair Logan, Robin Richmond with his Hammond Organ, and Bert Brownbill. The eight-year-old film star, Rae Collet, will make an appeal on behalf of the Fund during the interval.

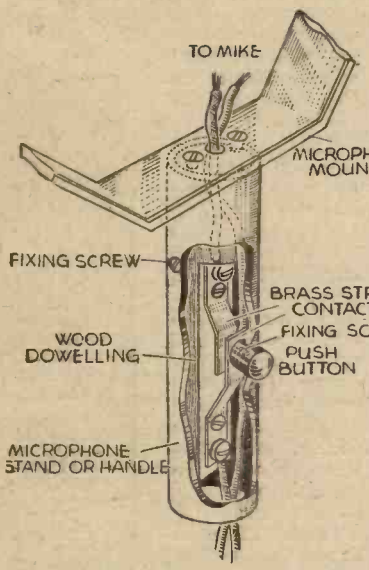
Prices of admission range from 2s. to 10s. 6d., and all seats, which are reserved, may be booked at the Palladium Box Office on any day.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS' WRINKLES — THE HALF-GUINEA PAGE

A Microphone Switch

THE accompanying sketch shows a useful safety switch which may be fitted to any home-made microphone stand; as shown, it was fitted to a hand microphone, the handle of which was a

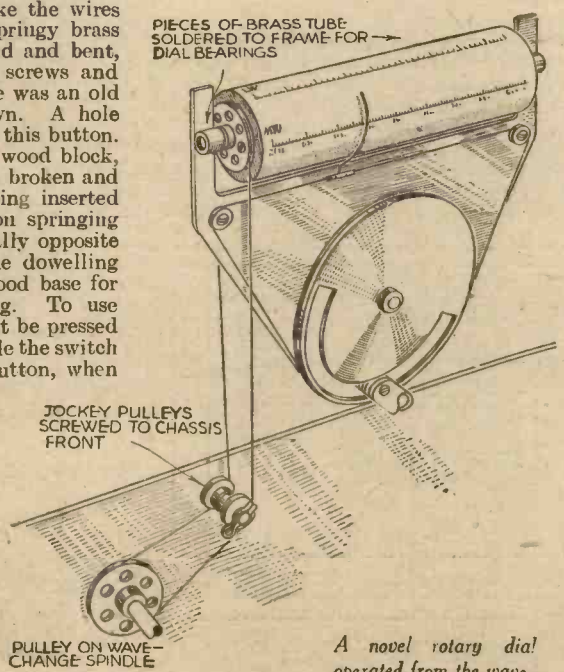


A safety-switch for a home-made microphone stand.

piece of 1in. tubing. The main item is a piece of dowelling which should be a tight fit in the tubing. This dowel is cut down its diameter for about two-thirds of the total length and drilled to take the wires from the microphone. Two springy brass strips ¼in. wide are cut, drilled and bent, as shown, to take the fixing screws and push button, which in this case was an old spade terminal cover cut down. A hole is drilled in the tubing to take this button. The switch is mounted on the wood block, and one lead to the "mike" is broken and connected to it, the whole being inserted in the tubing, the push button springing into the hole. Two diametrically opposite screws may be used to fix the dowelling firmly in place to provide a good base for the microphone mounting ring. To use the microphone the switch must be pressed whilst speaking. If more suitable the switch can be arranged so that the button, when pressed, disconnects the instrument instead of completing the circuit. — J. HADDON (Glasgow).

An Improved Tuning Dial

WITH the growing popularity of four-wave-band sets the dial tends to become more and more crowded and more confusing to the non-technical members of the household. In the modified dial shown in the sketch it will be seen that the dial rotates in unison with the wave-change switch, and as only the appropriate range is shown, confusion is impossible. The materials required are: two V-pulleys, from a boy's constructional set (the size is not important, but both must be of the same diameter); a piece of rod for the spindle, and a short piece of brass tubing for bearings. Two wooden discs 2in. dia. are cut out with a washer cutter or fretsaw, and cleaned up with a file and sandpaper. One of the pulleys is screwed concentrically to one disc, and the two can then be placed on the spindle and the two pieces of brass tubing soldered to the dial frame in the correct position. A piece of stout white paper is then glued round the discs and the scale marked neatly on it with Indian ink, and afterwards covered with a piece of Cellophane to protect it. Note that the pointer must be bent to fit round, and close to, the scale. The actuating cord is best made from stout fishing line, and the jockey pulleys from two more pieces of the brass tube, screwed to the chassis front with a washer between, allowing sufficient play for them to rotate freely.—D. BESSANT (Morden, Surrey).



A novel rotary dial operated from the wave-change spindle.

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.

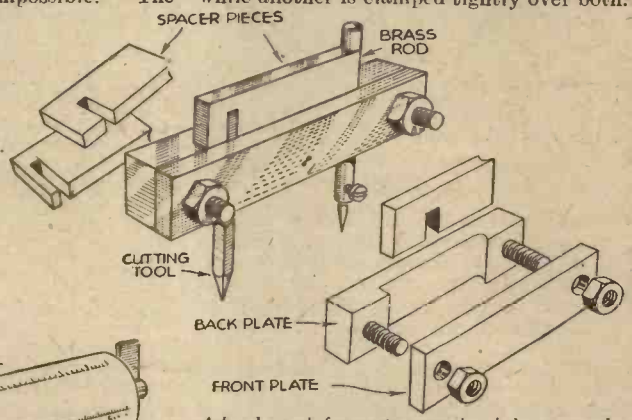
SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

A Handy Circular Cutting Tool

SOME pieces of flat brass, two bolts with nuts, and a piece of round rod are used to make this handy tool.

One piece of square brass is shaped, as shown, to take the cutting tool and pivot, while another is clamped tightly over both.



A handy tool for cutting circular holes in speaker baffles or chassis.

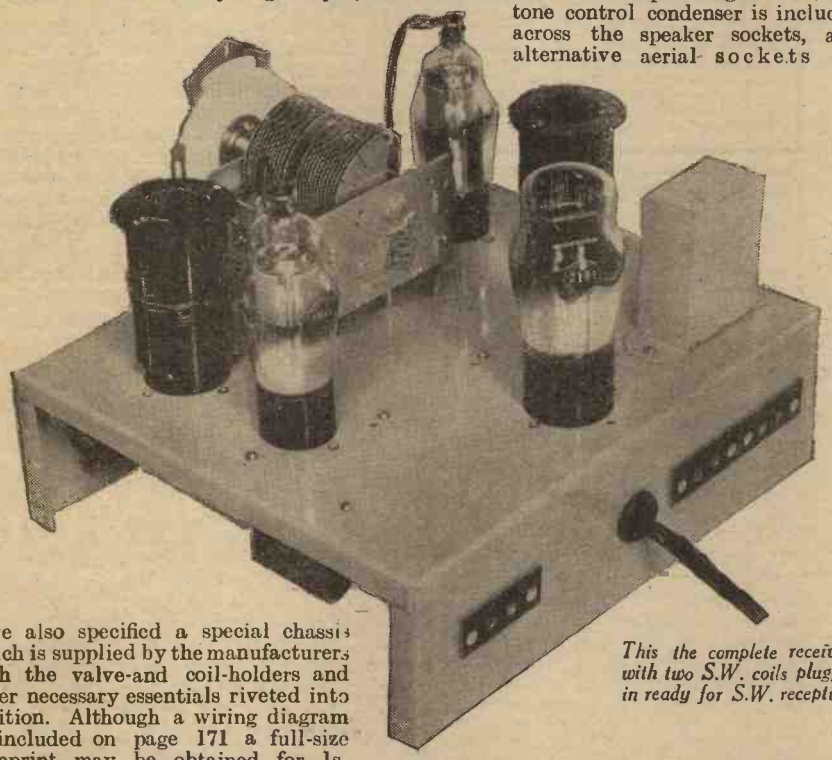
The spacer pieces are cut to fit in the slot left between the cutter and central point. Several of these spacers can be made of different sizes for varying diameter of cut.

The tool is extremely useful for speaker baffles, and also for the holes in chassis for valveholders.—G. WALTON (Middlesbrough).

THE "HURRICANE"

An Economical Simple-to-build Three-v Standard 6-pin Plug-in

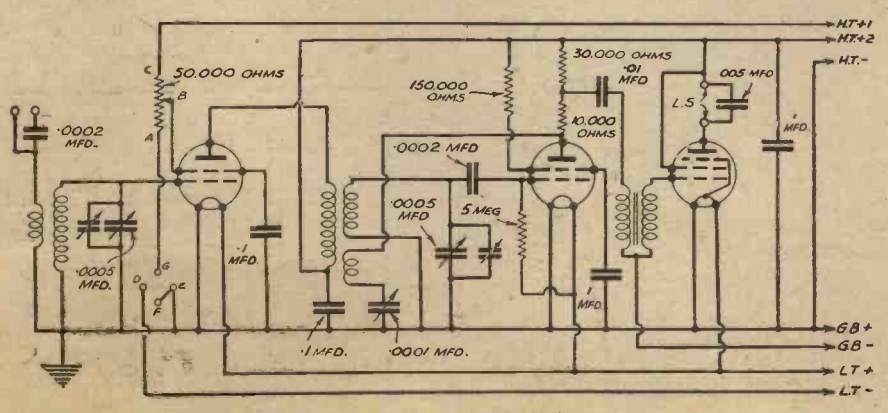
WE have received many requests for a low-priced all-waver which could be relied upon to give good results on all wavelengths, and it is obvious that a simple and cheap receiver could not be built around any standard all-wave tuning unit. Accordingly, the "Hurricane" has been designed round the standard type of 6-pin plug-in coil, and as will be seen from the accompanying theoretical diagram and illustrations, two of these coils are employed in this particular set. Furthermore, in response to the demand for a low-priced receiver, we have utilised special American-type valves and other components which are supplied by the firms specified in the list of components. To simplify the constructional work and thus bring this receiver within the reach of the youngest tyro, we have also specified a special chassis which is supplied by the manufacturers with the valve-and coil-holders and other necessary essentials riveted into position. Although a wiring diagram is included on page 171 a full-size blueprint may be obtained for 1s. for those who prefer to work from a full-size diagram, and the parts for the receiver may be obtained as a complete kit, or as separate units from the firms whose advertisements will be found in this issue.



This the complete receiver, with two S.W. coils plugged in ready for S.W. reception.

The Circuit

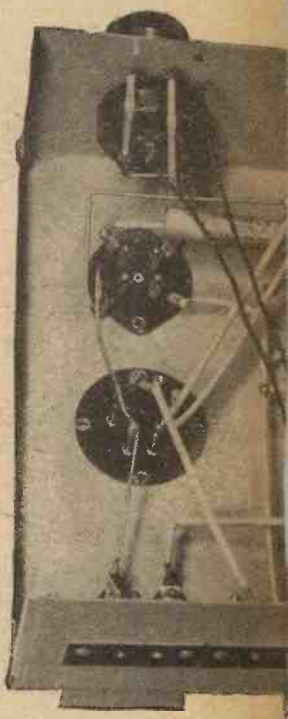
The circuit is of the H.F., Detector and Output type, but two S.G. valves are employed for the initial stages and a pentode in the output stage, thus ensuring a very high output in each stage. Both the aerial circuit and the detector grid circuit are fully tuned, and therefore a two-gang condenser is employed. H.F. transformer coupling is employed in the first stage, and a parallel-fed transformer is used between the detector and output stages. A fixed tone control condenser is included across the speaker sockets, and alternative aerial sockets are provided so that a fixed condenser may be included in series with the aerial if desired. The coils specified are of the 6-pin type with a locating plug affixed so that they may be easily inserted in the holders and wrong connections cannot be made. In this respect the coils resemble the octal valve bases which have been illustrated before in these pages. By obtaining a set of these coils (they are available in sets of 10) it is possible to tune over the entire waveband from 9.5 metres to 2,000 metres.



Theoretical circuit of the "Hurricane" receiver.

Construction

As already mentioned the chassis is supplied with the various holes drilled, and the valve-holders, coil-holders and socket strips riveted into position. All that remains to be done, therefore, is to bolt the transformer, condenser and tuning condenser in position, and place the two condensers and volume control on the front part of the chassis.



The dial should then be attached by means of two bolts and the small L.F. coupling condenser should also be fitted in position near the valve-holder for V2. The various resistors and fixed condensers (with two exceptions) are held in position in the wiring, and thus these should be wired into position as the circuit is completed. The two fixed condensers across the aerial and loudspeaker sockets may be placed in position when the wiring to these sockets is being carried out. It is desirable, as the receiver is employed for short-wave reception, to use a heavy-gauge wire for connection, and to utilise a single length of heavy-gauge bare wire for the earth return lead. The position of this may be seen from the wiring diagram on these pages, and various connections may be made direct to this, using insulated sleeving over the majority of the wires to avoid any risk of damage due to short-circuits which might develop after a period of time. The flexible

LIST OF COMPONENTS FOR THE

One pressed-steel chassis with valve-holders and coil-holders riveted in position (Peto-Scott) (5s. 6d.).

