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Edited by F. J. CAMM

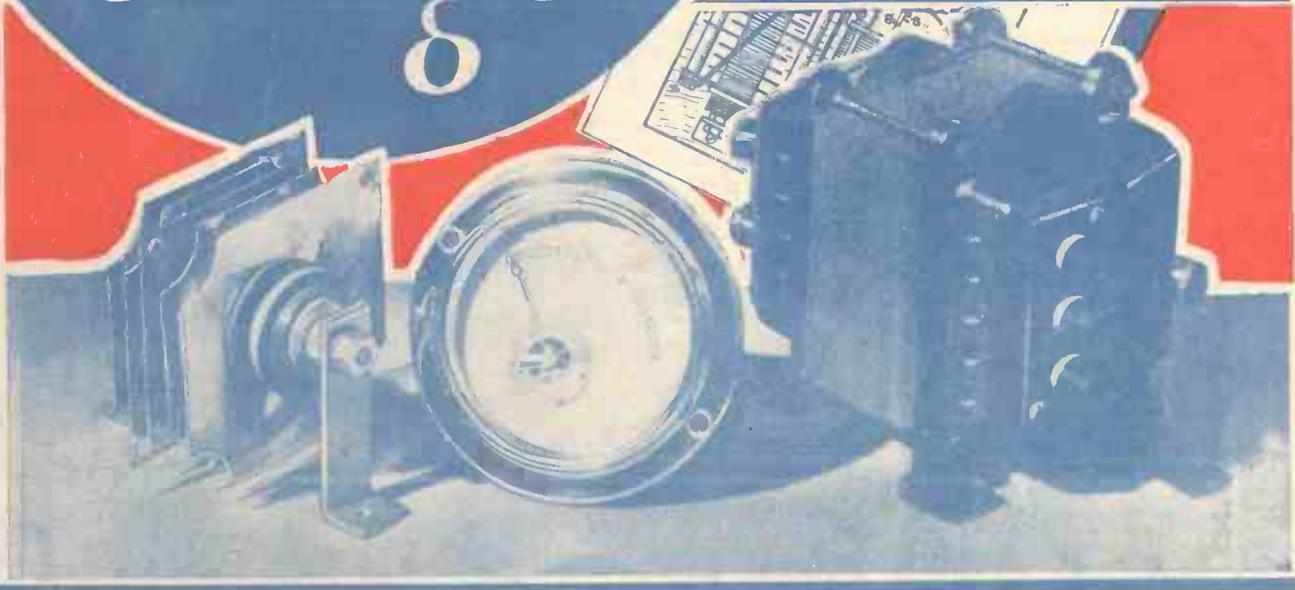
a GEORGE
NEWNES
Publication

Vol. 7, No. 182.
March 14th, 1936.

AND PRACTICAL TELEVISION

Making an
**A.C. Trickle
Charger**

Full Details Inside!

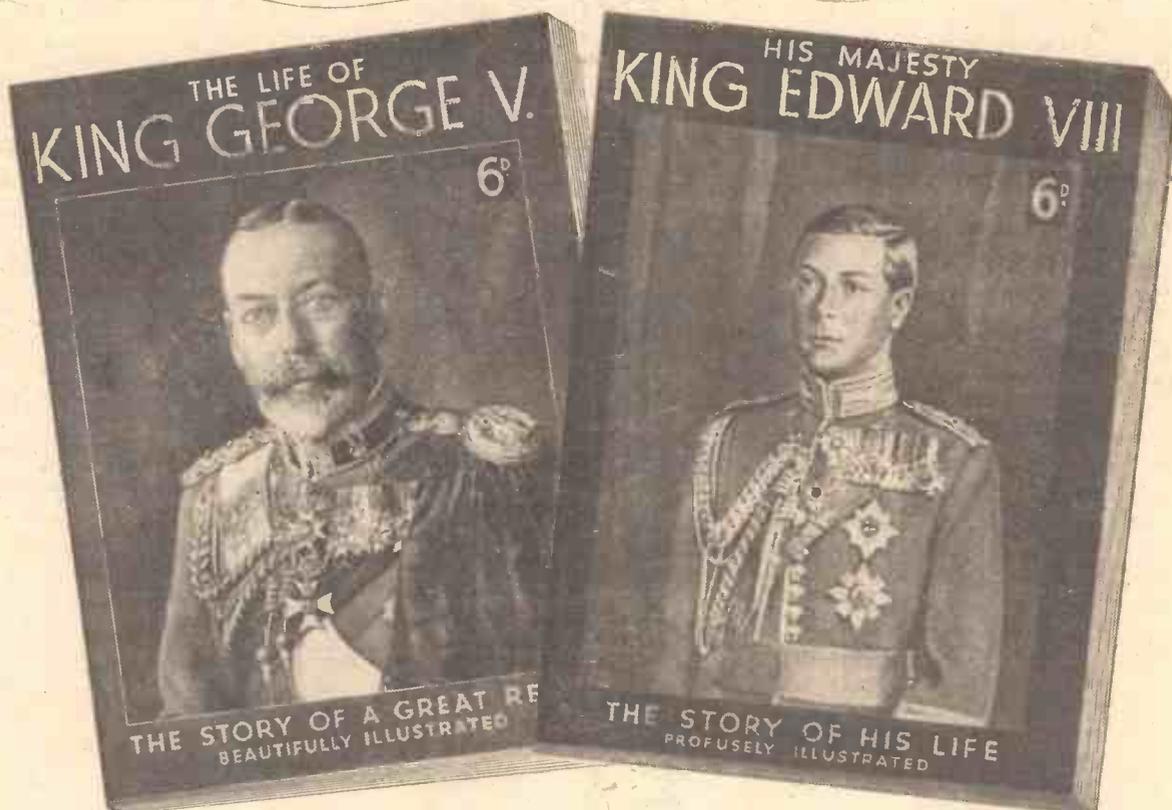


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Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. VII. No. 182. March 14th, 1936.

ROUND *the* WORLD of WIRELESS

An Interesting Experiment

WITH a view to ascertaining whether two channels can be used for other purposes, the German authorities synchronised the Berlin, Breslau, and Heilsberg transmitters on one wavelength, namely, 356.7 metres (841 kc/s), during the period March 2nd—7th inclusive. If the test proves successful there may be a general post amongst the German stations. In any case, during that week, as no transmissions were made on 316 metres (915 kc/s) and 291 metres (1,031 kc/s), we were given an excellent opportunity of listening to Radio Parade (Lisbon) and to Algiers in the late hours of the evening.

Greece's Lone Broadcaster

THE small private station which was installed at Salonica in 1929, and which was closed down some time back, is again on the air. Programmes are now regularly broadcast daily on 233.5 metres (1,285 kc/s), with a power of 1.5 kilowatts, from G.M.T. 17.00-20.00 on weekdays, and on Sundays from G.M.T. 11.30-13.00. The call is: *Empros etho Thessaloniki* (Hullo! Here is Salonica). All reports of reception should be addressed to: *Association des Sansfilistes Saloniciens, 37 rue Condouriotis, Salonica, Greece.*

A Quaint Source of Revenue

MOST of the small privately-owned stations in Belgium cover their running expenses by revenue either derived from local publicity or by voluntary subscriptions from listeners. In the late evening hours you may hear gramophone records played for the benefit of persons whose anniversaries coincide with the date, and to whom a special announcement is made. For these special broadcasts the station collects a fee!

The New Czech Transmitter

IT is anticipated that the Banska Bystrica 30-kilowatt station, to work on 765 metres (392 kc/s), will be ready for testing this month and will be formally inaugurated in May.

A High-handed Procedure

ACCORDING to a recent decree of the Berlin High Court, the German studios are entitled to broadcast gramophone records without the permission of the manufacturers.

Rumoured Suspension of Eiffel Tower

RUMOURS are current in Paris to the effect that the Eiffel Tower may be dismantled in 1937, to make room for the International Exhibition, and that some of the material may be used for the erection of a new station at some distance from the French capital.

Made in Palestine

WITH the opening of the new Jerusalem broadcasting station, the demand for receivers has been such that works have

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TUTOR THREE
IS CHEAP AND EASY
TO BUILD, and Has
World-wide Range!

Free Blueprint Next Week!

been erected at Tel Aviv to meet the demand of listeners. It is claimed that seventy-five per cent. of the components are of local manufacture.

The Voice of Leningrad

THE largest loud-speaker in the world has been installed at the sports stadium for broadcasting running commentaries and news items to an audience of one hundred thousand sightseers. The power of the instrument is 20 kilowatts, and it can be heard for miles around.

Relayed Television Transmissions

FOLLOWING a series of experiments the German Post Office Authorities recently successfully relayed a television transmission over a high-frequency cable to a distance of 400 kilometres. It is now considered practicable to supply the entire country with such programmes from the capital by means of smaller relay transmitters.

Moscow Becomes Up to date

ONE of the principal hotels in the Russian capital has been equipped with wireless apparatus feeding four hundred and thirty loud-speakers, the majority of which are installed in bedrooms. Concerts from the high-power and other stations are broadcast throughout the hotel.

Danish Weather Reports

LISTENERS dwelling in North Britain may sometimes hear a Danish transmission on 1,200 metres (250 kc/s). It is a weather report transmitted by OXJ, Thorshavn (Faeroe Isles), daily at G.M.T. 06.55, 12.55, and 17.55, for the benefit of the fishing fleets. The information, as a rule, is repeated in the English language.

A Talking Radio Beacon

OF all the radio beacons in the British Isles the most curious is that installed at Cumbrae, off the west coast of Scotland. In thick or foggy weather, when it operates, it gives out its name in radio telephony followed by the counting of cables and miles. As the signals are interrupted by blasts of a fog signal, a ship possessing an ordinary wireless set may ascertain its distance from the lighthouse. It is the number of cables or miles announced by radio when the end of the third blast of the fog signal is heard through the air. The channel on which the beacon operates is 1,044 metres (287 kc/s).

"Village Opinion"

THE fourth talk in the series "Village Opinion," to be broadcast on March 17th from the Western Regional, will deal with the Village School and vocational training. The schoolmaster will throw out a challenge which will be taken up by the squire, the farmer, and another educationist.

"On First Acquaintance"

H. R. TREWHELLA will be on the air for the first time in the programme "On First Acquaintance" on March 20th. He can make every conceivable type of noise with his mouth, from a cock crowing to a siren screeching. In the February edition of "On First Acquaintance," two or three of the artists were hailed as discoveries and will probably be heard in future programmes.