One "Hurricane" 2-gang condenser and distance pieces (New Times Sales) (5s.).

One L.F. "Super" transformer (Peto-Scott) (4s. 6d.).

One 50,000-ohm potentiometer with 3-pt. switch (Erie) (5ss).

Four ½-watt resistors: 10,000 ohms, 30,000 ohms, 150,000 ohms, 5 megohms (Dubilier) (2s.).

Six tubular condensers: two .0002 mfd., type 451; one .005 mfd., type 451; three .1 mfd., type 341 (T.C.C.) (7s.).

One .01, type 34, fixed condenser (T.C.C.) (3s.).

One special 1 mfd. condenser (Peto-Scott) (1s. 6d.).

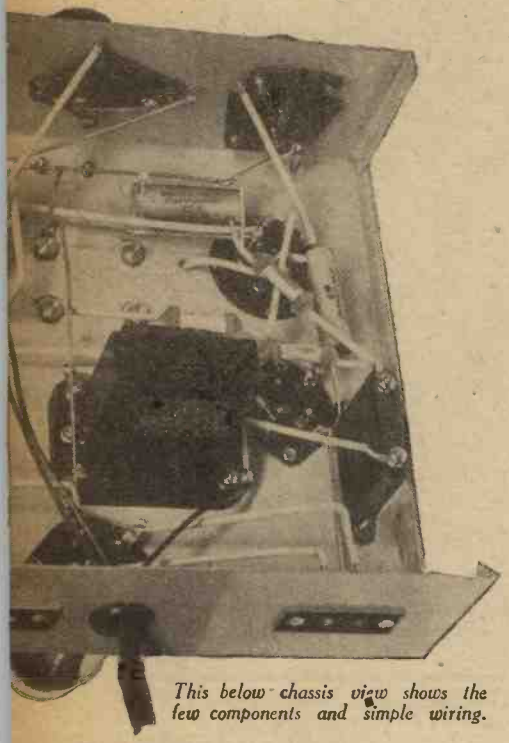
"ALL-WAVE THREE

valve Set for Use on All Wavelengths. Coils are Employed

battery leads are attached to the transformer, common earth wire and the combined volume control and switch, and care should be taken to connect the correct leads to these points. It is preferable to cut off pieces of flex to the desired length, and as each lead is placed into position an appropriate wander plug should be attached to the other end.

Testing Out

Particular care should be paid to the connections to the grid leak and condenser



This below-chassis view shows the few components and simple wiring.

for the detector stage, the leak being attached to a lead running from the L.T. positive socket on the valveholder V2, and the condenser being attached to the fixed vane connection on the gang condenser. The other ends of both of these components are then joined and connected to a short flexible lead for subsequent connection to the grid of V2. In this connection it should be remembered that these are American valves, and thus the top caps are grid connections — not anodes, as in the majority of British valves.

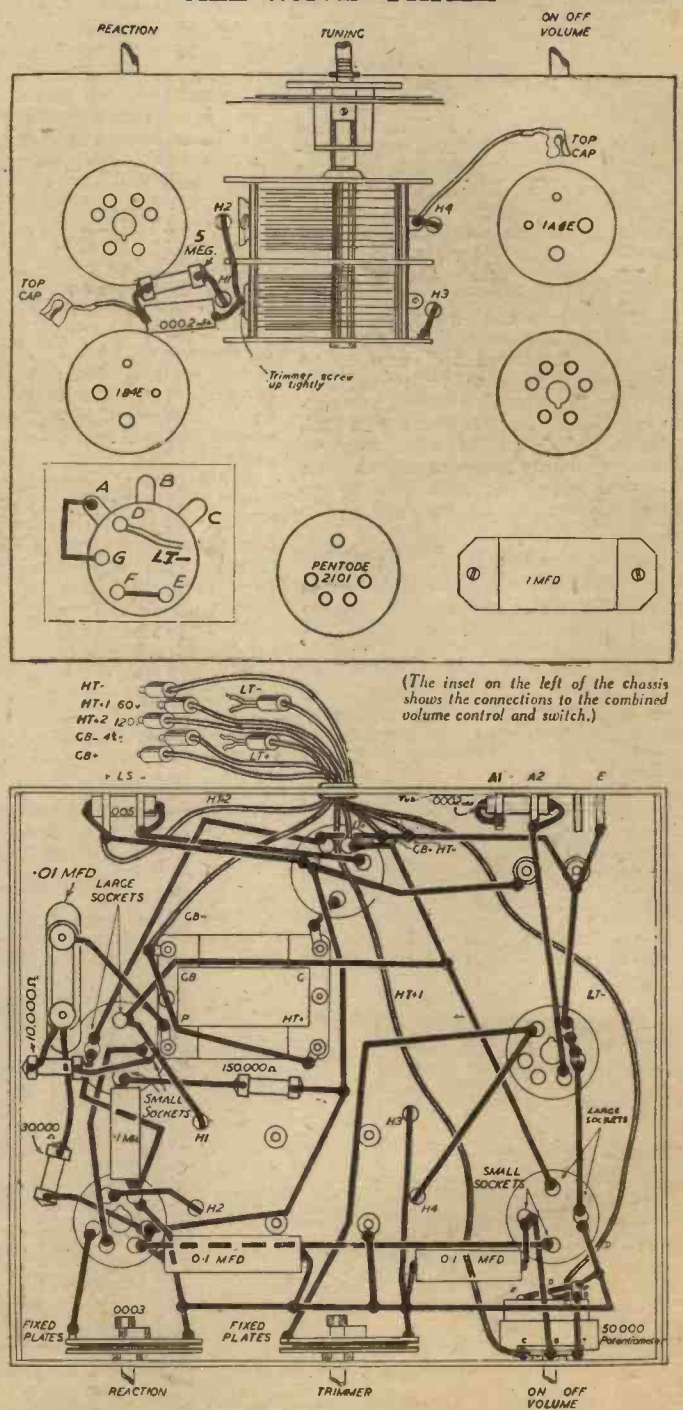
Plug in the battery leads, connecting the positive and negative L.T. leads to the accumulator, the G.B. positive to the positive side of the G.B. battery and the negative H.T. plug to the negative side of the H.T. battery. G.B.— should be inserted into the 4.5-volt socket for the time being, but this may be reduced to 3 volts or increased to 6 volts at a later period. H.T.1 should be inserted into the 72-volt socket temporarily and H.T.2 into the 120-volt socket, when the receiver is ready for test. Connect aerial and earth, and loudspeaker, and plug in a pair of coils—preferably for the medium waves for preliminary tests. If the receiver is found to function satisfactorily the short-wave coils may be used, and if it is not desired to use this receiver for medium waves a coil such as 9/S.2—15 to 43 metres—should be used for the first tests. It will naturally be found that tuning is critical, in spite of the slow-motion condenser drive, but after a little experience it will be found quite a simple matter to use the set. The central knob in the lower row is a trimmer connected across the main condenser and should be used to complete tuning after a station has been located. During the process of tuning this should be operated in addition to the main tuning control and reaction control, and it will be found quite a simple matter to balance the three controls to get the correct tuning point. Sensitivity is controlled by the lower left-hand control which varies the voltage on the screen of the first valve, and no difficulty should be experienced in obtaining most satisfactory results with this simple set.

It should be housed in the metal cabinet specified and the special metal panel supplied with this cabinet should be used.

"HURRICANE" ALL-WAVE THREE.

One "Hurricane" slow-motion dial (New Times Sales) (2s.).
One .0001-mfd. reaction condenser (B.T.S.) (2s. 6d.).
One .0003-mfd. reaction condenser (B.T.S.) (2s. 6d.).
One set of three "Hurricane" American-type valves (N.T.S.) (5s. 6d.).
One set of "Hurricane" 6-pin one-shot inductors (B.T.S.).
Connecting wire, battery leads, plugs, etc. (Peto-Scott) (2s. 6d.).
One "Hurricane" metal cabinet (12s. 6d.) and metal panel (2s. 6d.) (Peto-Scott).
One Junior 38J loudspeaker (W.B.).
One pair of 4,000-ohm headphones (Ericcson).
One 2-volt accumulator.
One 120-volt H.T. battery.

WIRING DIAGRAM OF THE "HURRICANE" ALL-WAVE THREE



(The inset on the left of the chassis shows the connections to the combined volume control and switch.)

An All-wave Tuner

Constructional Details of an All-purpose Unit Tuning from 5 to 2,000 metres, Which Forms the Basis of a Powerful Modern Superhet Receiver

By W. J. DELANEY

THE heart of any receiver is the tuning circuit, and in a modern receiver two or more circuits are generally used and tuned by means of a gang condenser. In order that the tuning may cover wavebands which offer entertainment, it is now customary to use what is known as an "all-wave" tuner, which generally consists of a standard medium and long-wave circuit plus one or more short-wave ranges, but the majority of such receivers and units now available do not, unfortunately, enable the television signals to be picked up—the minimum wavelength generally being about 10 or 12 metres. By suitable design it is possible, however, to make a receiver which will include the television signals, and if the minimum waveband can be reduced to 5 metres, it will enable many interesting amateur transmissions to be picked up, and some remarkable results may be expected on that waveband under normal conditions.

The tuner illustrated and now to be described covers such a low wavelength and actually includes five separate wave-ranges—nominally from 5 to 10, 12 to 33, 30 to 85, 200 to 550 and 900 to 2,000 metres. The actual minimum range on each section may vary in individual cases due to the effects of stray capacities introduced by the wiring, etc.

Constructional Details

The superhet circuit is to be preferred as a general rule for long-range short-wave results, and the fact that the signal frequency is changed enables a more simple layout to be employed without the risk of instability. To avoid image interference, however, a signal H.F. stage is highly desirable, and the tuner to be described is based on the assumption that such a circuit would be used. This means that there will be three tuned circuits—the aerial circuit, the frequency-changer grid-circuit, and the oscillator circuit, and accordingly three five-range tuners are needed. Two of these should be of the aerial type and one of the oscillator type, and they are mounted on a small metal chassis on the top of which the three-gang condenser is mounted. This condenser is of the "straight" type, as there are all the necessary trimming and padding condensers mounted on the coil units which also contain the necessary multi-contact switches. In the experimental model which we have built up we used very heavy-gauge aluminium, and if this cannot be obtained with sufficient thickness to form a rigid assembly it is recommended that a sheet steel chassis be employed. It should be bent to the dimensions shown, and drilled very carefully from the details given in Fig. 4. The gang condenser which is specified has small mounting feet, and to facilitate mounting this condenser should be supported clear of the chassis by small distance pieces. Those employed in the model illustrated were removed from an old pattern gang condenser, and have the advantage that each end carries a tapped hole which enables the pieces to be mounted on the chassis.

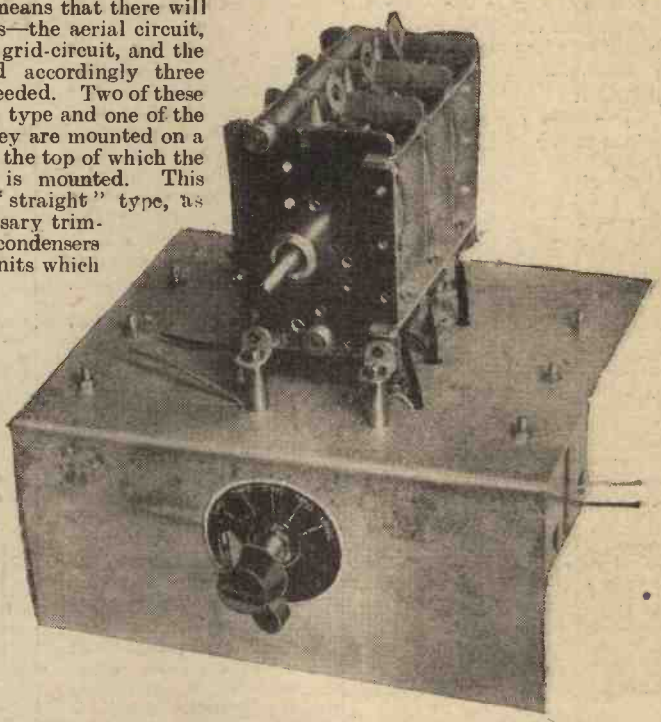


Fig. 1.—The complete tuner ready for insertion in a receiver.

(Continued on page 174)

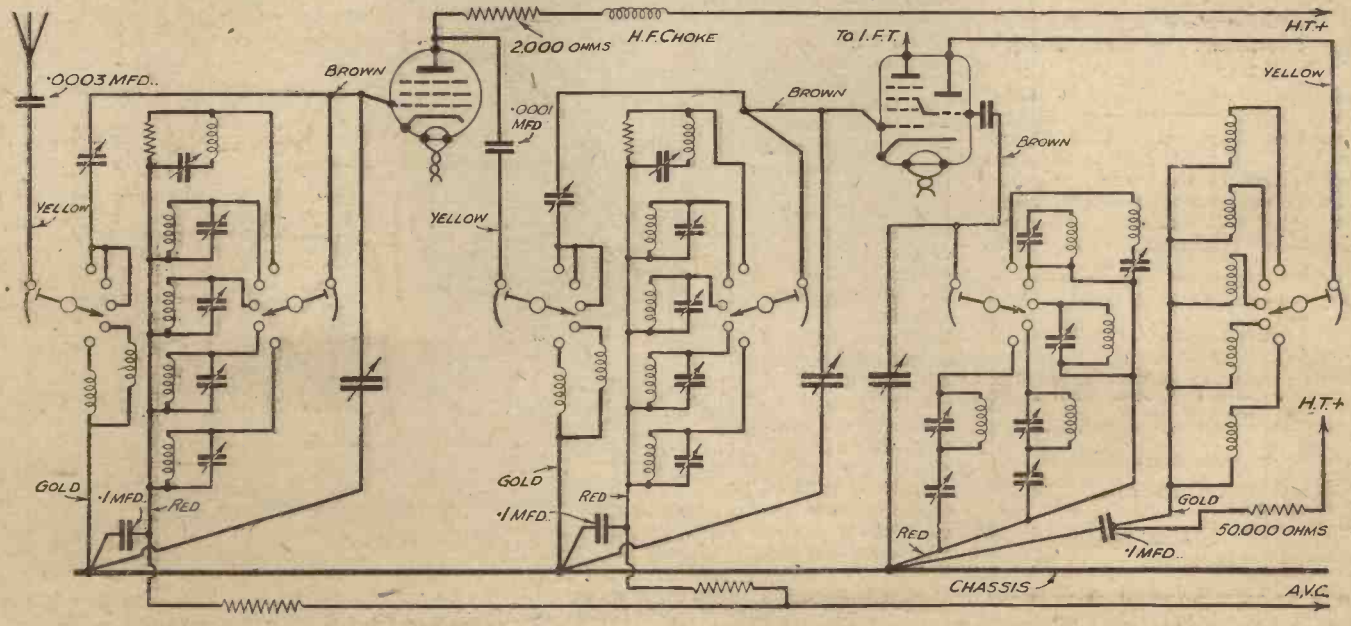


Fig. 2.—Theoretical diagram of the tuner. Note that various earth connections are made to single points to keep the circuits separate.

HURRICANE ALL-WAVE 3 PILOT AUTHOR KITS

LOWEST PRICES—EASIEST TERMS—EXACT TO SPECIFICATION

IMMEDIATE DELIVERY—CASH—C.O.D. or H.P.

KIT "A" CASH or C.O.D. 42/- or 2/6 DOWN

Balance in 12 monthly payments of 4/-

★ List of FIRST SPECIFIED PARTS

Any item supplied separately. Orders over 10/- sent Post Charges Paid.

	s.	d.
1 Peto-Scott pressed steel chassis, with valve and coil-holders, etc., riveted in position	5	6
1 N.T.S. Hurricane 2-gang condenser and distance pieces	5	0
1 Peto-Scott L.F. super transformer	4	6
1 Erie 50,000 ohms potentiometer with 3-pt. switch	5	0
4 Erie ½-watt resistors, 10,000, 30,000, 150,000 ohms, 5 megohm	2	0
6 T.C.C. tubular condensers, (2) .0002, .005, (3) .1 mfd.	7	0
1 T.C.C. .01 mfd. type 34 condenser	3	0
1 Peto-Scott special 1 mfd. condenser	1	6
1 N.T.S. Hurricane slow-motion dial	2	0
1 B.T.S. .0001 mfd. reaction condenser	2	6
1 B.T.S. .0003 mfd. reaction condenser	2	6
1 Set of plugs, connecting wire, flex for battery leads, etc.	2	6
KIT "A" CASH OR C.O.D.	£2	2	0

SPECIFIED VALVES
1 Set of Valves as specified .. 5/6

SPECIFIED LOUDSPEAKER
1 W.B. Junior 38J Type Speaker .. £1 : 12 : 6
or 2/6 down and 11 monthly payments of 3/-.

SPECIFIED HEADPHONES
1 pair Ericcsons Headphones (4,000 ohms) .. 15/-
Peto-Scott lightweight headphones .. 7/6

SPECIFIED FOR THE HURRICANE B.T.S. ONE SHOT INDUCTORS

For use with above set

	s.	d.
Type 9/M.W. (178 to 580 metres) per pair	5	6
Type 9/L.W. (900 to 2,000 metres) ,, ,,	6	6
Type 9/S.2 (15 to 43 metres) ,, ,,	5	0
Type 9/S.3. (24 to 70 metres) ,, ,,	5	0
Type 9/S.1. (9.5 to 27 metres) ,, ,,	5	0

SPECIFIED FOR THE HURRICANE 3 Peto-Scott STEEL CABINET

With hinged lid, black crackle finish, rigidly constructed and an excellent housing for the Hurricane. Panel drilled for Hurricane controls, 2/6 extra. Cabinet and Panel, 15/-. Post and C.O.D. charges Paid.

12/6

COMPRISING all first specified components for receiver as detailed on left. Less valves, coils, cabinet, phones and speaker.

KIT "A6" Comprising all parts to specification as in Kit "A," but with 3 pairs specified One-Shot Inductors, 15-43, 190-550 and 900-2,000 metres. Less speaker, cabinet, 'phones and valves. *Cash or C.O.D. Carriage Paid 59/- or 5/- down and 12 monthly payments of 5/9.* **5/- DOWN**

KIT "A10" Comprising all parts exact to specification as in Kit "A," but with 5 pairs specified B.T.S. One-Shot Inductors for 3 Short-wave, Medium and Long wavebands. Less valves, speaker, 'phones and cabinet. *Cash or C.O.D. Carriage Paid, 69/- or 6/- Deposit, and 12 monthly payments of 6/3.* **6/- DOWN**

KIT "C" Comprising all parts as Kit "A," but with 5 pairs B.T.S. One-Shot Inductors. Set of 3 specified Hurricane Valves and specified Peto-Scott Hurricane Cabinet and drilled panel. *Cash or C.O.D. Carriage Paid, 89/6 or Deposit 7/6 and 12 monthly payments of 8/-.* **7/6 DOWN**

FINISHED INSTRUMENT

Assembled exactly to designer's circuit, with specified valves, 5 pairs B.T.S. One-Shot Inductors covering 9-2,000 metres, housed in Peto-Scott Hurricane Cabinet, rigidly tested before despatch, less speaker and 'phones. *Cash or C.O.D. Carriage Paid, £5 : 5 : 0, or yours for 9/3 and 12 monthly payments of 9/3 or if required less all coils, Cash or C.O.D. £3 : 19 : 6 or 7/- Deposit and 12 monthly payments of 7/-.* **9/3 DOWN**

SPECIALLY RECOMMENDED FOR THE HURRICANE ALL-WAVE THREE

SPECIAL PURCHASE of WHOLESALER'S STOCK HALF USUAL COST

A wonderful opportunity to purchase a shop-soiled only Rola, R & A or Magnavox Permanent Magnet Moving Coil speaker at 50% off list value. 8" Cone for Power or Pentode Output.

Our Special Price, *Cash or C.O.D.* 17/6 *or 2/6 Deposit and 7 monthly payments of 2/6* **2/6 DOWN**

1-valve ALL-WAVE KIT

Ideal for the All-Wave Beginner! Save 11/—buy a complete Kit.

2/6 DOWN

- A unique All-Wave single-valver combining simplicity of assembly with extraordinary efficiency and low cost.
- Waveranges 18-52, 200-550, 900-2,000 metres.
- Ready assembled tuning-unit incorporates all windings and switching and needs only six simple connections for incorporation. "KIT A" comprises complete kit of parts for building, including ready-drilled steel pane land chassis, drawings and instructions, less valves and cabinet.

List Value £2:0:10 OUR PRICE 29/6
Or 2/6 down, 11 monthly payments of 2/9.
KIT "B" with valve £1 : 13 : 6, or 3/- down and 11 monthly payments of 3/-.

1938 RADIO BARGAINS

Brand new 1938 All-wave Receivers, supplied in sealed manufacturers' cartons and guaranteed for 12 months. **Buy now while the opportunity lasts!**

DECCA 1938 Model 33:

3-valve All-wave Battery Receiver. Three tuned circuits covering 19-49, 200-550 and 1,000-2,000 metres. High flux density permanent-magnet moving-coil speaker. Station-named and degree-calibrated dial. Real walnut cabinet (illustrated), inlaid with ebony. Provision for pick-up and external speaker. *Less Batteries.*

List Price 7½ Gns. **OUR PRICE £5:19:6** **5/- DOWN**
or 5/- deposit and 18 monthly payments of 7/4.

DECCA 1938 Model 99:

6-valve All-wave A.C. Superhet. 12 to 2,000 metres. Seven tuned circuits. A.V.C. Beautiful hand-polished upright walnut cabinet. Decca commonsense tuning. . . No complicated trouble-causing mechanism. Bold station-named dial. Spread-tuning 4 separate, easy-to-read wave-bands. Oversize elliptical cone dynamic speaker. Provision for external speaker and gramophone pick-up.

List Price 7½ Gns. **OUR PRICE 8½ Gns. or 10/- down**
Balance in 18 monthly payments of 12/6.

CYCLO 2-VALVE CONVERTER PILOT AUTHOR KIT 'A'

Cash or C.O.D.

Comprising all parts as specified with Peto-Scott Metaplex chassis, J.B. condenser, connecting wire, screws, etc., less coils and valves. **35/-**

Deposit 3/- and 11 monthly payments of 3/6.

2 Specified Valves, 14/9 or add 1/5 to deposit and to each monthly payment.

B.T.S. Recommended *6-pin coils, 9-14, 12-26, 22-47, 41-94, 76-170 metres, 3/3 each: 150-325, 265-510 metres 4/- each. Order type "S."*

ECONOMY ONE-VALVER PILOT KIT 'A'

Cash or C.O.D.

Complete Kit to designer's circuit with B.T.S. Special S/Wave Condenser, H.F. Choke, wire, flex, screws, etc., less coils and valve. **21/-**

Deposit 2/6 and 9 monthly payments of 2/6.
Specified valve 3/9 extra, or 2/6 down and 10 monthly payments of 2/7.

B.T.S. Coils. *Recommended types as for Cyclo 2-valver.*

S.G.3 All-Wave BATTERY CHASSIS

Assembled, Tested **WITH ALL VALVES**

BARGAIN 79/6

5/- DOWN

CASH OR C.O.D. CARRIAGE PAID, OR Dep. 5/- and 11 monthly payments of 7/6.

4 WAVEBANDS: 14-31, 28-62, 200-550, 900-1,200 metres. Slow-motion drive 8-1 and 100-1; Low-capacity switch; Airplane dial (stations and wavelengths); 12 months' guarantee.
BRIEF SPECIFICATION: Provides reception from all parts of the world. Variable Selectivity. Stove enamelled steel chassis. Screened coils. Low H.T. Consumption. Each chassis supplied complete with Screen Grid, Detector and Pentode output valves. Fully tested on all wave-bands before despatch.

Send coupon for immediate attention, also for latest lists of Receivers, Chassis, Amplifiers, Microphones, Kits, Speakers, etc. Everything Radio at from manufacturer to consumer prices.

B.T.S TROPHY RECEIVERS

More Records are being Broken with these Wonderful Short Wave Receivers

IMMEDIATE DELIVERY

BATTERY MODEL (Less Batteries)	A.C. MODEL 200/250 v. 40/100 cycles.
£5:15:0	£6:6:0
Or 9/6 deposit and 13 monthly payments of 9/11.	*Or 10/- deposit and 13 monthly payments of 10/9.*

PETO-SCOTT CO., LTD., *Clissold 9875-6-7*
77 (Pr.W.35) City Road, London, E.C.1. *Holborn 3248.*
62 (Pr.W.35) High Holborn, London, W.C.1.

Please send me.....
..... Cash/C.O.D. or H.P.
for which I enclose £.....
Name .....
Address .....
.....