ROUND the WORLD of WIRELESS (Contd.)

Chief Engineer's Talk

ON March 19th the B.B.C. Chief Engineer, Sir Noel Ashbridge, will give a fifteen-minute talk on the new Northern Ireland transmitter and what it will mean to listeners.

Light Programme from Midland Regional

A LIGHT programme, to be given on March 17th, is contributed by Donald Groome, a Birmingham crooner; Roy Sanders and Eric Shrimpton, guitarists; and a Leicester duo known as Mr. A. and Mr. Bee. The last named are J. S. Pickard and Walker Rothwell. They first broadcast as pianist and tenor in 1935, and later devised their dual act "Original Stories in Song." Mr. Pickard is also an organist and a composer. The programme is followed by dance music by Tony's Red Aces.

Cassado at Leeds

CASPAR CASSADO, the celebrated Catalonian cellist, will be the soloist in Elgar's "Concerto in E minor" broadcast by the Northern Philharmonic Orchestra from Leeds Town Hall on March 14th. John Barbirolli will conduct the programme which also includes Wolf-Ferrari's overture "Il Segreto di Susanna" and Tchaikovsky's "Symphony No. 5 in E minor."

"The Vagabond Lover"

"THE Vagabond Lover" comes to the microphone again on March 17th, supported by Lorna Hubbard and Sydney Jerome, pianist. The Vagabond Lover specialises in sentimental songs for sentimental people. His appeal has been so successful that listeners have written to Broadcasting House, asking that his broadcast should take place at regular intervals at a later hour, so that they may not have to cancel engagements in order to listen to the "Vagabond Lover" serenading his unseen but romantic audience.

Gracie Fields

GRACIE FIELDS has promised the Variety Director to broadcast immediately on her return to England. She will travel straight from the docks at Southampton to Broadcasting House. At present she is concluding her very successful tour of South Africa, and has promised to write and rehearse her act on board ship on the way home. This will include her latest song additions and, in her own inimitable style, she will describe some of the more amusing experiences which have befallen her on her South African tour. British listeners in general, and those of her native Lancashire in particular, should note March 30th for this broadcast.

INTERESTING and TOPICAL PARAGRAPHS

Six Men Went Forth

WHEN a telegram is sent to friends overseas the sender is scarcely likely to give a thought to the man whose work was largely responsible for the success

of submarine telegraphy. Yet it was a Belfast man whose work in the sphere of electricity applied to submarine telegraphy so improved the manufacture of cables as to make ocean telegraphy a practical possibility. That man was Lord Kelvin. Born in 1824, Kelvin will be remembered for his connection with undersea telegraphy, but scientifically his most important work was in the field of thermo-dynamics. The

speaker who will deal with Kelvin's life and work in this talk, the third of the series called "Six Men Went Forth," is Professor Magnus Maclean, of Glasgow University and Emeritus Professor of Electrical Engineering in the Royal Technical College, Glasgow. This broadcast will be given in the Northern Ireland programme on March 13th.

YOUTH BEFORE THE MICROPHONE



Mary Lee, Roy Fox's 14-year-old child vocalist, making her first "His Master's Voice" record with the band.

A Blue Water Evening

ONCE every year a goodly company of seafaring men is assembled in the North-Eastern Hotel at Goole, Yorkshire, with the object of enjoying a "Captain's Blue Water Evening." This takes the form of a supper and singing; the songs including sea-shanties in which the whole company joins. Part of the proceedings, including toasts and

speeches, are to be broadcast on March 12th from the Northern Regional.

National Theatre in the North

TWO well-known Northern broadcasters will be the principals in a debate which is to be broadcast from the Athenæum, Manchester, on March 13th. The speakers are Edgar Lustgarten, whose gramophone recitals of "swinging" music are a popular feature, and Giles Playfair (son of the late Nigel Playfair), who has been associated with various Northern revues and variety programmes. The actual wording of the motion has not yet been decided upon, but it will be to the effect that the proper location of a National theatre is the North.

Dance Orchestra's First Broadcast

BRAM MARTIN and his Holborn Restaurant Dance Orchestra will be heard by listeners for the first time on March 15th. Although it is the first broadcast by this orchestra, Bram Martin's broadcast career goes right back to the early days of Savoy Hill, when he was a member of various instrumental combinations. In the first post-war season at Covent Garden he played the cello under Bruno Walter. Later he gave up straight music for the lighter type and, as a guitarist, played in the orchestras under the command of both Jack Hylton and Ambrose.

SOLVE THIS!

PROBLEM No. 182.

Jeffries built a three-valve receiver having band-pass coupling between the aerial and the first valve. Bottom-capacity coupling was used between the two tuned stages forming the band-pass coupler, the coupling condenser having a value of .005 mfd. The sensitivity of the set was adequate but the selectivity was poor; stations tuned in at two positions on the dial. What was the trouble? Three books will be awarded for the first three correct solutions opened. Address your letters to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 182 in the bottom left-hand corner, and must be posted to reach this office not later than the first post Monday, March 16th, 1936.

Solution to Problem No. 181.

The spindle of the wave-change switch in the Centaur Three acts as one of the four necessary contacts for cutting out the long-wave windings when medium-wave reception is desired. Connection is made between the switch spindle and the coils via the switch bracket and the metallised surface of the baseboard. This path was incomplete in Jones's set owing to the absence of the metallising.

The following three readers successfully solved Problem No. 180, and books are accordingly being forwarded to them:

H. Hodgson, Newton, Nr. Clitheroe; J. S. Garrett, 54, Clarence Road, St. Philips, Bristol 2; E. G. Evezard, 16, Farm Lane, Purley, Surrey.

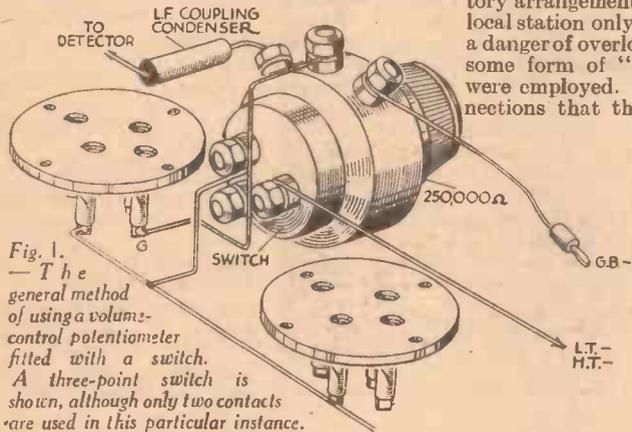
SOME IDEAS ON SIMPLIFIED CONTROL

Details of a Few Methods of Using One Component for Two Purposes and of a Successful Fixed Reaction System. The Ideas Described are of Interest to the Experimenter and Constructor

ONE of the most important changes in receiver design during the past few years has been the simplification of control. Circuits have been made more complicated by the introduction of new and improved components and systems, but the outside of the set has been made better to look upon and far less complicated in design. It is not necessarily that fewer controls are now used or required, but that it has been found possible to combine two controls in one, or to make one component perform two entirely different functions.

Volume-control Switch

One very well-known example of a dual



control is the volume-control potentiometer fitted with an on/off switch. The normal method of using this is as shown in Fig. 1, where it is assumed that the potentiometer is used as a volume control between the detector and first low-frequency valves, the switch being used simply to connect or disconnect the low-tension supply. As the switches fitted to these dual components are of the quick-make-break pattern they can be used for switching in mains receivers as well as in battery-operated sets as indicated. Additionally, the potentiometer may be used for variable-mu bias control instead of being employed to adjust the input to the L.F. amplifier. It is worth mentioning that it is now possible to obtain potentiometers in nearly all values with self-contained switches, whilst the latter may be of the ordinary on/off or three-point pattern.

Local-distance Switching

An entirely different method of using a component of the type just referred to is shown in Fig. 2, where it will be seen that the switch acts in conjunction with a portion of the bias resistance of the first valve. The idea is that when the volume control is turned to its minimum position (anti-clockwise), not only is the input to the low-frequency amplifier reduced to its lowest value, but also the amplification of the variable-mu H.F. valve is diminished. This scheme is often found valuable,

especially in a long-range "straight" receiver when it is preferred not to employ a normal variable-mu control, or where it is desired that a single volume-control potentiometer should be able to vary the output when using either "radio" or "gram." For normal reception of all but the local stations the H.F. valve operates at maximum efficiency, and the volume is varied simply by altering the input to the L.F. stage. This is normally a perfectly satisfactory arrangement, but when reception of the local station only is required there might be a danger of overloading the first valve unless some form of "local-distance" switching were employed. By so arranging the connections that the bias on the first valve is increased by a suitable amount when the volume control is turned to the "off" position, however, both the first valve and the low-frequency stages are completely safeguarded against overloading.

Resistance Values

The values of the two resistances connected in series between the cathode of the variable-mu valve and earth may have to be found by trial, although a good idea of the best values can be obtained by making reference to the valve-makers' recommendations. For example, if they advise a fixed bias resistance of 500 ohms and a variable resistance of 2,000 ohms, it will generally be found perfectly satisfactory to keep to the former value, using a fixed resistance of one half the latter in place of the variable one used with the generally-employed circuit. These are the values which are shown as typical examples in Fig. 2. If it is found that the "off"

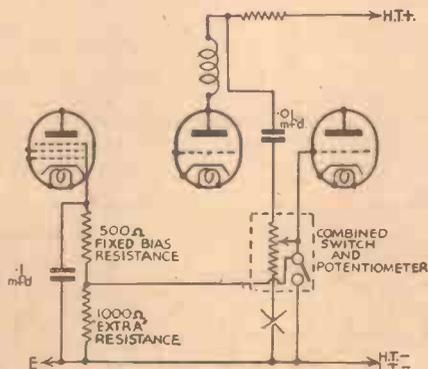


Fig. 2.—Another method of volume-control in which the switch acts in conjunction with the bias resistance of the first valve.