PETO-SCOTT CO. LTD 77 City Road, London, E.C.1 *Clissold 9875-6-7*
62 High Holborn, London, W.C.1 *Holborn 3248*

Order of Assembly

It will also be noted that the front of the chassis is slotted and this is to enable the complete coil assembly to be placed into position without distorting the switch assembly, and the exact dimensions given must be strictly adhered to—otherwise it will be found difficult, if not impossible, to place the coils into position. Before assembling the coils some extra leads have

LIST OF COMPONENTS

			s.	d.
2	5-range Aerial Coil Units, Type C.64.	Bulgin ..	21	0
1	5-range Oscillator Coil Unit, Type C. 66.	Bulgin ..	30	0
3-Gang Bar-Type Condenser, .0005 mfd. each section		Polar ..	17	6
1	Micro-Horizontal Drive with degree markings.	Polar ..	9	6
3	.1 Mfd. Tubular Condensers, Type 250.	T.C.C. ..	4	0
1	Sheet 16-gauge Aluminium 9½ins. by 7½ins.			

to be attached to them. These extra leads should be of flex and preferably of a different colour from those fitted by the makers to avoid confusion. The extra leads are soldered to the points on the coils to which the red lead is attached on the two aerial units and to the point where the gold lead is attached on the oscillator unit. The three coil units should now be placed down on the bench or table and the switch rod pushed through carefully, making certain first of all that all switches are turned to the maximum position in either a clockwise or an anti-clockwise direction. Push the coils right up the rod until the first coil unit is close against the switch locating plate, and it will then be found that the 9-inch rod recommended will just enable the three switches to be operated successfully. Remove the locking nuts from the top of the three coil units and take off the lock-nut and indicating plate from the locator unit. Now attach the three condenser distance pieces by bolting them from the underside of the chassis, and in this connection it is preferable to use shake-proof washers at this point as it will afterwards be impossible to obtain access to the screws without dismantling the entire unit. When properly attached the three coils should be placed at the edge of the bench and the chassis placed over them and carefully pushed along so that the one-hole fixing bush protrudes through the slot in the front. Now push up the various coloured leads through the holes indicated in the wiring plan, and then as the chassis is gradually pushed into position the leads should be gently pulled to ensure that they do not get caught round the holding-down bolts or otherwise get entangled. Then, with the utmost care to avoid distorting the separate units the chassis and coils should be moved about until the small bolts project through the appropriate holes. This will be found a slightly tedious job as the bolts are eyelcted to the coil chassis and thus will not all be in the exact position required. Accordingly, as soon as one or two are located a thin, long screwdriver should carefully be inserted under the chassis and the various bolts pushed into position whilst the chassis is pressed down. In this way it will be found that they will all come through just enough to enable the locking nuts to be placed over. Lock up the nuts carefully, first taking the end ones and afterwards those in the centre, so that the

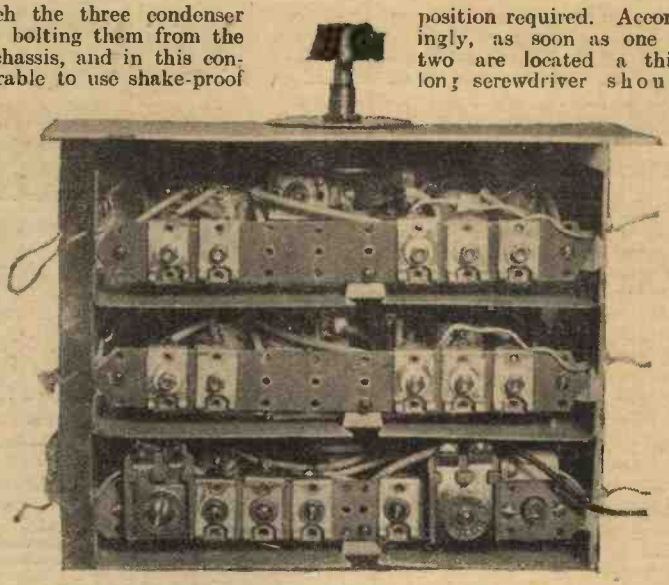


Fig. 3.—The underside view of the complete tuner.

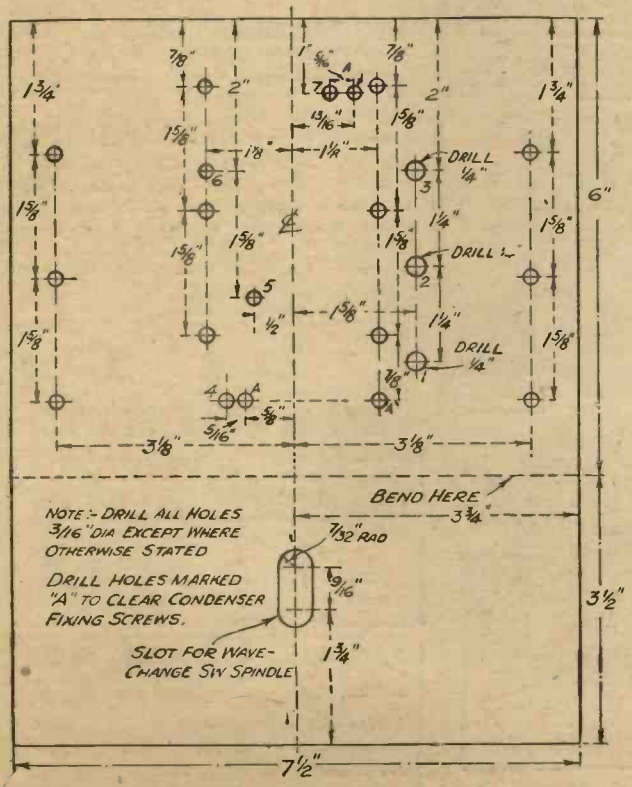


Fig. 4.—Drilling dimensions for the chassis.

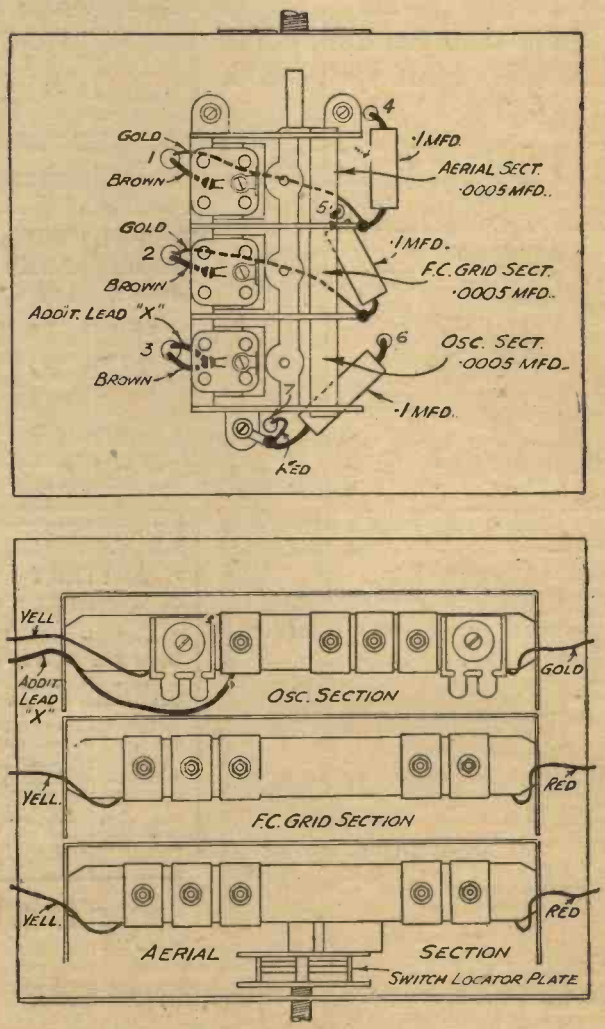


Fig. 5.—Details of the wiring above and below chassis.

coils are pulled up into position without distortion. Although it may sound a long job and rather complicated it will be found that the work is quite simple when a little care is employed, but the unit cannot be pushed together in a few minutes, and in view of the expense of the coils it is worth while taking care of them.

Wiring

Pull up the projecting leads very carefully, and slip short lengths of insulated sleeving over those leads which are joined to the fixed vanes of the tuning condenser. Cut off the ends of the leads so that just sufficient is left for connecting. Before mounting the condenser thread a length of insulated sleeving down the rear hole and through this pass a length of tinned copper wire. This lead should be soldered to the fixed vane connection on the rear section and the other end is connected to the frequency-changer oscillator grid via a fixed condenser (.0002 mfd.). Solder the leads to the points indicated in the wiring diagram. To the three extra leads which you attached and which project on the left of the chassis, .1 mfd. fixed condensers must be attached as shown, and are joined to the earth points and moving condenser vanes as indicated. The leads attached by the makers are then used for connection to the resistors which form the A.V.C. line, and it will be found that the inclusion of the condensers in the points indicated will assist in obtaining a stable layout. The remaining leads are attached to the H.F. and frequency-changing valves as shown in the wiring diagram, and the remainder of the receiver may follow any desired idea—incorporating either one or two I.F. stages, with or without beat-frequency oscillators or other refinements.

The tuner chassis should, of course, be attached to the centre of the receiver chassis, which is cut away for the purpose in the manner described in my article in the issue dated April 16th last. Rubber supports should be employed between the two chassis to avoid tuning shift and other difficulties which might arise from vibration.

TRADE NOTES

Peto-Scott Communications Set

MESSRS. PETO-SCOTT have introduced a receiver of the type known as a communications set. It is an all-wave superhet for A.C. mains operation, with a signal H.F. stage. The rated output is 3 watts and the price is 11½ guineas. Four bands are covered—10 to 25, 22 to 65, 200 to 550, and 800 to 2,000 metres, and the tuning scale is calibrated in metres for each band. The cabinet is of the all-metal black-crystalline finish type and provision is made for headphone and dipole aerial connections.

Twin Feeder Cable

A NEW type of feeder cable is now available from Dr. C. G. Lemon, of 72A, North End Road, W.14. This is of the type having two wires embedded in an insulating material, the actual substance being chlorinated vinyl. This material is impervious to damp or other climatic conditions and the cable is available in two types, one having the wires laid side by side, and the other having them separated by about ½in. The prices are 12 yards for 5s. 6d. and 12 yards for 6s., according to the type. A booklet on aerial design may also be obtained from the same source for 4d., post free. This is a short treatise which was the basis of a lecture given by Dr. Lemon to the Radio Physical and Television Society recently.

New South Wales Police Radio

THE development and application of radio communication for increasing the efficiency of the modern police organisation is receiving the attention of police authorities throughout the world, and information received from overseas indicates that police radio is no longer considered an experiment. The State of New South Wales now possesses a police radio communication system with a record of service to the public of which it can be justly proud.

The police radio transmitting centre is located at the Redfern Training Depot, this site being chosen with the following requirements in view :—

(a) Absence of high steel buildings in the immediate vicinity of the depot, which would reduce the transmitting efficiency by absorption.

(b) Facilities and ground space for the erection of an efficient aerial and earth system.

(c) Adequate power facilities as supplied by the Electricity Supply Department.

The main transmitter is entirely A.C. operated, even to microphone current supply, and is of the multi-stage type consisting of two units which include power and bias supplies utilising mercury vapour rectifiers, quartz crystal oscillator, power amplifiers and linear amplifier. The stability of the oscillator is such that the frequency is held constant within .03 % of the assigned frequency. The equipment is placed into operation by push-button control which operates a bank of relays in correct sequence and is complete with an adequate supervisory metering system, protective gate switches and overload relays. Transmission by either radio telephony or continuous-wave telegraphy can be accomplished by operating a single multi-contact switch which instantaneously changes the circuit conditions. The power transfer from transmitter to aerial is made by means of a 600-ohm line extending from the transmitting room to a tuning box on the Depot lawn. The radiating system consists of a quarter-wave aerial supported by two self-supporting steel towers 120ft. in height, built for a head pull of one ton and spaced 480ft. apart. An extensive earth system is buried under the Depot lawn.

In order to ensure that a 24-hour service can be maintained an emergency radio telephony transmitter has been installed and is complete with duplicate speech amplifier. This unit, which is of the multi-stage type, employs quartz crystal control and can be quickly switched over to the main aerial transmission line or an emergency aerial system. The power rating of the main transmitter is 200 watts unmodulated carrier for telephony and 700 watts for continuous wave telegraphy, and the emergency transmitter is rated at 100 watts unmodulated carrier for radio telephony.

The New South Wales Police Radio service is not alone as regards interference to radio reception from the large amount of electrical apparatus which is in daily use in city and suburban areas, and it has been necessary to select a wireless receiving site in a quiet residential location about 7 miles from the main police transmitting station. The receiving station is equipped with a number of superheterodyne receivers capable of operation on all wavelengths, and the signal from any receiver is fed through a switchboard to the main wireless station by means of direct land line.