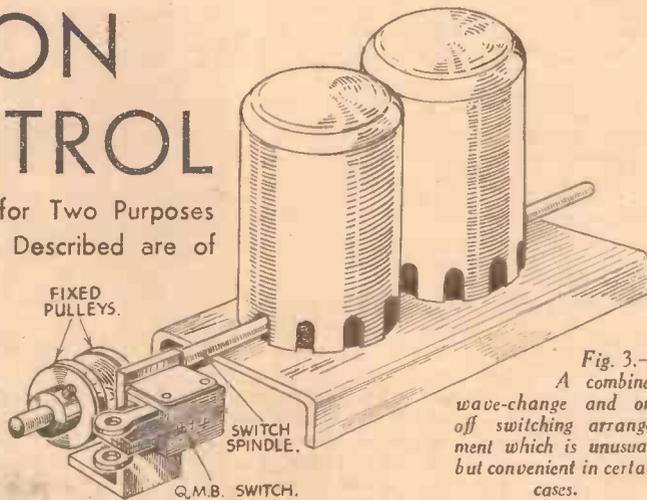


Fig. 3.—A combined wave-change and on/off switching arrangement which is unusual, but convenient in certain cases.

position on the switch reduces volume to too great an extent—as it probably will in most cases—this difficulty can best be overcome by joining a fixed resistance in series with the potentiometer at the point marked X in Fig. 2. The most suitable value for this resistance can best be found by trial, but, as a general rule, its resistance should approximate to one-half that of the potentiometer. By following this idea the input to the L.F. valve can always be maintained at a reasonable figure at the same time as the H.F. stage is working at maximum efficiency except for local-station reception.

Wavechange On/off Switching

An idea which can sometimes be used for dispensing with a panel-mounted on/off switch is shown in Fig. 3. This is applicable for use with certain coils fitted with self-

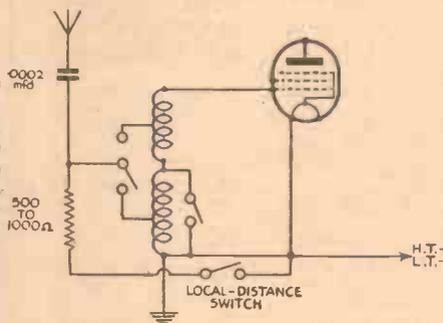


Fig. 4.—The switching system shown in Fig. 3 can be used as a "local-distance" control by using the simple connections shown here.

contained wave-change switches, the operating spindle of which is free to move backward and forward. It can be seen that a couple of model fixed pulleys are mounted on the end of the spindle, and a Q.M.B. switch, mounted on a small metal bracket, is arranged so that its "dolly" is controlled by the movement of the pulleys. A little experiment is required to determine the most suitable height of the switch and the distance apart of the pulleys, but once this has been done the idea will be found to work splendidly.

If desired, the on/off switch could be replaced by a single-pole change-over switch of the Q.M.B. type, which may be employed for radio-gram switching, the connections being made in the usual manner. Alternatively, the simple on/off switch can be used for a different kind of "local-distance" control, for it might be connected to one end of a fixed resistance,

(Continued on next page)

SOME IDEAS ON SIMPLIFIED CONTROL

(Continued from previous page.)

of which the other is joined to the aerial terminals, as indicated in Fig. 4. When the switch is in the "on" position the fixed resistance—a value between 500 and 1,000 ohms will generally prove satisfactory—is connected in parallel with the aerial and earth. In consequence, the input to the first valve is appreciably reduced and overloading thus prevented.

Battery and Radio-gram Switching

A method of using a single double-pole double-throw switch of the anti-capacity type for connecting the batteries and changing over from radio to gramophone or pick-up is shown in Fig. 5. Since the two "outside" terminals of the front section of the switch are bridged the batteries are in circuit whether the knob is turned to the left or right. The rear portion of the switch is used as a standard type of radio-gram switch, so that the grid of the detector valve is connected to the grid condenser when the knob is turned anti-clockwise, or to the pick-up when it is rotated in the opposite direction. A suitable type of switch for this purpose is made by Wearite, among others. It should be made quite clear that the system just described is intended for use on battery sets only, for it is imperative that a quick make-break switch should be employed where the mains circuit has to be broken.

Eliminating the Reaction Control

The reaction condenser often causes difficulty in operation, especially to "the family" who are not technically inclined, and it is often desired to dispense with this control altogether. With the simpler type of "straight" circuit, however, the loss of reaction cuts down signal strength completely, and makes it impossible to receive many of the more distant stations. A good compromise between full reaction and no reaction can be obtained by replacing the normal variable reaction condenser by a pre-set which may be mounted inside the set, and connecting a second pre-set of .0003-mfd. maximum capacity between the anode of the detector valve and earth, as shown in Fig. 6. The only objection to this arrangement is

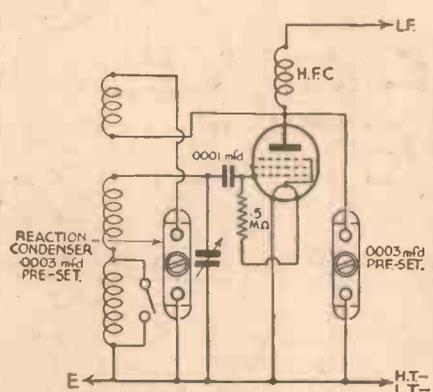


Fig. 6.—A system of fixed reaction, using two pre-set condensers in conjunction with an H.F. pentode.

that the set generally becomes far more sensitive on some wavelengths than on others, due to the fact that the fixed reaction has more effect at certain settings of the tuning condenser.

Much depends upon the design of the particular tuning coil employed, but a good deal can be done in the way of "smoothing out" the control by carefully finding a correct "balance" between the settings of the two condensers. For example, if it is noticed that the set tends to oscillate, or signals become louder, as the wavelength is decreased, it is a sign that the anode-earth condenser should be set to give a slightly higher capacity. After this has been done it might be possible to increase the capacity of the reaction condenser with good effect and without causing the valve to oscillate.

Finding the Best Setting

With a little patience this arrangement can often be made to provide excellent results, and it may be found that an improvement is obtained by inserting

a 200-ohm non-inductive fixed resistance between the reaction condenser and the anode of the valve. Where the condenser is on the "earth" side of the reaction winding, the resistance should be placed between the anode and the coil. It is a fact that this system nearly always proves to be most satisfactory when a high-frequency pentode is used as detector, and when the anode voltage to it is fairly high. After experimenting with a few coils the writer has been able to produce a three-valve receiver comprising two H.F. pentodes and a power pentode which gives remarkably good results at every wavelength setting by using this fixed-reaction circuit. It is a mains-operated set, and the anode and auxiliary-grid voltages applied to the pentode used as detector were 100 and 70 respectively, whilst the grid condenser and leak had values of .0001-mfd. and .5 megohm. The coil used in the final set was a home-made one, but equally good reception was obtained when using three different ready-made coils of both air-core and iron-core type. When using one of the iron-core coils it was found necessary to increase the value of the series resistance to 1,000 ohms before uniform reaction could be obtained over the whole of the tuning scale. With the final arrangement it was possible to make the set oscillate at any wavelength on the medium-wave band by turning the knob of the pre-set reaction condenser through one half turn. Despite this, however, the set never fell into oscillation nor did it become so near to oscillation that distortion was introduced.

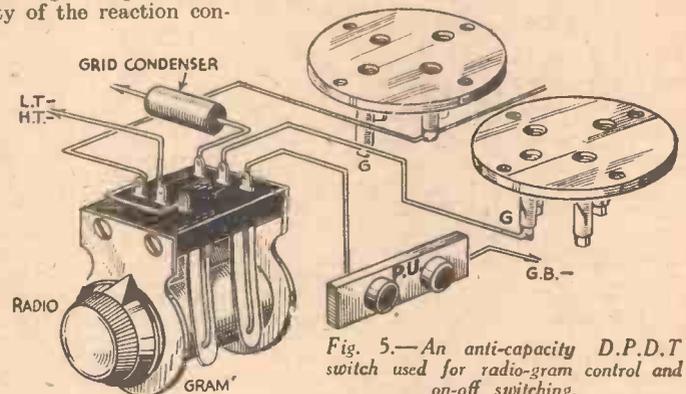


Fig. 5.—An anti-capacity D.P.D.T. switch used for radio-gram control and on-off switching.

Mexico Plans a Super-super

XERA, the 50-kilowatt station at Villa Acunha (Coahuila), Mexico, at present working on 357.1 metres (840 kc/s), and of which the studio is at Del Rio, Texas (U.S.A.), is likely to become the world's largest transmitter. Its owner proposes to increase the power to 1,000 kilowatts in the near future!

Try for Brazil

IN view of the excellent reception of many of the Buenos Aires broadcasts in the British Isles, it is worth while trying to log a Brazilian station. An attempt should be made to tune in Radio Farouphilla (PRH2), Sao Paulo, a new 25-kilowatt on 300 metres (600 kc/s). It is on the air nightly until G.M.T. 03.00.

Those Misleading Broadcasts

ON 410.4 metres (731 kc/s) daily, at G.M.T. 13.30, you may pick up a weak transmission in the French language. Although at first you might be led to attribute it to Marseilles PTT, log it as emanating from Seville, which, at that time,

ITEMS OF INTEREST

puts out a French news bulletin for the benefit of listeners in North Africa.

Oriental Music at Radio-Toulouse

FROM G.M.T. 23.30-00.30 during the winter months and from 22.30-23.30 when summer comes round, Radio-Toulouse proposes to give once weekly a broadcast of Arab and other Oriental gramophone records. At present on most nights it is possible to pick up this kind of music direct from Radio Maroc (499.2 metres—601 kc/s).

Aberdeen Variety

ABERDEEN will demonstrate its capacity for economy on March 14th, when a miniature variety show, consisting of no less than fifteen turns, will be broadcast in as many minutes. The programme is appropriately entitled "Multum in Parvo,"

as a reminder that Aberdeen has a reputation for Latin as well as frugality.

Dr. Johnson

A FEATURE programme written round the most compelling personality in the history of English letters will be broadcast from Regional stations on March 18th. It will not be biographical in form, but will be an attempt to build up a picture of Dr. Samuel Johnson from his own works, his sayings as reported by Boswell and others, and letters written by him, to him, and about him. Episodes and phases of his life which will be dealt with will include his first dreary days as a hack writer in Grub Street, the compilation and publication of the famous dictionary, the "frolic" with Beauclerk and Langton, Johnson's first meeting with Fanny Burney, and the journey with Boswell to the Hebrides. The programme has been devised by Moray McLaren with the assistance of S. C. Roberts. Mr. Roberts, who is one of the greatest living authorities on Johnson, and a past President of the Johnson Society, is also an amateur actor of experience and talent, and will himself play the rôle of "the Great Cham."

An Efficient A.C. Trickle Charger

In this Article Constructional Details are given of an Inexpensive Unit for Charging 2-, 4- and 6-volt Accumulators at 1 amp. from A.C. Mains

MANY constructors have at times wished they could abolish the bugbear of carrying their accumulators backwards and forwards to the charging station.