Altogether 14 patrol cars and two launches are fitted with wireless equipment, the patrol radius extending up to 60 miles from Sydney and 40 miles from Newcastle. During the past 12 months over 10,000 messages relating to crime and stolen cars have been transmitted for attention by the patrols, an increase of 2,500 messages over the previous year's total.

Leaves from a Short-wave Log

Martinique Down 10 Kilocycles

FZF6, Fort-de-France (Martinique), hitherto working on 30.98 m. (9.685 mc/s), may now be found on a slightly higher condenser setting, *i.e.*, 31.01 m. (9.675 mc/s). Broadcasts from this station have been heard well recently in the British Isles.

A New Mexican Call-sign

A correspondent reports the reception of a programme from XEYU, Mexico City, working on 31.32 m. (9.58 mc/s). The opening announcement stated that the station was operated by the *Universidad Naçional* or National University in the capital. The power of the transmitter was said to be 1.5 kilowatts.

A Powerful Mexican Signal

XEWW, Mexico City, now definitely logged on 31.58 m. (9.5 mc/s), may be heard nightly at good strength relaying the radio programmes of the medium-wave studio XEW in the Mexican capital. The call is : *Estaçiones XEW y WEWW, La Voz del Americana Latina*, the interval signal consisting of four chimes (descending scale) with one stroke on a gong between announcements. Address: Estaçiones XEW y WEWW, Apartado Postal, 2,516, Ajuntamiente, 54, Mexico City, Mexico, Central America.

Boston Tries Out New Frequency

W1XAL, usually logged on 25.45 m. (11.79 mc/s), is testing on a new channel, 25.58 m. (11.73 mc/s). Experimental broadcasts are being carried out between G.M.T. 20.00-20.30, and after 02.00.

The Daily Schedule of Paris-Colonial

With the opening of the new transmitters at Essarts-le-Roi, the daily schedule of Radio-Colonial (Paris) is now fixed as follows : TPA3, G.M.T. 06.00-09.00, 25.24 m. (11.885 mc/s) for Africa, New Zealand, Australia, etc.; on 31.35 m. (9.57 mc/s) a special broadcast is simultaneously made for North Africa. TPA2, on 19.68 m. (15.243 mc/s) comes on the air at G.M.T. 10.00 and broadcasts continuously until 15.00 for Indo-China, the Far East, and Australia. TPC3, on 16.88 m. (17.765 mc/s) works from G.M.T. 13.30-15.00 for Indo-China and is followed by TPA3, on 25.24 m. (11.885 mc/s), from 15.15-22.00, for the Middle East, East Africa, Brazil and Argentine Republic. A simultaneous broadcast is made on 31.35 m. (9.57 mc/s) for North Africa. Until April 16th, TPA3 carried out a transmission on 25.24 m. (11.885 mc/s) from G.M.T. 23.15-01.15; after that date the broadcast will be abandoned on that channel, but will be carried out on 19.83 m. (15.13 mc/s) for South America. TPA4, on 25.6 m. (11.72 mc/s), comes on the air at G.M.T. 23.15 until 01.15 for the U.S.A., Canada, etc., and again at 01.30-04.00 for North and Central America. The last broadcast is taken by TPA3, on 25.24 m. (11.885 mc/s), for North America from G.M.T. 01.30-04.00. As against the power of 12 kilowatts radiated by the Pontoise transmitters, the new stations at Essarts-le-Roi are rated at 25 kilowatts, and the power can be increased if necessary to 100 kilowatts.

Signals from Tahiti

Calling *Radio Oceanie* (FO8AA), Papeete, a French transmitter at Tahiti on 42.25 m. (7.1 mc/s), has been heard broadcasting a programme of gramophone records (native music). Announcements were made in the French language only. Transmissions are carried out every Wednesday and Saturday between G.M.T. 01.00-04.30.

Schedule of Guatemala Broadcasts

Although no definite schedule has yet been advertised of the transmissions of TGWA, Guatemala City, on 19.78 m. (15.17 mc/s), a correspondent reports that these broadcasts are regularly carried out on Sundays between G.M.T. 15.30-20.30, and on Mondays between 17.45-20.45, but that on other days they are occasionally given at odd times only, and are still of an experimental nature.

Another Puzzling Harmonic

Notwithstanding the fact that the little Belgian private transmitter at Verviers is only rated at 100 watts, the fourth harmonic of its fundamental wave (199.3 m.) is well heard by listeners dwelling on the south coast of England, on 49.82 m. (6.021 mc/s). This studio broadcasts in French only.

New Buenos Aires Station Testing

Experimental transmissions of gramophone records have been picked up from LSM3, Hurlingham (Buenos Aires), Argentine Republic, on 15.67 m. (19.14 mc/s). This 12 kilowatt station used for commercial radio telephony with Europe, occasionally relays radio programmes.

Putting Punch into Schenectady Signals

It is reported that W2XAD and W2XAF, Schenectady (N.Y.), will be shortly bringing new plant into operation for their short-wave transmissions, and that the power may reach 120 kilowatts, thus making them the most powerful short-wave radiotelephony transmitters in the world.

Listen to Finland

The Suomen Yleisradio, the company responsible for the Finnish radio programmes is testing out a 1 kilowatt transmitter on 31.58 m. (9.5 mc/s) nightly. No regular schedule has been arranged, so far, but on most evenings the station relays portions of the Helsinki programme from G.M.T. 19.00. Announcements are made in Finnish, German, French and English. The power of the station in the near future will be raised to 25 kilowatts.

Three New Mexicans

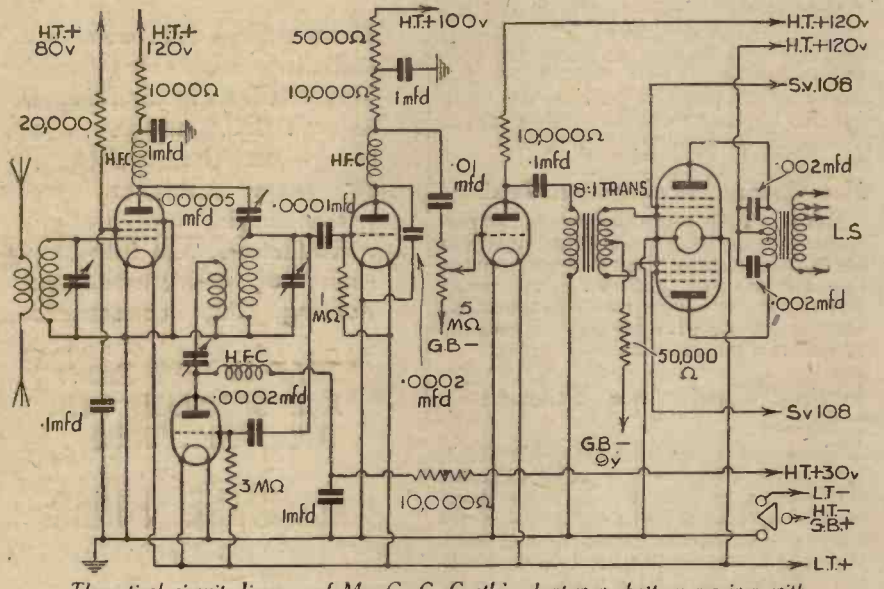
XEGW, Mexico City, 49.1 m. (6.11 mc/s), 250 watts. Address : Senor José Garza Fox, Estaçion XEGW, Mexico City D.F. (Republic of Mexico). XEBF, Jalapa de Vera Cruz, 49.26 m. (6.09 mc/s), 100 watts. Address : Señor Pedro Coronel Aburto, Estaçion XEBF, Jalapa, Vera Cruz (Republic of Mexico). XEXR, Mexico City, 49.46 m. (6.065 mc/s), 100 watts. Address : Estaçion, XEXR, Secretaria de Educaçion Publica, Mexico City.

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).

An Economical Q.P.P. Circuit

SIR,—The Short-Wave Section of PRACTICAL AND AMATEUR WIRELESS has always proved interesting to many of your readers who have decided to build short-wave receivers, and I am sure the articles describing H.F. stages, tuned and untuned, or the merits of H.F. transformers or tuned-grid coupling between stages, have helped to increase the popularity of short-wave construction. With the present power and reliability of short-wave transmissions, anyone who has built an efficient receiver must feel that they have come to the end of their experiments, and the urge to experiment leads them to buy other types of coils and components which probably do not improve their reception. In my opinion not enough has been written about improving the L.F. and power stages, and after all, until we can obtain really stable multi-high-frequency amplifiers, it is easier to add another valve after the detector in straight sets, powered by batteries. This is where the Q.P.P. system proves its worth. After two years' use of this system I feel it is to be recommended to battery users for its remarkable power output with economy in high tension. Strong signals can be adequately handled in conjunction with a good loudspeaker. Another advantage is the saving in current when searching, and when quiet signals are being received. To gain the best from this system I have always used two batteries—one for feeding the Q.P.P. valve only, and the other the H.F. Det. and L.F., including separate reactor valve, with longer life for each battery, owing to less current being drawn. Unless variable-mu control is being used, a volume control should be fitted after the detector stage, because locals will overload the set, especially on the ground wave signal. The accompanying theoretical circuit diagram will no doubt prove of interest to home constructors.—GEO. C. CASTLE (Newcastle-on-Tyne).



Theoretical circuit diagram of Mr. G. C. Castle's short-wave battery receiver with Q.P.P. output.

Underground Reception

SIR,—I read D'Arcy Ford's letter in a recent issue on "Down to Earth," with great interest, and also those from W. J. Hill and Leslie Tearney. I can well support Leslie Tearney's suggestion that radio signals travel through the earth.

I am studying S.W. propagation underground in mines, lead and coal, and have received good results from various amateurs on 7 mc/s, using a commercial two-valver.

Here is a log of a few of the stations I have received underground on a 40ft. aerial slung on the bars supporting the roof.

G8TX, Q5, R6, clg. test, 7 mc/s (13-8-37); ON4XX, Q5, R5, T9, QSO GI8GK, 7 mc/s (24-7-37); G8FY, Q5, R6, clg. test, 7 mc/s (25-2-38); G8KD, Q5, R5, T9, clg. test, 14 mc/s (25-2-38); PAOEO, Q5, R5, clg. test, 14 mc/s (14-2-38); G2XV, Q5, R5, T9, QSO W9RUIK, 14 mc/s (14-2-38); G6WY, Q5, R4, T8, QSO VP1AA, 14 mc/s (14-2-38).

I am now building an S.G. H.F.-S.G. det.-Pen. L.F. receiver for my next experiments. I have tried a 56 mc/s receiver underground, but with no results.—J. STEPHEN GINGELL (2AAM) (Swanwick, Derbyshire).

A 14 mc/s Log from Yorkshire

SIR,—I enclose my log heard on 14 mc/s on Sunday morning, March 20th, between 10 hrs. 30 mins. and 11 hrs. 30 mins. G.M.T.

W1IFD, W1CR, W2VT, W2IKV, W2IXY, W2JT, W2UK, W2GYM, W2BFH, W2AZ, W2HNA, W2GIZ, W3MD, W3EMM, W3AMH, W3CHE, W3CRG, W4AH, W4BM, W4YC, W4EHG, W4DAA, F8UE, F8DC, F8PY, F8JJ, F3CP, F3OO, F3FA.

Miscellaneous stations include ON4PJ, ON4AR, G6PC, LA1G, EI3J, SM5YU, LX1TW, W9YGC, and PA-NA.

The stations listed were all received at signal strengths varying between R7 and R9, with the exception of the Netherlands station. The receiver used was a two-valver, employing two triodes, and an indoor aerial consisting of a nickel-plated steel spring stretched across the bedroom.

I should be very pleased to hear from any short-wave enthusiast who reads your excellent paper.—A. KNOWLES, 59, Carlton Terrace, Carlton, Barnsley, Yorkshire.

A High-quality Amplifier

SIR,—In the interests of accuracy, may I point out that early in 1935 (or was it late in 1934) you published details of my then direct-coupled paraphase amplifier (you later corrected two resistance figures from 1,500 ohms to 15,000 ohms) which did not use high voltages, and which *did* work the valves on the best parts of their characteristics.

I have no wish to seek notoriety over this matter, but I would ask you, Sir, to consider technically the maximum r.m.s. undistorted output from an MHL4 valve consuming .3 milliampere (which is as Mr. Hunt has it), and then compute the resulting PX4 undistorted output. It will not exceed 200 milliwatts.