The accumulator, moreover, is the worst treated part of the wireless set, and it is surprising the number of constructors with battery or eliminator-fed sets, who look

For the baseboard use $\frac{3}{8}$ in. plywood; for the cabinet and panel $\frac{1}{2}$ in. plywood. Dimensions for panel and baseboard are given in Figs. 2 and 4.

The cabinet may be nailed, screwed or glued together, according to the constructor's ability in carpentry. A hole must be made in the rear of cabinet to admit the mains lead, as well as several holes for ventilation purposes.

There are two methods of charging, the tapped secondary and tapped resistance. The tapped secondary method of charging is to be preferred, and this is the one described. Mount the components on the baseboard as shown in the wiring diagram, Fig. 1. Their position is important only as regards ease of wiring. The panel should be prepared by drilling the required number of holes for ammeter, rheostat, terminals, sockets, and the hole for the transformer tapping wire marked X in this particular illustration.

Next mount the terminals, an ammeter, rheostat, and the three sockets on the panel, fit same to the baseboard by means of small screws, and wire up as shown in the wiring diagram, Fig. 1. At this point it will be noticed that the transformer is provided with a

tapped secondary winding for obtaining the different voltages required for charging 2-, 4-, or 6-volt accumulators. This explains the tapping lead marked X Fig. 1, which is brought out through the hole in the panel. The rheostat allows charging rates to be varied from .25 to 1 amp., and it will be generally found better to charge a little under 1 amp.

To fully charge a 10-ampere hour accumu-

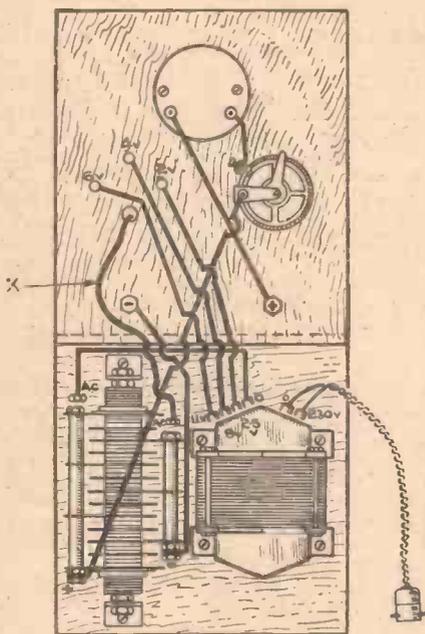


Fig. 1.—The wiring diagram.

upon a charger with a certain amount of mystery, believing that its construction is beyond their abilities.

This is not the case, however, for the unit described in this article is extremely simple, easy to understand, and easy to build.

The components consist of a step-down transformer, an L.T. rectifier, 0-6 ohm rheostat, 0-3 amp. ammeter, and two terminals.

If desired, a 1 amp. fuse may be inserted in the mains lead, marked with a cross in Fig. 3.

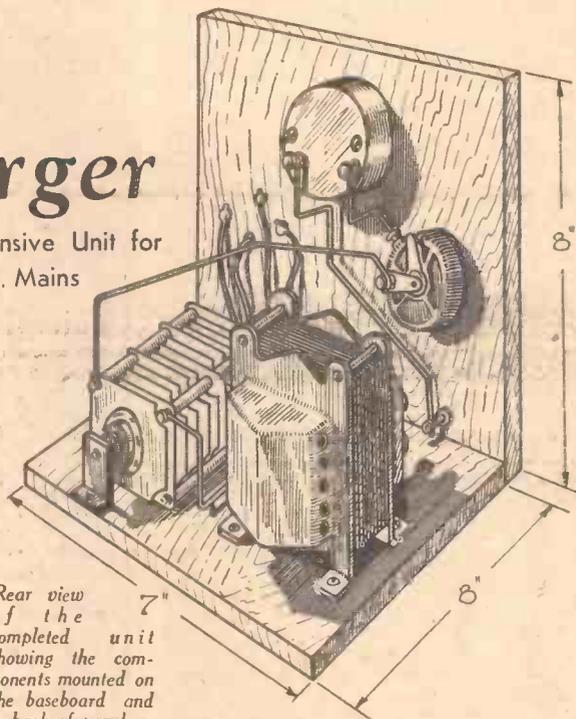
Construction

First obtain the required amount of

COMPONENTS REQUIRED

- One L.T. transformer (Heyberd W.36).
- One L.T. rectifier (Westinghouse L.T.4).
- One 0-6 ohm rheostat (Igranic).
- One 0-3 amp. ammeter (Sifam).
- Two terminals, one red, one black (Belling-Lee).
- One plug and three sockets (any good make).
- One bayonet plug (any good make).
- Flex, glazite wire, screws, handle, etc.

wood for the cabinet; any kind of wood will do, but teak as used in the original model is much to be preferred.



Rear view of the completed unit showing the components mounted on the baseboard and back of panel.

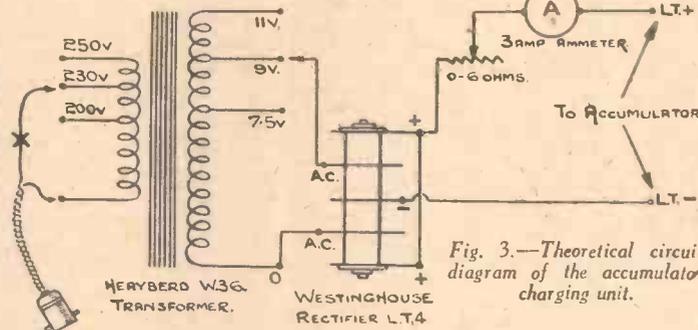


Fig. 3.—Theoretical circuit diagram of the accumulator charging unit.

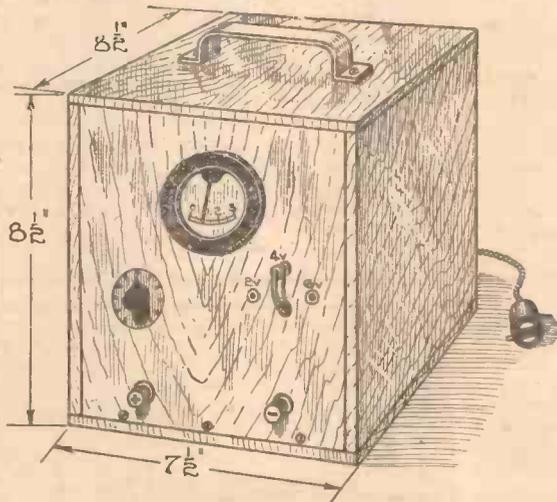


Fig. 4.—The completed instrument in its cabinet.

lator, and assuming a charging rate of $\frac{1}{4}$ amp. it will take 10.75 hours, i.e., 13.3 hours. As it is better slightly to exceed this time, the accumulator would take, say, 14 hours.

A 20-ampere hour accumulator would require 27 hours.

A 25-ampere hour accumulator 34 hours, and so on.

Charging Range

Lead X in 2-volt socket— one 2-volt accumulator.

Lead X in 4-volt socket— two 2-volt. acc. in series, or one 4-volt acc.

Lead X in 6-volt socket— three 2-volt acc. in series, one 4-volt acc. and one 2-volt acc. in series, or one 6-volt acc.

The usual rules concerning the care of the accumulator must, of course, be observed.

Renovating Marked Cabinets

THERE is no reason why a scratched or dull cabinet should be tolerated. For after all a radio set is an article of furniture as well as a musical instrument. The majority of marks that make a cabinet look shabby are scratches, chips, and finger marks, and such cabinets can easily be rejuvenated by the following method which should be followed for both french polished and sprayed cabinets.

The materials required are: a small bottle of french polish, a "water" stain-in powder form to match the colour of the cabinet, and a fine paint brush.

For Scratched Surfaces

To touch up scratches or chips, proceed as follows: Place a little polish in a saucer and add just enough of the powder stain to colour the mixture, mix well and gradually add more powder until the approximate colour required is obtained. It is as well to be a little on the light side as the colour can always be darkened when adding a second coat.

Thoroughly clean the scratch with a cloth dipped in methylated spirits and carefully "paint" the scratch with the mixture of stain and polish, taking very great care not to get any on the polished surface of the cabinet, or the surface will be spoilt. Should the mixture get on to the cabinet, wipe it away as quickly as possible.

When the first coat has dried thoroughly, a second may be applied, and if the scratch

Fig. 1.—Pour the polish on to the cotton wool and not on to the surface of the polishing pad.



Fig. 2.—The and gradually remove the polishing pad surface. Rub it over occasionally by all means, but use only a soft, clean duster with no polish.

has been coloured to match the rest of the cabinet by the first application of the mixture, the second "dose" should be of polish only. Otherwise, continue the treatment as outlined above with another coating of the mixture. When tackled in this way, the scratch will soon be filled and will scarcely be discernible.

Using Plastic Wood

Some scratches, or chips, are too deep to be removed by this method and plastic wood should be used. This is obtainable from most ironmongers and, since it will not take a stain, the coloured variety should be used and a little pressed firmly into the scratch with the blade of a pen-knife. Here again, take care not to allow any of the plastic wood to creep on to the rest of the cabinet, as it contains a powerful solvent which will quickly attack the polish and give it a matt surface. Smooth off the surface of the wood as soon as it is applied, and leave to dry for at least an hour. Plastic wood contracts as it dries,

so the surface when applied should be just slightly above the level of the cabinet. When hard, it should be carefully levelled down with a very fine sandpaper. The mixture of stain and polish may then be applied as before, and any irregularities in the surface of the plastic wood will be

Simple Instructions for Renovating Scratched or Marked Cabinets, with Hints on Re-polishing, are Given in this Article.

levelled up by this application. This method is so effective that the position of a scratch may be practically hidden.

When a cabinet is merely dull, the application of a little "oilet" or "liquid glass" coupled with plenty of "elbow grease" should be tried. It is surprising what a few minutes of such treatment will do, but if no improvement is obtained, "Karpol" may be tried. In fact, any of the many commercial car polishes (cellulose type) are extremely good, not only for removing finger marks and generally cleaning up the cabinet, but also in giving an extremely high polish and removing fine scratches from most of the finishes used in cabinet manufacture. Such treatment is of no avail when the cabinet has been hand french polished.

Perhaps the worst kind of cabinet to tackle is one on which the actual polish surface has worn off due to continual use and polishing. Too many people make a habit of regularly polishing their cabinet with polish, with the result that they do more harm than good.