Again, will you please consider that, after .3 milliampere has passed through 50,000 ohms the MHL4 cathode is at 15 volts positive only. This means that the A.C./P anode is less than 15 volts positive—hardly an ideal state from a quality point of view.

Again, with the external loads adopted by Mr. Hunt, even a .0001 mfd. shunt causes a nasty drop in amplification long before 10,000 cycles are reached.—W. S. (King's Lynn).

CUT THIS OUT EACH WEEK.

Do you know

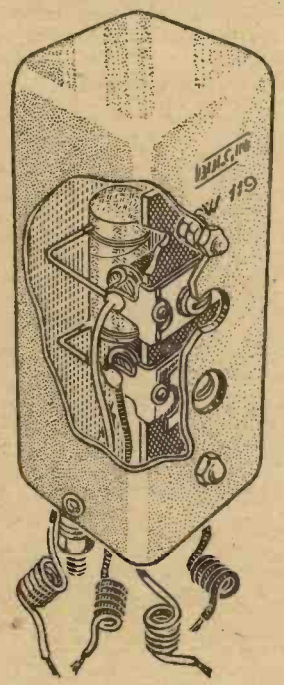
—THAT the impedance of the feeder to a dipole aerial should be very carefully chosen.
—THAT the impedance of a feeder for television reception should be about 90 ohms.
—THAT it is very important to keep the earth connection in a moist condition to reduce the resistance to H.F. currents.
—THAT hum can sometimes be caused by vibration from a mains transformer or choke, setting into vibration the electrode assembly of a valve.
—THAT the efficiency of a band-pass coupling varies at different frequencies.
—THAT it is possible to arrange an aerial feed to a coil which will remain constant at all normal broadcast frequencies.

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 Newnes, 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.

The British Long-Distance Listeners' Club

AS this is a special short-wave issue, and as we have received many requests for details for making short-wave coils, we give herewith the main essentials of the standard types of 4- and 6-pin coil, such as are employed in the receivers described in this issue. It should be remembered that coil formers, fitted with either 4 or 6 pins, and with grooves or plain, are available from various firms, and many constructors find interest in



The H.F. transformer produced by Bulgin for use in television receivers

making or winding their own coils. In the Economy One-valver and the Cyclo S.W. Converter the coils recommended are of the 6-pin type, and it will be seen in the wiring diagrams of those receivers that we have numbered the pins.

It should be remembered, however, that the pins are not numbered by the makers, either on the coil holders or on the coils themselves. The three windings on a 6-pin coil are primary, secondary and reaction, the latter winding being in some cases an interwound layer and in other cases a continuation of the secondary winding. Between terminals 1 and 4 the secondary winding is joined, and the primary is connected to terminals 3 and 6. The remaining two terminals are used for the reaction winding. Bear in mind that all turns should be in the same direction, and to ensure even spacing the type of former having threads cut on the ribs will be found of great value.

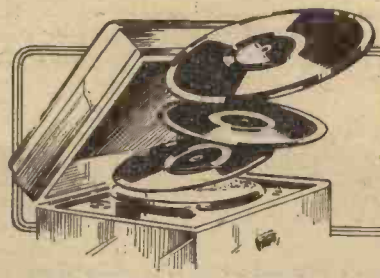
Enamelled wire should be used for primary and reaction, which may be regarded as a single winding with a tapping at the centre (the two ends of the tap being, of course, cut and joined to separate legs). The aerial winding, or primary winding, should be wound from a fine-gauge silk or double-cotton covered wire of about 26 gauge. The exact size is not important. The wave-range covered will depend in the smaller coils to a large extent upon the stray capacity existing in the wiring to condensers, etc., and no extra details can therefore be given. Briefly, if a .00015 or .00016 mfd. tuning condenser is employed, you will be able to tune from 10 to 100 metres with three coils in which the secondary windings will consist of 4, 8 and 25 turns. The primary windings for these coils will have 2, 5 and 9 turns, and the reaction windings a similar number of turns.

"Earth" Aerials

The recent correspondence on the subject of aerials lying on the ground has aroused considerable interest, and it must again be pointed out that the idea is not new. We have before given details in these pages of the method of using such an aerial and some time ago in America it was customary to use such an aerial in order to prevent severe static interference. During the Great War it was quite a common occurrence for the R.E.'s to use lengths of wire laid along the ground in preference to erecting a mast, and old war-time operators will confirm that results were admirable under certain conditions. The anti-static aerials on sale in America mostly consisted of coils of wire enclosed in a metal can and furnished with an insulated leading-out wire. It was intended that the can be buried and connected to the aerial terminal. Although the signal-to-noise ratio was good, signal strength suffered on most wavelengths, although a peculiar effect was sometimes noticed on some short-wave bands at certain periods, where excessive volume was available, much better, in fact, than that obtained with orthodox aerial arrays. For those members who wish to try such a scheme the length of wire enclosed in the can may vary from 50 to 200 feet, and it should be wrapped neatly round a small diameter cardboard tube. An old copper screening can taken from a coil unit will be found ideal for a container and the depth to which it should be buried will have to be found by trial—in most cases 12 to 18 inches proving most suitable.

Television Circuits

The type of circuit to use for the reception of television (sound or vision) is still a difficult point for the majority of listeners to decide. Although the superhet has so many points in its favour, many listeners prefer the straight type of receiver, and at least one firm uses a straight receiver in its complete television apparatus. The amplification of each stage must be kept low, and transformer coupling must be employed with special arrangements to provide a square peaked response of sufficient width to give adequate quality. Special components for this purpose are now available, and the Bulgin component is illustrated on this page, from which it will be seen that it is screened and provided with flexible output leads. Resistances are connected across the windings to flatten the response and pre-set condensers are mounted on the case so that the tuning may be pre-adjusted and the set then fixed tuned in the same manner as a superhet.



Impressions on the Wax

A REVIEW OF THE LATEST GRAMOPHONE RECORDS

H.M.V.

IT would be a very difficult person to please who could not find something acceptable to his musical taste in the record releases for this month. There are some attractive records of light orchestral music. The B.B.C. Variety Orchestra, conducted by Charles Shadwell, with Reginald Foort at the B.B.C. Theatre organ, play "Lulworth Cove" and "Seville" on *H.M.V. BD* 523. The combination of organ and orchestra is very effective.

Barnabas Von Geczy's Orchestra, reputed to be the most famous restaurant orchestra on the Continent, plays two favourites—"Chanson Triste" and Jarnefelt's "Berceuse"—on *H.M.V. B* 8730.

There are plenty of new tunes in the new film "Sailing Along" from which Louis Levy's Gaumont-British Symphony plays a selection, with vocal refrain—*H.M.V. BD* 526. Baby Terry (one of the famous Terry's Juveniles) gives impressions of the child film star in "Shirley Temple Memories," with Anto and the Paramount Theatre Orchestra, on *H.M.V. BD* 529. Leslie Jefferies, well known for the popular broadcasts of his Orchestra from the Grand Hotel, Eastbourne, which he now leaves to tour the Halls, makes his first H.M.V. record. He has chosen "Dearest Love" from Noel Coward's "Operette" and "Hey Gypsy, play Gypsy," from Kalman's "Countess Maritza," which is to have a London revival—*H.M.V. BD* 534.

An exceptionally fine record of the brass band is provided by Callender's Senior Band, which plays the well-known marches "Colonel Bogey" and the "Entry of the Gladiators"—*H.M.V. BD* 518.

The H.M.V. records made from the sound track of the Walt Disney film "Snow White and the Seven Dwarfs" were pre-released last month. They are now followed by a selection of the principal tunes, played by Reginald Foort on the B.B.C. Theatre Organ—*H.M.V. BD* 532, and a dance record of "Whistle While You Work" and "With a Smile and Song" by Guy Lombardo and his Orchestra on *H.M.V. BD* 5348.

Yehudi Menuhin, who is once again in this country after two years' retirement for study in California, has made a set of records with his sister Hephzibah (piano) and Maurice Eisenberg ('cello), of Tchaikovsky's "Trio in A Minor," Op. 50, on *H.M.V. DB* 2887-91 and *DBS* 2892. The work occupies eleven sides, the "odd" disc being charged for at half rate. Kreisler contents himself with two of his own arrangements of short pieces, the "Londonderry Air," and "Poupée Valsante" one of Poldini's Doll pieces, descriptive of the Waltzing Doll—*H.M.V. DA* 1622.

Vocal Records

A VERY varied list, headed by Gigli singing two fine Italian songs, Tosti's "Serenata" and the vigorous "Mattinata Veneziana"—*H.M.V. DA* 1618. Nelson Eddy brings back memories of the great days of the Ballad Concert, with his singing of "Oh, promise me," which he does delightfully on *H.M.V. DA* 1600. His other song is "The Hills of Home."

Paul Robeson and Peter Dawson have also chosen ballads, the former "Just a' Wearyin' for You" by the composer of "A Perfect Day," and Cadman's charming little song "At Dawning" on *H.M.V. B* 8731, whilst Peter Dawson sings two fine robust ditties—"Wandering the King's Highway" and "The 'prentice Lads o' Cheap"—both with Orchestra and Male chorus, on *H.M.V. B* 8723.

The Bauldauf Brothers, newcomers to H.M.V., do some very pretty yodelling in "In the Ziller Valley" and also a catchy vocal march, "Gailthaler," which has a tra-la-la-ish refrain. Both are sung in German with zither and guitar accompaniment—*H.M.V. BD* 501.

A record that will prove a great favourite is the Kentucky Minstrels' rendering of Liddle's "Abide with Me," arranged by Doris Arnold. The chorus work is splendid and the accompaniment is played by orchestra and organ. This number was repeated on the air by request recently—*H.M.V. BD* 535.

Ernest Lough devotes his "grown-up" baritone voice to two Easter melodies, with orchestra, organ, and chorus. Gounod's setting of "There is a Green Hill far Away" and Carey's well-known hymn, "Jesus Christ is Risen To-day" may be heard—*H.M.V. B* 8729.

Parlophone

RICHARD TAUBER has chosen for his latest record two songs from the film "Rosalie," by that well-known composer Cole Porter. They are the theme song, "Rosalie," and "In the Still of the Night" on *Parlophone RO* 20382.

A number of famous singers appear in the "classic series," including Joseph Schmidt, the well-known tenor, who sings "La Paloma," and "O Sole Mio," both in Italian, on *Parlophone R* 2498, and Herbert E. Groh, also a tenor, sings "Serenade" and "Good Night, Oh! My Love," both in German, on *Parlophone R* 2497.

Leslie A. Hutchinson, more familiarly known as "Hutch," who has recently been on the "air," has made two new records this month. The first—*Parlophone F* 1069—introduces "So Many Memories," a hit of the moment, coupled with "Outside an Old Stage Door" from the film "A Star Without a Name." On the other—*Parlophone F* 1070, he sings "Souvenir of Love" from the film "Sailing Along" and "Two Dreams Got Together."

Harry Roy and his band, who have recently left on a tour of South America, have recorded "You're a Sweetheart" and "Me, Myself and I" on *Parlophone F* 1057, as well as two tunes from "Snow White and the Seven Dwarfs"—"With a Smile and a Song" and "Whistle While You Work" on *Parlophone F* 1054.

RADIO CLUBS AND SOCIETIES

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

THE EXETER AND DISTRICT WIRELESS SOCIETY

AT the last meeting of the Exeter and District Wireless Society, a lecture was given by Mr. Rich, of the Mullard Wireless Company, on "Measuring Instruments." He had many types with him for demonstration, including cathode-ray oscillographs, frequency modulators, and also a measuring bridge. Mr. Rich showed how these pieces of apparatus could be brought into good use by any enthusiastic experimenter, and many questions were satisfactorily answered at the close of the meeting.

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. Ching, 9, Sivell Place, Heavitree, Exeter.

KING'S LYNN SHORT-WAVE CLUB

A MEETING of the above club was held at the Oddfellows Institute, Railway Road, on April 6th. The chairman reported he had received his full licence, his call sign being G3IP. He hoped to be on the air soon, and would welcome any reports. He also demonstrated a D.C. receiver using a circuit similar to the "All World Two" described in the March issue, and in spite of the poor locality, and aerial, many interesting transmissions were tuned in, including the sound and vision signals from Alexandra Palace. 8BW delivered an interesting talk on aerial location and direction, and with the aid of a Webbs "Azimuthal" map he showed how necessary it was, in view of the fact that the principal amateur countries lie east and west of Gt. Britain, to plan the aerial system in most cases so that it ran north and south.

2VS has a Pye television receiver, and has been receiving a very good picture at night. He is troubled by car QRM, in spite of his 65ft. high dipole. It was decided to hold a morse class during the first half-hour of each subsequent meeting, and Mr. A. Porter, G8BW, and G3IP volunteered to act as instructors. Hon. Sec., G. W. Rodgers, 112a, High Street, King's Lynn.