In such a case, the only way to make a good job of the cabinet is to "strip" it, that is to remove all that remains of the existing polished surface by well rubbing the cabinet with fine sandpaper. Always sandpaper the way of the grain, never across the grain, and make a perfectly smooth and uniform surface before attempting any re-polishing. After sandpapering, clean the cabinet with a duster and then with a rag moistened with methylated spirit to remove all grease.

This time, however, the polish cannot be

applied with a brush, or a very uneven surface, showing all brush marks, would result. The following method should be followed, and although it may seem a little tedious, it will render results equal to a new cabinet, and is well worth the time and patience.

Polishing Hints

Place a small amount of cotton wool in the centre of a square of linen or fine rag as in Fig. 1, and pour sufficient of the staining polish (which should be made up as described above), on to the wool so as to damp it right through. Screw the rag round the wool so as to make a tight pad, as in Fig. 2, with a smooth polishing surface. Slight pressure of the fingers on the sides of the pad should cause some of the polish to ooze through the linen.

Apply the polish in circular motions, as indicated in Fig. 3, with a gentle but firm pressure, taking care to cover every

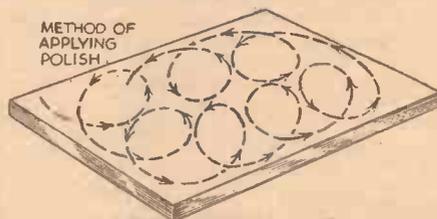


Fig. 3.—Always apply the polish with circular movements, and never stop in the middle of a piece of work.

portion of the surface with a layer of polish. If more polish is required, never pour it on to the rag, but undo the pad and add polish to the cotton wool. If the pad sticks to the surface being polished, apply a spot of linseed oil to the actual polishing surface of the pad. On no account add more than one spot unless the surface is extremely large. This will prevent the pad sticking as the polish hardens.

When the first application has dried thoroughly, rub it over very lightly with extra-fine sandpaper, working the way of the grain as before, and then apply another layer of polish, but using, this time, a slightly drier pad, and working in very small circles. Work up and down the surface in these small circles and, at the end of each line, draw the pad very lightly across the newly-polished surface in the direction of the grain.

If it is found that the surface is patchy when dry, i.e., polished in some places, but with dull patches here and there, the surface must be lightly sandpapered once more and the above procedure repeated again, until, finally, a highly-polished surface is obtained. Practice, of course, makes a great deal of difference to the ease with which a cabinet may be completely repolished.

Finally, there are one or two hints that may save time and patience, viz., never attempt polishing except in a dry atmosphere; always see that the pad is clean and smooth and, above all, never go over a polished surface until it has become quite hard. It is not the amount of polish, nor the pressure, that produces a good surface, simply the continued rubbing. Speed does not matter, but rather an even, steady circular movement with even pressure.

If the pad is stopped on the work, a mark will be made which can only be removed by sandpapering off the entire surface.

To Track That Fault—to learn how a wireless receiver works, obtain

EVERYMAN'S WIRELESS BOOK

2nd Edition

by F. J. Camm, 5/-, or 5/6 by post from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

Phase Reversal—2

The Application of the Out-of-phase Signal to Two Separate Valves in "Push-Pull" is Dealt with This Week - - - By W. J. DELANEY

WE saw last week how the applied signal could be split up across a resistance so that each end of the component was at equal and opposite potential or voltage. Now to employ this signal for ordinary L.F. amplification purposes it is only necessary to join a valve to each end of the resistance and our two valves would then be in what is commonly referred to as "push-pull." This term is actually more relative to the fact that the valves are adjusted to work on a certain part of their characteristic curves. Perhaps, before going further, it might be mentioned that Class B, Q.P.P., and one or two other similar circuits are only ordinary push-pull schemes in which the valves which receive the out-of-phase signal are biased in a certain manner, and they may therefore be considered under the heading of ordinary push-pull. This term is applied to the two valves owing to the fact that the out-of-phase signal results in an increase in the normal

up and each valve only has one half the voltage to deal with.) It will be obvious that to preserve the exact electrical balance, and to apply at G1 and G2 a signal which is exactly 180 degrees out of phase, the point E must be an exact centre or zero point. Although the transformer may be correctly wound, it is possible under certain circumstances to upset the balance by the external wiring. A circuit sometimes adopted with an ordinary L.F. transformer, and which is electrically similar, is shown in Fig. 2, where a centre-tapped resistance (or two exactly equal resistances) are joined across the secondary winding, but this scheme modifies the characteristic of the transformer and will result in distortion or uneven response.

Resistance-capacity Coupling

To dispense with the transformer, and

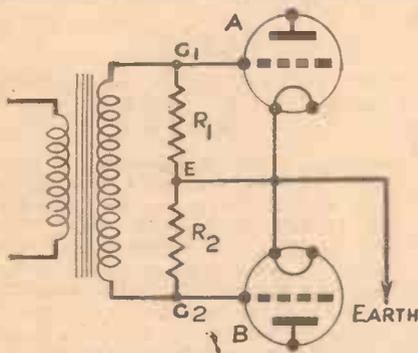


Fig. 2.—An alternative method of obtaining the centre-tapping on an L.F. transformer.

anode current in one valve and a decrease in the anode current of the other, and thus one valve may be said to push and the other to pull.

Transformer Coupling

The simplest method of applying a signal of this nature to our two valves is to use an ordinary L.F. transformer in which the secondary winding has been tapped at the centre. This winding may thus be regarded as the resistance which was shown in Fig. 5 last week, and in Fig. 1 above, the two ends of the secondary (G1 and G2) are connected to the two grids, whilst the centre tap (E) is connected to earth or the cathodes (filaments in the case of battery valves). The signal which is induced from the primary winding in the ordinary way is thus present across the whole of the secondary winding, but the explanation given last week with regard to Fig. 5 now holds good, namely, the centre point will "tap off" one half of the total voltage, and thus, assuming that there is a total voltage across the secondary of 20 volts, only 10 volts will be applied between E and G1 and E and G2. (Incidentally this explains the value of a push-pull circuit for preventing overloading troubles, as the signal is split

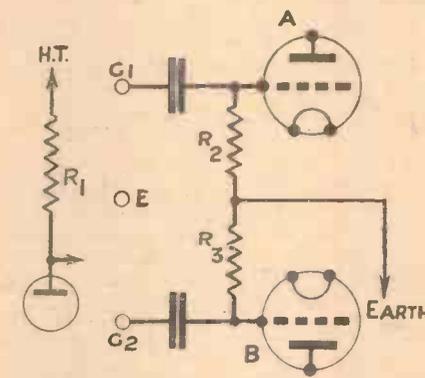


Fig. 3.—Two valves employing capacity coupling, showing the normal resistance employed in the previous stage.

to make full use of the distortion-free qualities of the double output stage, many listeners prefer the resistance-capacity method of coupling, but when using this for push-pull purposes many difficulties are encountered. In Fig. 3 the two valves are depicted, and it is apparent that the signals must be applied between G1 and

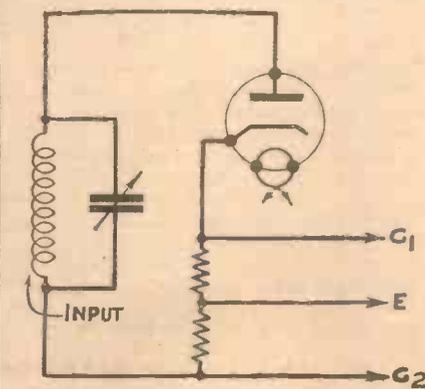


Fig. 4.—A method of obtaining a resistance output with centre-tap for use with the circuit shown in Fig. 3.

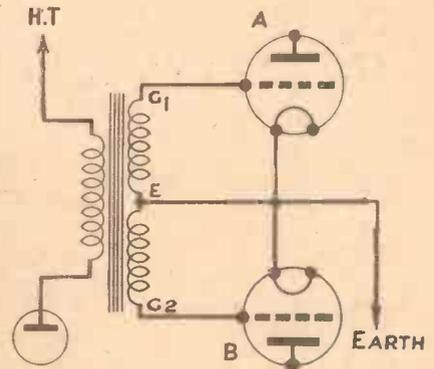


Fig. 1.—The simplest method of obtaining "push-pull" working, using a centre-tapped transformer.

G2, with the centre point at E as in the previous circuits. On the left of this diagram is a reproduction of the normal anode circuit when R.C. coupling is adopted, and it will be seen that a resistance is joined in the anode circuit. Now this could not be centre-tapped as it stands, as there would be nowhere to connect the tapping. It could not be joined to earth as it would earth the H.T. supply, and if the H.T. were applied to the centre point then there would be no signal voltage across the upper half of the resistance. It is obvious, therefore, that this resistance must be included in some part of the preceding valve circuit where the entire signal currents are passing through it, and where it is possible to take a centre tap back to the earth, cathode, or filaments, for all of the latter points are in effect identical and form the return path to the output valves. (Reference to Fig. 1 will show that each grid circuit is completed through the "load" resistance—or that component across which the signal voltage is developed—and back to the cathode or filament, whence the normal electron stream completes the circuit to the grid.)