SHEPPEY AMATEUR RADIO CLUB

THE above club have been fortunate in securing the services and support of two fully licensed amateur radio stations on the island, namely, G8SS and G3GW, and it is with their instructions, etc., that rapid progress has been made in the theory of transmitting.

Under the supervision of G8SS a 1.7 mc/s transmitter has been constructed for use with an artificial aerial under the call-sign of the secretary, 2CVM, and it is hoped to experiment with various forms of modulation, etc.

DX amateur band listening is still encouraged, and members have expressed their willingness to build 56 mc. receivers for the coming summer months, when it is hoped some field days can be held. We shall be pleased to co-operate with any transmitting stations, and invite membership of all who are really interested in amateur radio. Further particulars can be obtained from F. G. Maynard (2CVM), hon. sec., 160, Invicta Road, Sheerness, Isle of Sheppey.

SLOUGH AND DISTRICT SHORT-WAVE CLUB

AT the meeting held on April 12th, the extremely poor attendance provoked a discussion on ways and means of improving the attendance at meetings and of attracting more members to the club. It was decided to inaugurate a publicity campaign in which all members are asked to participate. Each member will receive further particulars from the secretary. It was also decided that a great effort should be made to make the agenda of the meetings more attractive, and it was agreed that a step towards this end would be made if there were always some apparatus at the meetings for discussion and demonstration. With this in view, 2DDG will bring along a modulated oscillator to the next meeting.

The scores in the current section of the RX contest were also compared, and the next section, Europe, will be held under somewhat different rules, of which all members will receive details. Hon. sec., J. H. White, 20, Chalvey Road East, Slough, Bucks.

THE EAST DORSET AND WEST HANTS. RADIO CLUB

THE membership of this Club now numbers 32, and a number of attractions are being arranged for the near future, including a lecture by Mr. Cholot, of Lissen, Ltd., a visit to Dorchester Beam Radio Station. The question of a Club transmitter is under consideration. David M. Williams, Organising Sec., "Amberley," Cornwell Road, Poole, Dorset.

PROPOSED CLUB FOR FRAMLINGHAM

MR. H. Brand proposes to form a short-wave club for amateurs residing in and around the Framlingham area. He has no transmitter at present, but any person who has one is cordially invited to help. Please write to H. Brand, Station Road, Framlingham, Suffolk.

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.

R. J. (Watford). The best set for your purpose is the A.C. Hall-Mark, PW. 45. This is classed as a four-valver as it has a push-pull output stage and may be relied upon for really high quality with adequate selectivity for your purpose.

F. A. P. (W.4). We cannot identify your coils and cannot recommend you to build one of our sets round these components.

P. R. (Brundall). Whilst we admit that the majority of the points you raise are correct, we suggest you build up the amplifier and see if theoretical considerations are borne out in practice.

T. A. M. (Glasgow). You would need a rectifier and mains transformer, but no exact details can be given in the absence of details of the charger you have already built.

E. W. (Sheffield). Your set may be faulty and we suggest that you have it examined by the makers of their nearest local service agent.

F. B. (Deptford). We did not design the receiver in question, and, as pointed out in these columns, we cannot give instructions for modifying receivers designed by other experts.

D. H. (Windsor). The wire in question should be used for maximum results, but eighteen is the minimum to which you should go. Remember that if you can obtain it, silver-plated wire is desirable, but as an alternative, use bare tinned copper wire and shellac or coat it with collodion.

A. W. M. (Bradfield). We cannot supply wiring diagrams to individual requirements. Our latest book "Coils, Chokes and Transformers" would give you the necessary coil data.

G. S. A. J. (Heybridge). We have several different types of portable, but you do not state your exact requirements. Some of the designs are self-contained, but others require a throw-out aerial.

G. E. T. (Radford). The choke is obviously ineffective, and as a suggestion we might point out that a high resistance could be used in its place.

R. W. (Brighton). The aerial should be provided with a reflector, when we are certain results will prove satisfactory.

Practical and Amateur Wireless
BLUEPRINT SERVICE

	Date of Issue.	No. of Blueprint.
PRACTICAL WIRELESS CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve: Blueprints, 1s. each.		
All-wave Unipen (Pentode) ..	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve: Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	—	PW36B
The Signet Two (D & LF) ..	29.8.36	PW76
Three-valve: Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans)) ..	*June* '35	PW1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen). Battery All-Wave Three (D, 2 LF (RC))	—	PW53 PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	PW87
Four-valve: Blueprints, 1d. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW46
Fury Four (SG2, D, Pen) ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)		PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve: Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW10
Three-valve: Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A. C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	—	PW35C
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen) ..	28.7.34	PW30A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve: Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four ..	6.11.37	PW81
SUPERHETS.		
Battery Sets: Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	5.6.37	PW40
F. J. Camm's 2-valve Superhet ..	13.7.35	PW52

These Blueprints are drawn full size.
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

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Practical Mechanics ..	7½d. " "
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The index letters which precede the Blueprint Number indicate the periodical in which the description appears; thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, P.M. to *Practical Mechanics*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
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"Qualitone" Universal Four ..	16.1.37	PW73
SHORT-WAVE SETS.		
One-valve: Blueprint, 1s.		
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Two-valve: Blueprint, 1s.		
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The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen) Pen)	29.8.36	PW68
PORTABLES.		
Three-valve: Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	—	PW65
Parvo Flyweight Midget Portable (SG, D. Pen)	19.6.37	PW77
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Featherweight Portable Four (SG, D, LF Cl.B)	15.5.37	PW12
"Imp" Portable 4 (D, LF, LF, Pen)	19.3.38	PW86
MISCELLANEOUS.		
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AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.		
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Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
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£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen) ..	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351

QUERIES and ENQUIRIES

Meter Conversion

"Some time ago you published an article on converting a 1 m/A meter for use on A.C. volts, etc. I possess a 2 m/A meter actually having a resistance of 500 ohms per volt (yours had 1,000 ohms per volt), and I should like to know how to adapt this for use in an all-purpose test instrument of the type you described."—E. G. M. (Southsea).

AS the meter has half the resistance of our instrument, you could adopt exactly the same method of wiring shunts, etc., and thereby obtain double the readings of our instrument. You will appreciate, of course, for A.C. readings you would have to use a 2 mA type rectifier, and the instructions which we gave for calibrating the instrument may be used in your case.

Interference Suppressor

"I often wish to listen when the vacuum-cleaner is being used in the house, and I find that the interference is terrible. I had a spare pair of fixed condensers, but am rather doubtful as to the best position for these as the lead for the cleaner is of the three-wire type, one of them being earthed. Can you suggest the best connection, or tell me if there is a ready-made device I could clip on to prevent the trouble?"—

THE third lead may be regarded merely as the earth and thus you can deal with the remaining two leads in the usual way. We would point out, however, that Belling-Lee supply a special suppressor mounted in a neat bakelite case intended for inclusion in the flex leads to such a device as you refer to, and this costs 7s. 6d. It consists of fixed condensers plus a choke, and will be found very satisfactory for your purpose.

Valve Formulae

"I have been reading some of your recent articles on valve characteristics, but have so far not found the formula for the amplification factor and undistorted output. I wonder if these are simple and could be worked out by the average amateur where the figures were not available?"—F. R. A. (Weybridge).

THE amplification factor could be worked out by connecting grid bias and H.T. batteries and noting the change in anode voltage required to bring back the current to a given value when the grid-bias is altered. The formula would then be expressed as amplification factor equals change in anode volts divided by change in grid volts. In other words, the anode current is kept at a constant value. The undistorted output is a rather complicated formula and takes into account a number of different things. However, for all practical purposes you may work on the assumption that the difference between maximum and minimum anode current, multiplied by the difference between maximum and minimum anode volts divided by 8 will give the output in watts.

A.C.-D.C. Heater Circuit

"I am building an A.C.-D.C. set, but am not quite certain regarding the wiring of the heaters. The set will use four valves, X, W, D, and N. 31's, and for a rectifier I propose to use a U.30. I should also like to include a dial-light of suitable type, and should be glad of your recommendation regarding the best order of wiring the heaters and lamp and what type of ballast to employ."—P. S. (Margate).

THE heaters should be wired in the following order—commencing from the mains side and finishing on the earth line—U.30, dial lamp, W.31, N.31, X.31 and D.31. The dial lamp should be a standard Osram "S" bulb made for the purpose. To feed these heaters from the mains use an Osram Barretter type 304, and remember that in a set of this type it is highly desirable to include a filter on the mains side, consisting of the special low-resistance H.F. chokes (one in each mains lead) with fixed condensers across the chokes and earth.

Tone Controls

"You recently mentioned the position of a tone control, but I am rather uncertain regarding my set where the tone control (which is so marked) is supplied with only one lead, and it works perfectly. I cannot see how it can be in circuit with a single lead and this lead goes through a fixed condenser to the speaker. Perhaps you could solve this point, which has puzzled one or two of my radio friends?"—P. A. W. (Bradford).

THERE is quite a simple solution to your problem, we imagine. The usual position of a tone control circuit is across the loudspeaker, and one side of the speaker is joined to the output anode whilst the other side is connected to H.T. positive. Now the H.T. battery is at earth potential, and therefore if the tone control is joined from the anode to earth it is still across the loudspeaker in an electrical sense. We therefore imagine that your panel is a metal one and the control which is mounted on the panel is thus earthed through the spindle, this forming the second connection to the control.

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 Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Short-wave Troubles

"I have built a simple short-wave mains set, but find great difficulty in cutting out hum. The signals are very rough when received, but I cannot listen owing to the background of hum. Is there any way of removing this difficulty, or must I go back to a battery set for the purpose?"—R. T. J. (Port Talbot).

IT is usually very difficult to remove hum on a short-wave set operated from the mains, especially if headphones are used. Very elaborate smoothing should be included on the H.T. side of the set and in addition you will no doubt find it essential to include various devices on the H.F. side. Amongst these may be mentioned fixed condensers direct from the heater pins on the H.F. valves to earth, shunting all by-pass condensers by small capacity mica condensers, in case they are not entirely non-inductive, and screening the heater leads to each valve.

Thermal Test Instruments

"I have seen an advertisement for a meter for wireless tests which is described as a thermal instrument, and I should be glad if you could tell me just what type of instrument this is and whether it is as good as a moving-coil, as I am thinking of getting a good instrument as the basis for an all-purpose tester."—J. B. (Carlisle).

THE thermal instrument operates by the expansion of a very fine wire, which heats when current is passed through it, or by the movement of a pointer which is carried out by heating a wire round the junction point of two dissimilar metals. The instrument would not be suitable for an all-purpose tester of the type you require, and for this purpose we advise a really good moving-coil having a maximum reading of only 1 mA. If you can afford it an instrument reading only .1 mA would be even better.

Electric-light Wiring

"I am going to make up a trickle charger and want to fit it to the mains. When I unscrewed a cover of a switch, however, I found three wires running to it, two joined to one connector and one to the other. Is this a standard three-wire system, and if not, how is it that there are three wires and not two? Perhaps you could tell me the best way to fit my charger?"—L. S. (Brighton).

THE switch is not a three-wire circuit, and the fact that there are two wires on one connector merely indicates that the wiring is looped in. That is, the wire is brought down from the ceiling in a loop and the end of the loop cut and attached to avoid making a joint above the ceiling. You should not tamper with the wiring at the switch, but if you need an additional point for your charger, you should use an adapter in a convenient socket, with a switch on the adapter to enable either the charger or the other socket to be used. If you are not familiar with the mains we recommend that you get a good electrician to carry out the work for you.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

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W.B. 8" Permanent Magnet Speakers at One-third Cost.

Extension Type (no transformer) **7/6** Standard Type (with transformer) **12/6**

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Standard 12 guinea model, but fitted with high fidelity Piezo Crystal Pick-up. *Limited number* **£4.12.6**

RECEIVERS (FOR CALLERS ONLY)

Cossor, Alba, Decca, Aerodyne. Prices from **£1.19.6** to **£4.17.6**. Battery and mains models. Only a few left. *For callers only*

SHORT-WAVE CATALOGUE

New Edition with dozens of new lines. 1½d. post free.

G5NI's 66-PAGE MANUAL

The greatest value and most comprehensive Manual ever published in this country 7½d. post free.

RADIOMART

44, HOLLOWAY HEAD, BIRMINGHAM, 1

ALL goods previously advertised are standard lines, still available. Post card for list free. VAUXHALL UTILITIES, 163a, Strand, W.C.2. Over Denny's the Booksellers. (Temple Bar 9338.)