Mains Valves

The battery user is, unfortunately, unable to adopt any satisfactory circuit for use with this form of coupling, but owing to the existence of the cathode in the indirectly-heated mains valve, users of mains apparatus can adopt one of several schemes to obtain the necessary split resistance circuit. In Fig. 4, for instance, a simple diode is shown, with the input circuit joined between the anode and cathode, and to complete the circuit the load resistance is included in the cathode lead. If this is divided as previously

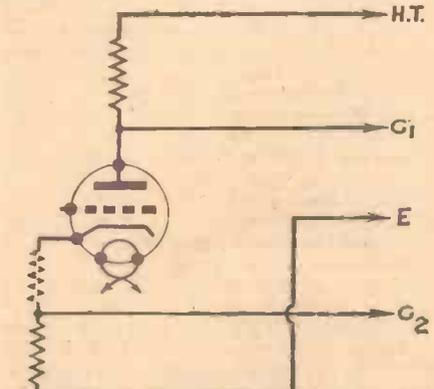


Fig. 5.—Using a triode valve this scheme may be used in place of that shown in Fig. 4. Smaller circuit features are omitted for clarity.

mentioned, the centre tap may be joined to earth (H.T.—) and the ends of the resistance taken to the two grids of the output valves. Thus, the arrangement is identical with our fundamental circuit, Fig. 5 shown last week. As the anode and cathode of a normal valve are at opposite potential, it is also possible to obtain the two separate signals by utilising a resistance in the anode circuit and a similar resistance in the cathode circuit

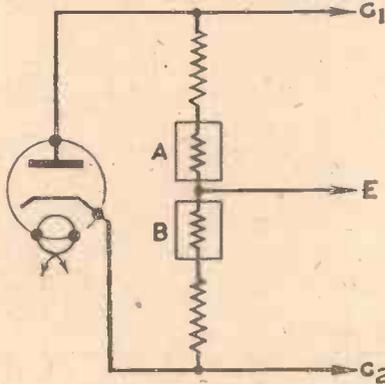


Fig. 6.—The circuit of Fig. 5 re-drawn to show how the centre-tapped signal input is obtained. A and B are the battery and bias resistances.

as shown in Fig. 5. It should be noted, however, that the bias for the valve is obtained by the usual resistance in the cathode lead, and although this may be very small it introduces a modification of the balance and thus destroys part of the valuable circuit gain of the true push-pull circuit. In case the valve in Fig. 5 confuses the circuit for the beginner, it may be re-drawn in the form shown in Fig. 6, where it will be seen that the signal is present across the valve, and as H.T. positive and H.T. negative may be considered as a junction between the ends of the resistances (for H.T.— is joined to earth, and the resistance of the H.T. supply is, or should be, practically negligible) the original circuit is obtained. One other scheme is shown in Fig. 7, where the diode is again employed, and the output for the two valves is also taken from cathode and anode, with the tuned circuit (across which the signal is developed) joined to these two points through load resistances, or a split single load resistance.

Drawbacks and Disadvantages

In view of the fact that it has already been shown that the signal should be at a phase difference of exactly 180 degrees in order to obtain the full advantage of push-pull amplification, it will be obvious that only in Fig. 1 (with a good com-

ponent efficiently wired) and Fig. 4 are the requirements met. In the remaining circuits there is a slight out of balance effect introduced by the inclusion of the additional circuits and components. Whether or not this is material depends, of course, upon the listener. In the paraphase and duophase arrangements, however, an endeavour is made to counteract these defects and to obtain a perfectly-balanced signal having the required phase difference, and these will be dealt with in the next article.

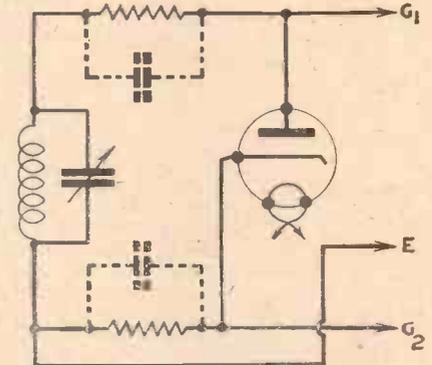


Fig. 7.—An alternative scheme employing a diode detector for resistance-capacity coupling.

The B.B.C. Postbag

By RUTH MASCHWITZ

"I HAVE just been recording for a gramophone company with an electrical larynx. My own had to be removed owing to throat trouble, and the present one is so satisfactory that my singing is better than ever. I feel sure this would be of interest to listeners and should very much like to broadcast."

"Dear Mr. Henry Hall—Would you mind asking your band to play up a little because my battery is running down, and I can't afford to get another one just yet . . ."

"I thought you might like to know that my twins were listening to one of the morning talks on the upbringing of children the other day when they heard that comforters were bad things to use. Thereupon they took them straight from their mouths and flung them into the fire!"

These are some of the letters which find their way to Broadcasting House. As an institution it attracts the interest of all and sundry, from the small boy who writes to ask: "What am I to do, my dog's ears keep twitching after listening to the 'Romany?'" to the eminent foreign professor who sends congratulations on musical programmes.

About 150,000 letters a year are received dealing with programmes alone, of which 30,000 are inquiries concerning matter that has been broadcast. As a rule, most of these ask for further information on the subject of the programmes, but sometimes an interesting story will come to light.

A Link with Nelson

A month or so ago Miss Horatia Nelson, the ninety-year-old granddaughter of the famous Admiral, came to the microphone and mentioned that a much-valued seal which had been made for Lord Nelson and engraved with the initials H.N. had been lost. Within a few days' time a letter reached the B.B.C. from a listener in Pontypridd who, forty years before, when he had been a jeweller's assistant, had come into contact with a similar seal. He had made a wax impression of it and

offered this to Miss Nelson. Meanwhile, the bank manager of one of the announcers, who was connected with the Nelson family, wrote that he was in possession of the seal itself. Sad to say within a fortnight of her broadcast the old lady died.

In some cases there is evidence that certain programmes, particularly talks, have made a most vivid impression on listeners' minds; in fact, as a result they have sometimes taken unpremeditated action.

Miss Wace, who is in charge of the Morning Talks, was filled with a grave sense of responsibility when the other day a letter arrived from a married couple to say that they were so inspired by a talk on the joys of country life that they had sold up their home and bought a cottage and a little land in the country. Another listener, who had spent fifty years in America, stated that he was so moved by a broadcast description of his old home town that he straightway arranged to pay it a visit, and has only recently arrived back from the States.

Suggestions from Listeners

Then there is the type of letter, which makes suggestions either for new programmes or a re-arrangement of old. In most cases they cancel each other out. One pines for more dance music, which another deprecates, asking for poetry readings, a third condemns this "highbrow nonsense," and demands longer variety shows.

Occasionally, however, some really helpful innovation is suggested—as, for example, the re-grouping of the instruments round the microphone in the Foundations of Music series. Two telegrams arrived from a listener in the North, dealing with this question, followed by a third simply saying "Thank you."

Many of the staff at Broadcasting House have a fan mail, particularly the Aunts and

Uncles of the Children's Hour, who have a number of regular correspondents. There is a sad story of one small boy who used to write regularly, and then his letters became rarer, and soon afterwards ceased altogether. One morning a note arrived from his mother to say that he was dying, and would the Children's Hour be kind enough to include his favourite song in their programme.

Bill Hanson, who organises "Saturday Magazine," has many devoted followers, including a young lady from Devon, who repeatedly sent requests for his photograph. "I believe your picture appeared in the *Radio Times*," was one of her remarks, "but unfortunately I am afraid my sister has used you to light the kitchen copper!" When at last her wish was gratified, she wrote back: "Thank you so much. I had always imagined that you were dark and had a beard, instead of which you are almost a platinum blond!"

An Information Bureau

A number of people seem to regard the B.B.C. as an information bureau and lost property office combined, and many have been the curious questions which have been asked.

"A swarm of bees has settled in my house, what am I to do?"

"I left my engagement ring in a teashop; can you help me to recover it?"

"What is the difference between a 'down' train and an 'up'?"

"Yesterday I dropped my false teeth in a swimming bath, how am I to get them back?"

"My wife has eloped, and if you will broadcast a description of her I don't mind paying as much as thirty shillings!"

These are just a few samples of the problems with which the B.B.C. has been asked to contend.

Finally, comes the herd of would-be broadcasters, and some of them appear to have the most remarkable accomplishments. One man claimed to be able to write the Lord's Prayer on a grain of rice, while another could play the piano with his feet.

On Your Wavelength

The B.B.C. and Records

I RECENTLY mentioned the extremely high quality which the B.B.C. seemed to obtain from ordinary gramophone records, and my reference has drawn from Mr. Veale, of Bristol, a very interesting letter in which he whole-heartedly agrees on the subject. But he is apparently in an ideal position to judge of the results which are actually obtained, for he sends me details of his apparatus which includes two DO.25s in push-pull (these deliver an undistorted output of over 15 watts), a piezo-electric pick-up, a mains-energised loud-speaker, and suitable meters are included in each stage. "But," he says, "even then I climb down the ladder and bow to the B.B.C. on the reproduction of records by their apparatus." He wishes to know whether the B.B.C. would answer a letter of inquiry asking for hints on "How to Reproduce Records as the B.B.C. do," and I am sure they would only be too helpful in the matter. But I am afraid that the apparatus which will be required will be beyond the average listener's ability to construct in view of the very elaborate circuit arrangements and measurements which are necessary.

On the Short Waves

OUR much-maligned dailies were the cause of much merriment in my household the other day, when my better half drew my attention to a "write-up" of a short-wave receiver which was advertised therein. "Another feature of this amazing receiver," said the paper, "is the added attraction of a short-wave *deception* (the italics are mine). Hear your favourite film-star in person from Hollywood. Hear Chicago Gangsters talking to one another on



Just as I'm going to bed!

their secret transmitters. Hear cricket commentaries from Australia, etc., etc." Well, well, as the vicar said, can you beat that? I wonder how one listens to the gangsters talking on "secret" transmitters?

The short waves offer unlimited fields for listening, and there are some most ingenious transmissions to be heard, if only you can select the right time. In a list of short wave transmissions compiled by a Canadian company I see that the short waves have been divided up into bands, in which the various interesting items are tabulated. On what they term the "Broadcast-band Scale" there are enumerated police stations and fire alarm stations, for it appears that if you live in or near Boston, Mass.; Detroit, Mich.; San Francisco, Calif.; or Seattle, Wash.: you will hear fire alarms broadcast

By Jhermion

on a frequency band of from 1,628 to 1,632 kilocycles. On the "First or Intermediate Short-Wave Scale" you will hear amateur 'phone transmissions, police stations, aircraft and airports, ships at sea, and ocean liners. But somehow, I always feel upset when, just as I am getting ready to turn in for the night, I am greeted by the announcer with "Good Afternoon."

Wireless Influence

IT is not so very long ago that we received a letter from an old gentleman in the country who complained bitterly of the broadcasting of programmes. He said that wherever he went he could hear the music and people kept talking to him through the wireless. He said he could not get away from it, and even went on to say that it was the cause of his rheumatism and also gave him pains in the stomach. He could hear voices all through the night, and was generally in a bad way. Well, I have read at odd times, in the early days, that people came forward in various countries and said they could hear the programmes without any apparatus, and I believe at one time there was a serious investigation by some psychic body into the possibility of the human brain attuning itself to radio waves, but finally it was decided that there could be no rectification and thus no signal could be rendered audible. However, in addition to such complaints there were also statements that the general bad weather was attributed to the influence of the high-frequency radiations on the ether, and it went so far in some quarters that it was openly stated that the radio was an invention of the devil, and that the bad weather was our punishment from a higher body for utilising such heathen apparatus. I also believe that in at least one country in the world there was a law against the use of radio apparatus on account of religious feeling. However, all this seemed to die a natural death, but only the other day it was revived again by the publication in a daily of a letter claiming that the reason for the terrible storms all over the world and the earthquakes, cold and other climatic disturbances, was found in the abnormally dense ether waves used for the transmission of television and other short-wave transmissions. The paper went on to explain just why these low wavelengths caused the trouble, and the correspondent had even gone to the trouble of collecting data of "freak" long-distance short-wave reception and showing that on those dates a violent storm had occurred at some part of the world, ships being blown on to the rocks, and so on. No doubt many folk would be misled into believing the data which was given, but I am sure our more learned friends would prove that the long-distance reception was coincident with the occurrence of sun-spots, and that these also were responsible for the vagaries of the weather.