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/-. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

---

25 ONLY FOR SALE.—3-valve kits with valves and diagram, 12/6; 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation. —Universal Radio Co., 221, City Road, London, E.C.1.

NEW All-Wave Receiver Bargains.—Makers' Cartons. Ferranti 837 A.C., list 9 gns., £6/10/-. Ferranti 1137 A.C., list 12 gns., £8/10/-. Ultra 121 A.C., list 12½ gns., £9/10/- (Universal, £9/12/-). Ultra A.C. Two-wave, list 9½ gns., 5 gns. Carriage extra.—Smyth's Radio Store, Ballygowan, Belfast.

BANKRUPT Bargains.—Large stock receivers and components of all types at very keen prices. Write for quote. All new goods.—Butlin, 6, Stanford Avenue, Brighton. Preston 4030.

NEW RECEIVERS, COMPONENTS AND ACCESSORIES

£26. Bargain, Brand New 1938 20-valve Midwest. Six wavebands. Push-button motorised tuning. 3 Speakers. Every new feature.

£21. 18-valve Midwest. Six wavebands. Motorised tuning. 2 Speakers.

£10 10s. Brand new Hallicrafter Sky-Chief Communication receivers. 7 valves, 110/250 volts. Bandspread dial, B.F.O., A.F. control. L.F. control. A.V.C. switch, pitch control.

£7 17s. 6d. Brand new Hallicrafter. Sky Buddy. 5-valve communications receiver, 110/250 volts.

17s. 6d. for 27s. 6d. Birnbach Allwave aerials. Two transformers. Ready for erection. Really fine job.

£5. 5s. Push-button-tuned Compact. Handsome polished walnut cabinet. Marvellous performance. Long and Medium.

Radiographic, Ltd., Dean House, 2-4, Dean Street, London, W.1. 66 Osborne Street, Glasgow, C.1.

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Premier 90 Page Giant Illustrated Catalogue, Handbook and Valve Manual Now Ready. Price 6d.

SPECIAL OFFER ROLA SPEAKERS.

8" P.M.'s, 15/-; 10" P.M.'s, 19/11; G.12 12" High Fidelity P.M., 79/6. G.12 Mains Energised, 57/6

U.S.A. GEN. E. MOTORS STEP-UP, 12 volts to 285 volts at .06 amps. D.C. output. Complete in Metal Case 6in. x 5in. x 3in. 25/- each.

BATTERY VALVES, 2 volts, H.F., L.F., 2/3. Power, Super-Power, 2/9. Var-mu-S.G., 4- or 5-pin Pentodes, H.F. Pens, V-mu-H.F. Pens, 5/- Class B, 5/- Freq. Changers, 7/6.

EUROPA MAINS VALVES. 4v. A.C. Types, A.C./H.L., A.C./L., A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P., and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens, I.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. changers, 8/6; Double Diode Triodes, 7/6; Triode Hex. Freq. Ch., 8/6; Tri. Grid. Pen., 10/6; 3½ watt, D.H. Triode, 7/6.

UNIVERSAL TYPES. 20v. .18a. S.G., Var-mu, S.G. Power, H.F. Pen., Var-mu. H.F. Pen., 4/6 each. 13v. .2a. Gen. Purpose Triodes, 5/6; H.F. Pens and Var-mu. H.F. Pens. Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

AMERICAN VALVES. We are sole British Distributors for TRIAD High-grade American Valves. All Types in stock. Standard types, 5/6 each. All the new Octal base Tubes at 6/6 each. / 210 and 250, 8/6 each: 81 and 2A3, 8/- each.

PREMIER COMPONENTS for Economy "One-Valver" in this issue. Complete Kit of Premier Parts with 2-volt valve and 4 coils, 23/6. Post Free.

PREMIER TRANSFORMERS, wire-end type with screened primaries, tapped 200-250 v. Filaments. Guaranteed one year. **H.T. 8 & 9** or **H.T.10** with 4 v. 4 a. C.T. and 4 v. 1 a., C.T., **10/-. 250-250 v. 60 m.a.,** or **300-300 v.,** 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., **10/-. 350-350 v. 120 m.a.,** 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., **13/-.** With engraved panel and N.P. terminals, 1/6 extra. **500-500 v. 150 m.a.,** 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., **21/-. 500-500. 200 m.a.,** 5 v. 3 a., 4 v. 2 a., 4 v. 2 a., 4 v. 3.5 a., all C.T., **25/-.**

FILAMENT TRANSFORMERS, Tapped Primaries, 200-250 v. All secondaries C.T. 4 v. 3 a., 8/6; 4 v. 5 a., 9/6; 7.5 v. 3 a., 8/6; 6 v. 3 a., 8/6; 2.5 v. 8 a., 8/6; 6.3 v. 3 a., 8/6; 5 v. 3 a., 8/6.

NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT. 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE!**

DE LUXE MODEL, 14 to 170 metres, complete Kit with Chassis. 4 Coils and all parts, 17/6.

S.W. SUPERHET CONVERTER KIT, for A.C. Mains Receivers, 22/6. A.C. Valve given **FREE!**

NEW 2-VALVE S.W. KIT, 13 to 86 metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE.**

DE LUXE MODEL, 14 to 150 metres, complete Kit and Circuit, 4 Coils and all parts, 25/-. **VALVES GIVEN FREE.**

NEW 1938 S.W. S.G.3 KIT. Pentode H.F., Detector and Pentode. 14 to 170 metres. Complete Kit of Parts with 3 Tested Valves, 59/6. Metal Cabinet, 7/6 extra. Ideal for Amateur Reception.

CENTRALAB POTENTIOMETERS, all values, 2/-. With Switch, 2/6.

MOVING IRON METERS. Any range between 10 and 500 m/a. Also 1.3 or 5 amps. Read A.C. or D.C. Flush Bakelite case, 2¾in. diam. B.E.S.A. standard specification 89, 5/9 each.

MOVING COIL METERS. 1 ma. Scale. 100 ohms resistance. Diameter 3¼in., 22/6. Flush mounting, Bakelite case, B.E.S.A. first-grade accuracy. Multipliers for above, 1/- each. 50 ma., 27/6.

PREMIER "TROLITUL" Short-Wave CONDENSERS. Certified superior to Ceramic. All-brass Construction, 15 mmfd., 1/6, 40 mmfd., 1/9, 100 mmfd., 2/-, 160 mmfd., 2/3, 250 mmfd. 2/6; Double Spaced 15 mmfd., 2/9; 40 mmfd., 3/6; S.W.H.F. Chokes, 9d.; screened, 1/6. All-Brass S.W. Condensers with integral slow-motion .00015 Tuning, 4/3; .00015 Reaction, 3/9. UTILITY 4" MICRO-CURSOR DIALS. Direct and 100 : 1 ratio, 3/9 each.

SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 14-25, 19-43, 38-86 metres. Suitable any type circuit, 2/6.

COIL FORMERS, 4- or 6-pin low-loss, 1/- each.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1 Holborn 4631.

SPECIAL! SPECIAL! We score again by a keen purchase of the entire Radio Stocks of Messrs. Gambrells, enabling us to offer same at a fraction of the original cost. Stock includes Chassis and complete Table and Console Receivers. The demand is sure to be heavy, **ORDER EARLY TO AVOID DISAPPOINTMENT.**

GAMBRELL 7-valve All-wave, All-stage Chassis. Constructed throughout of heavy Cadmium plated steel. This Chassis represents a real engineering job. Fitted with all the latest refinements, including Six Harries All-stage Valves, one Valve for All Positions, plus standard Hivac UU/120/350 Rectifier. Wave Band Ranges: Long Wave 800 to 2,000 metres, Indicator Light Red; Medium Wave 200 to 550 metres, Indicator Light Yellow; Short-wave Band 2, 30 to 75 metres, Indicator Light Green; Short-wave Band 1, 12.5 to 30 metres Indicator Light Blue. Provision for Pick-up and External Speaker. Fitted 2-speed Drive, Built-in Visual Tuning. Wave-change Switch, Combined Volume Control, Push-pull Tone Control and Mains On-Off. The Dial is a really magnificent affair, size 9ins. long and 5ins. wide, Tuning Indicator being built in the Dial. The Chassis throughout is heavily screened, thus providing stability on all bands, with the finest all-round performance. Valve Screens spun from one piece. Transformer and Choke are of massive construction. In fact, the Chassis through is constructed in such a way that overloads, etc., are provided for without strain. Size of Chassis, 14½ins. long, 10½ins. wide and 3½ins. deep. Pre-H.F. stage operates on all bands. Reports from satisfied customers more than confirm our contention that this chassis represents the finest value we have ever offered to the Public. **Supplied complete with Six of the latest Harries All-stage Valves, plus Rectifier, £4 9s. 6d. each.**

As above, but with Celestion 10in. Moving Coil Speaker £4 19s. 6d. each.

As above but fitted in Handsome Table Piano Finish Walnut Cabinet, complete with Valves and Speaker, £5 10s. each.

As above, but fitted in handsome Piano Finish Walnut Console Cabinet, complete with Valves and Speaker £6 6s. each.

Hunt's 1,000 mfd. Cardboard Electrolytics, Wire Ends, Peak Voltage, 12 volts, **2/- each.**

Special offer in ½ gross lots only, **T.C.C. 0.1** Wire End, Tubulars, **15/- per half gross.**

Polar N.S.F. Resistances, Our Selection. ½, 1 and 2 watt, **4/- gross.**

Tubular Condensers, our selection, **1/- dozen.**

Dubilier ½ meg. Volume Controls, with Switch, standard model, very compact, **1/6 each.**

H.T.8 Type Rectifiers (skeleton type). A really splendid job, **4/6 each.**

6 Bank 4 Position Yaxley Type Switches, beautifully finished. Each Bank 5 Contact Type, plus Common. **5/- each.**

Visual Tuning Indicator, m/a type, complete with mounting Bracket, **1/3 each.**

3-gang .0005 **Straight Condensers.** A precision instrument with Ceramic Insulation, suitable for all Circuits, including All Wave, **3/- each.**

Dials for above, 2-Speed type, 9" Long, 5" Wide. Station Marked for 4 Wave Bands, Two Short, Medium and Long, **4/6 each.**

465 I.F.s, Iron Cored, with Trimmers, **2/6 each.**

Plessey Can Type Condensers (Electrolytics), complete with Fixing Clamp, **8 plus 16 Mfd. 8 Mfd.,** working voltage 450, 16 Mfd., working voltage 350. **2/- each. Plessey 16 Mfd.,** 150 volt working, **1/3 each.**

Special offer **Mains Transformers,** 350-0-350, 120 m.a. 15 volts C/T at 4 amp., 4 volts C/T at 2.5 amp. Mains Inpnt Adjustable 200-250 volts. Heavily Shrouded, **4/6 each.**

20 Hy, 100 m.a., 500 ohms Choke, Unshrouded, **5/11 each.**

350/120 Indirectly Heated Rectifier, Octal Base type, well-known make, complete with Octal Base Valveholder, **4/6 each.**

All orders 5/- or over, post free; orders under 5/- must be accompanied by a reasonable amount for postage; C.O.D. orders under 5/- cannot be accepted. All enquiries must be accompanied by 1½d. stamp if reply expected. Hours of business 9 a.m. to 7 p.m. weekdays; 9 a.m. to 1 p.m. Saturdays.

RADIO CLEARANCE, 63, High Holborn, W.C.1. Holborn 4631.

LOUDSPEAKER REPAIRS

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

REPAIRS to Moving Coil Speakers, Cones and Coils fitted and Rewound. Fields altered. Prices Quoted Including Eliminators. Loudspeakers Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service, Estimates Free.—L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

ADVERTISEMENT INDEX

NEW RECEIVERS AND CHASSIS

ARMSTRONG Company pioneer firm supplying all British Radio receivers in chassis form, announce several new models as under:

ARMSTRONG Model 3NBP/T, 7v. (including Cathode Ray), all-wave radiogram chassis, complete with moving coil speaker, £7/18/6.

ARMSTRONG Model RF73/T; this 8-valve chassis has been designed in answer to many requests for a luxury chassis with smaller output.

ARMSTRONG Model RF94/T 10-valve Radiogram Chassis, with 10 watts push-pull output; £13/13.

ARMSTRONG Latest Catalogue Contains Illustrated Technical Data of Model 3NBP/T; also many new models.

ARMSTRONG Chassis Carry Generous Guarantee, no charges for material, labour, or carriage for 12 months.

ARMSTRONG Chassis Sent on 7 Days' Trial, packing and carriage free.

ARMSTRONG Co., 100, King's Road, Camden Town, N.W.1. Gulliver 3105.

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RADIOGRAPHIC PRICES ARE LOWEST. ARCTURUS, TRIAD, HYTRON.
5/- each all popular types.
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