First Aid

I SHOULD very much like to have a concealed camera in order that I could snap some of the receivers which are sent into the PRACTICAL AND AMATEUR WIRELESS laboratories for test. I have several times been invited by the Editor to visit this interesting section of the House of Newnes, and I am really surprised that he is able to make them function satisfactorily at all as he does. I am sure if I were Editor I should send some of these sets to the British Museum (as I know of no worse punishment for the builders). It is surprising that, in spite of the articles which have been given in this paper, many listeners still seem to think that they can tie wires together with string and get efficient results. I saw a set the other day which he had received and I am sure that



They are blaming short waves for the foul weather.

soldering had been "accomplished" with a match. Great pieces of solder and wire were lumped together and some of the components were held down by screws which were literally miles too long. And the marvel of it is that the technical staff seem able to coax these atrocities into a semblance of the original receivers. I heard one such working and I was really surprised that even what I heard could be obtained on such an affair, but I am sure that the blessings of all would be bestowed on constructors if they paid as much attention to the actual construction as they do to the acquisition of the wherewithal with which to purchase the component parts. I was reminded of all this when I passed a radio shop the other day and saw a large red cross on the window, with the inscription: "Radio Doctor—Technical Expert on the Premises." I wonder if he realises what is coming to him? No doubt the idea is a good one, but I do not envy him his job, and each time I pass by I look for the Metropolitan Asylums Board van outside the shop, for I am sure they will have to carry him away one day. Still, good luck to him, for he has started a new fashion in shopkeeping and has thereby put himself one up on his opponents.

The Crooner Again

I MUST return to the war on the crooner, although I know that it pains .05 per cent. of my readers. The Rev. William Allen, of Toronto, which is out Canada way, recently made an attack on the crooner, and he is reported to have said that "people

(Continued overleaf)

ON YOUR WAVELENGTH

(Continued from previous page)

committing the crime of crooning are in danger of losing their voices entirely, or developing vocal disease." Good! but notice that he has slightly missed the point, when he says *developing* vocal disease. I contend that many of the crooners are already diseased, not only vocally, but mentally. I have just received from the Editor of the *Bulletin of Sydney* (Australia) a whole-page cutting of a cartoon published on January 29th last, showing a farmer bemoaning the fact that the cow "only gave half a pint this morning," and in another picture showing him discussing with his wife the reason for the strawberries going dry. According to the cartoon, they read that in America a claim has been made that must increase the milk output of a cow, and these folk decide to try it. We see them in this cartoon trying a mouth organ, a fiddle, and finally a gramophone, and then, when they play "Madame Butterfly" the cow starts work. They dash round for buckets and can't turn it off, until, finally, they change the record. Then, "That's funny,



A radio surgeon.

she's stopped," says the farmer, and they look into the buckets, and their expressions of pleasure turn to amazement when they see all the milk is curdled. The reason is disclosed in the last picture, when they look at the last record they played and see that it is Bing Crosby. Now, all you supporters of the crooner, I have received support from Canada and Australia, so what are you going to do about that?

American Talks

I MENTIONED last week the record which was taken by the Brighton and Hove Relay Company's apparatus indicating the items to which the public listened. I have just seen a copy of an American publication in which is reproduced a graph taken by the New York Edison Company, and which indicates that a third of a million extra radio sets were turned on in New York City to listen to Al Smith "belaying the New Deal." This load continued whilst Al Smith spoke from 10 to 11 p.m. I cannot reconcile this statement with the usual news we receive that the Americans listen to dance music all the time, and it certainly shows a very high development that the New Yorker should sit up to listen to a political speech lasting over an hour. Perhaps, after all, we have been misinformed concerning our American cousins, and maybe they do not simply sit round a cocktail cabinet chewing gum and smoking endless cigars.

Volume Controls

IT was recently mentioned in these pages that a volume control is a mystery component, and that no real control had yet been found. Several manufacturers sent in components which they claimed would prove noiseless in use and would maintain their ratings, and these have been tried and in most cases found O.K. But it is really surprising how a component of this



Notes from the Test Bench

465 Kc/s Superhet

THE superhet having an intermediate frequency stage tuned to 465 kc/s is gradually superseding the 110 kc/s type. When the I.F. amplifier is tuned to 110 kc/s it is difficult to cut out second-channel whistles, but in most cases this is comparatively easy in the 465 kc/s superhet. It is practically essential to use two tuned circuits preceding the frequency changer in the 110 kc/s set, but if the intermediate frequency is increased to approximately 465 kc/s one tuned circuit is generally found to be sufficient, as the necessary degree of selectivity necessary to prevent second-channel interference may be obtained from this one stage. In some cases, however, it has been found that strong medium-wave stations cause whistles on the long-wave band. To cut out this form of interference an extra tuned stage may be placed between the aerial and the existing first tuned circuit, or a wave-trap may be connected in series with the aerial.

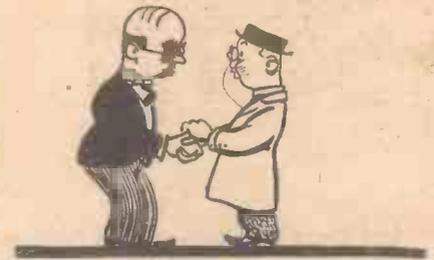
Aerial Wave-trap

THIS wave-trap should consist of a coil and a variable condenser having a capacity of approximately .0005 mfd.—a home-made coil and a small solid dielectric condenser may be used. As it is necessary to tune this combination to the wavelength of the interfering medium-wave station, about eighty turns of 32 S.W.G. wire on a 1½ in. diameter former should prove satisfactory. The ends of this winding should be joined to the fixed and moving-vane terminals of the condenser respectively, the juncture of the moving vanes and the winding being then connected to the aerial terminal of the set, and the junction of the coil and fixed vanes to the aerial lead; a slightly better effect can be obtained by connecting the aerial to a tap on the coil, about fifty turns from the end connected to the fixed vanes of the condenser. When long-wave reception is desired, the condenser should be adjusted until the whistle due to the local medium-wave transmission is cut out. A similar trap may be used to cut out morse interference, but the coil for this should have approximately 120 turns instead of eighty.

Variable Trimmer

HOME-CONSTRUCTED receivers, especially those using home-made coils, sometimes fail to gang up satisfactorily. In most cases, this failure is due to the use of incorrectly-matched coils, and cannot be remedied by adjustment of the trimmers attached to the gang condenser—the purpose of the semi-variable trimmer is to balance stray capacities across the tuned circuits. If the coils cannot be exchanged or rematched, the easiest procedure is to connect a small variable condenser across one of the tuned circuits. A .0001 or .00005 mfd. variable should prove satisfactory, its moving-vane terminal being connected to the moving-vane terminal of one section of the gang condenser, and its fixed vane terminal to the fixed vanes of the latter.

nature can produce grating and scratching noises after it has been in use for some time, and a service agent of a well-known company recently told me that out of ten sets which he had received in two weeks, and which the owners complained were fitted with faulty volume controls, only two actually had this component defective. In the other eight the noise was caused by vibration setting up intermittent contact in valves and other components, and was due to the fact that the spindle on the control was rather tight and, as it was turned, the movement was sufficient to make the chassis shake slightly and thus produce the noise. These commercial sets had "floating chassis"—that is, they were supported on rubber buffers and were not bolted down, and he found that by tightening the holding-down bolts the noise could be prevented without introducing any troubles from the removal of the floating feature. It appeared that the actual tracking of the faulty part was extremely difficult, but he blamed the valves for the most part. I thought the tip was worth passing on in case some readers have experienced what they



The Rev. William Allen, of Toronto.

take to be a faulty control and which may, in fact, be quite a good component.

Cotton People

THE variety programme by Lancashire cotton operatives, which was postponed owing to King George's death, will now take place on March 12th from the Northern Regional. Men and women taking part in this programme represent the "pick" of over two hundred applicants for auditions. Although these applications were made from the weaving as well as the spinning towns of Lancashire, it must be admitted that in the final selection the spinning section of the industry is better represented. Indeed, most of these new broadcasters come from Bolton.

Death in the Dressing Room

BOB LIVELY and Betty Laidlaw, two Hollywood artists who were heard in the B.B.C. programmes in 1935, have written a musical "thriller" which will be produced by Max Kester, and given in the National programme on March 16th, and Regional programme on March 17th. The story takes place during the production of a musical piece called "Follies of 1936," so listeners will have two plays going on at the same time—a murder mystery to a background of musical comedy melodies. The mystery concerns the murder of a wealthy widow, who is Chairman of Commercial Aircraft, Ltd. Her body is discovered in the dressing-room of the actress, Gita Walenska, at the Theatre Royal, and various people come under suspicion. The complications increase when at a critical moment in the musical comedy, a second body is discovered. The identity of the murderer is cleverly concealed, and the musical comedy continues to unravel its "Follies" story.

A PAGE OF PRACTICAL HINTS

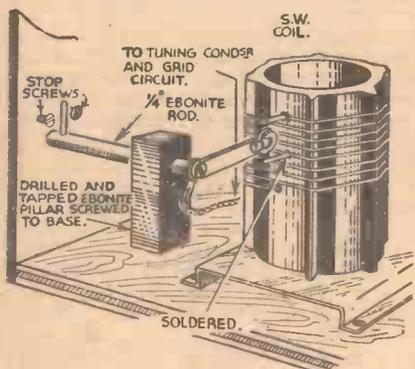
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Wave-changing on the Short Waves

THIS simple wave-change switching device is arranged as follows: The grid winding of the short-wave coil consists of No. 18 gauge copper, and has two wave

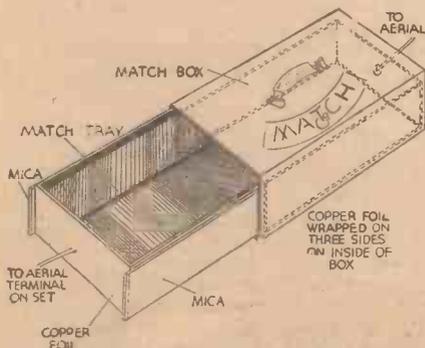


A simple wave-change switching device.

ranges. A piece of copper wire soldered on to the coil a few turns from the bottom acts as a tapping for the lower range, while the end of the coil at the top forms the tapping for the higher wave range. The ebonite rod is drilled and tapped 4 B.A. at the end for screwing to the base, to support the brass arm to which is soldered a spring washer, as shown in the sketch. A threaded brass rod screwed partly into the ebonite rod immediately behind the panel, and two screws prevent excess of movement. The turning of the rod by means of a knob at front of panel causes the spring washer to grip firmly the required tapping piece on the coil, and a sound connection is ensured. This arrangement does away with those long leads to the panel which may end at a faulty switch.—L. BEAUMONT (Heworth).

A Simple Pre-set Condenser

HERE is a very simple and easily-made pre-set condenser. It is made from a match box, a piece of copper foil, and some mica. The tray is taken out of the box and round the sides some copper foil is stuck; on the two long sides a piece of mica is also stuck on top of the copper. The box is now



A pre-set condenser made from a match box and copper foil.

THAT DODGE OF YOURS!

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

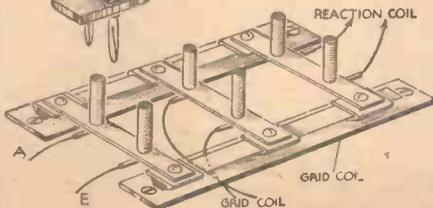
taken and around two long sides and one end a piece of copper foil is fitted inside. The tray can thus be slid backwards and forwards and the capacity altered. When the cup is pushed as far as it will go the condenser is shorted.—F. M. LESLIE (Leeds).

A Variable Short-wave Coil Holder

THE great disadvantage of a number of short-wave coil holders is that the coupling of the coils is fixed, this, in some sets, prevents oscillation. By using separate coils and a variable coil-holder, just the right degree of coupling can be obtained and, consequently, better all-round results are ensured. The coil holder illustrated owes much of its success to the dovetail section brass strip, which is sold as curtain fittings. Small parts which slide along the rod hold ebonite strips, to which are bolted



A short-wave coil and a novel form of adjustable coil-holder.



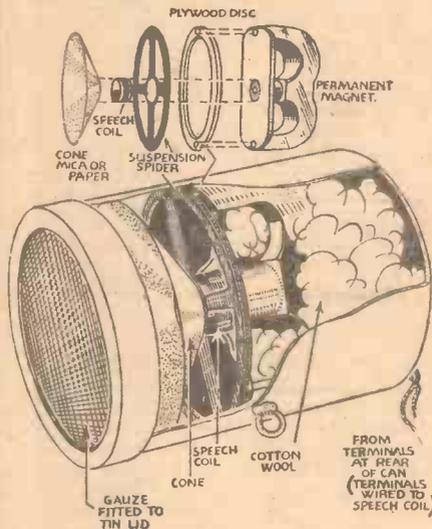
the coil sockets, the whole making a rigid but variable mount for the coils. It also has the advantage that it will take coils of varying width. Using the coil-holder as described, the writer has received over one hundred American amateurs on twenty metres, and the usual English and foreign broadcasting stations.—G. LINDSAY (Hitchin).

A Moving-coil Microphone

WHEN using a first-class quality amplifier I found that the usual carbon button type of microphone gave unsatisfactory results, lacking badly in bass and peaking in the treble, so I decided to try using a moving-coil speaker instead. Not having a spare P.M. speaker I bought a

Celestion Soundex (obtainable now for less than 10s. in some places), which matched up to first L.F. valve as near as possible. I tried this arrangement and quality was excellent but sensitivity poor, and this was caused by the rather stiff suspension of the cone. I therefore proceeded to make my own cone and suspension, as shown in the accompanying sketches.

After detaching the cone cradle, I detached the speech-coil from the old cone, later cementing it to a very shallow cone



Details of a home-made moving-coil microphone.

made of mica (hand-made paper would make a very good cone if mica is not available). When the cone and speech coil had firmly set, I cut out a large spider from thin card, which was fixed to the speech coil at the join of the cone.

As regards the magnet system, some means for holding the spider had to be found, and finally I cut a disc of plywood, the outside diameter being governed by the tin used for the case, a hole being also cut in this to allow access to the gap in the magnet and free play for the suspension spider.

After fixing the disc to the magnet by the two bolts already provided as means of holding face-plate to the rear, the completed cone was assembled as in sketch.

A tin of the required size [was next cut down slightly longer than the microphone, and before inserting this, cotton wool was padded around the magnets to prevent the possibility of echo, and leads from the speech coil joined to two terminals fitted to the end of the tin. Finally, the top of the tin lid was cut away and gauze fitted over the hole. Means of fixing the microphone securely was provided by the tight fit of the plywood disc, and by screw-hooks screwed through the tin into the edge of the plywood, thus providing convenient points for fixing rubber bands between the microphone and its stand.—W. J. ARBOTT (Battersea).

Beginners Supplement

FROM STUDIO TO LISTENER—8.

Further Notes on the Low-frequency Amplifier and a Preliminary Description of the Output Stage.
By IDRIS EVANS

A RESISTANCE-capacity coupled low-frequency stage provides good quality of reproduction provided that the correct component values are used, but the degree of amplification is low. The transformer coupler, on the other hand, provides a higher degree of amplification but greater care is necessary in the choice of component than with the resistance coupler; if loss of bass is to be avoided, the transformer primary winding must have a high inductance, and the stray capacity across the secondary winding must be low if loss of treble is to be avoided.

Low-frequency Volume Control

In many modern receivers of the

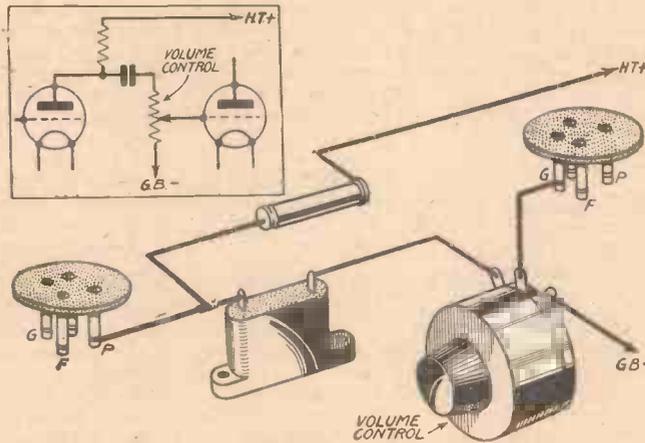


Fig. 1.—Volume control in an L.F. amplifier.

cheaper type the detector valve is coupled by means of a transformer to the output valve, but in cases where great volume with good quality is required, it is desirable to use an intermediate low-frequency valve, this being coupled to the detector by means of a resistance-capacity coupler and to the output valve by means of a transformer. In receivers of this type, it is necessary to fit a volume control in the low-frequency stage, in order to prevent the possibility of overloading the last two valves; this volume control generally takes the form of a high-resistance variable potentiometer connected as shown in Fig. 1.

Background Noise and Instability

After studying the various methods adopted for obtaining low-frequency amplification in the receiver, the beginner is tempted to ask why a large number of such stages cannot be used in conjunction with a detector, instead of one or more high-frequency stages preceding the detector, with one or two low-frequency stages following it. In the first place, the use of

a H.F. stage with its associated tuning condenser and coil improves the selectivity of the receiver, and, secondly, the H.F. valve amplifies the incoming signal sufficiently to load the detector. Apart from these two considerations, however, the use of a large number of low-frequency stages would increase background noises to too great an extent, and would also cause low-frequency oscillation—this takes the form of an audible howl, intermittent or continuous. It is therefore undesirable to have more than three low-frequency stages, and in practice two are generally found adequate.

Even when only two stages are used the above-mentioned howl is sometimes experienced, but this can be eliminated by connecting a high resistance between the H.T. terminal of the L.F. transformer and the H.T.+ lead, and a high capacity condenser between the H.T. terminal and H.T.—. The resistance and condenser are known as decoupling components and are shown in dotted lines in Fig. 2 of last week's article.

Bias Voltage

In order to obtain maximum output without distortion from the low-frequency amplifying valve, the correct value of grid-bias voltage must be applied. When discussing the detector, it was pointed out that a high negative bias voltage or a slight positive bias voltage was applied to the valve grid in order to work the valve on the bottom or top end of its characteristic curve, thus cutting half of the received

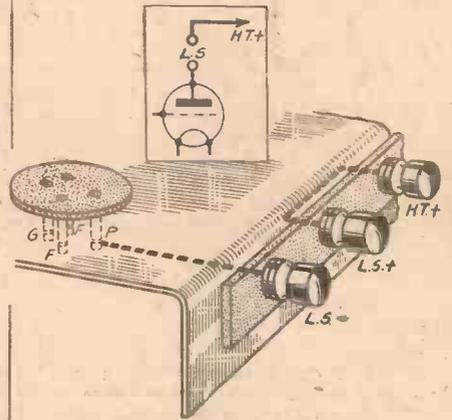


Fig. 2.—Showing direct connection of speaker. alternation passed on from the aerial. In the low-frequency amplifier, however, it is very desirable not to cut the low-frequency alternation—at this stage it is necessary to prevent any distortion of the wave form if good quality of reproduction is desired.

The bias voltage required for a given H.T. voltage is generally stated on the valve leaflet, but as the H.T. battery runs down the bias voltage must also be reduced if reasonably good quality is to be maintained. In battery-operated receivers the bias voltage may be simply adjusted in the following manner: increase the bias voltage gradually until a point is reached where signals are cut off, and then transfer the bias plug to the socket providing approximately half this voltage, e.g., if the cut-off bias voltage is -9 volts, approximately -4½ volts should be applied. In mains-operated receivers the H.T. voltage remains practically steady and therefore if the correct value of automatic bias resistance is chosen when the set is built, this need not be changed unless a different type of valve is fitted.

Power Stage

Having amplified the signal voltage to the desired value, it must now be converted into power to operate a loud-speaker. For this purpose a low amplification, low-resistance valve is used, the speaker being connected in its anode circuit. When the varying signal voltage is applied to the grid of this valve, the current in the anode circuit rises and falls and this operates the loud speaker accordingly, and this rise and fall of the current through the impedance of the speaker winding is the power which is converted into sound.

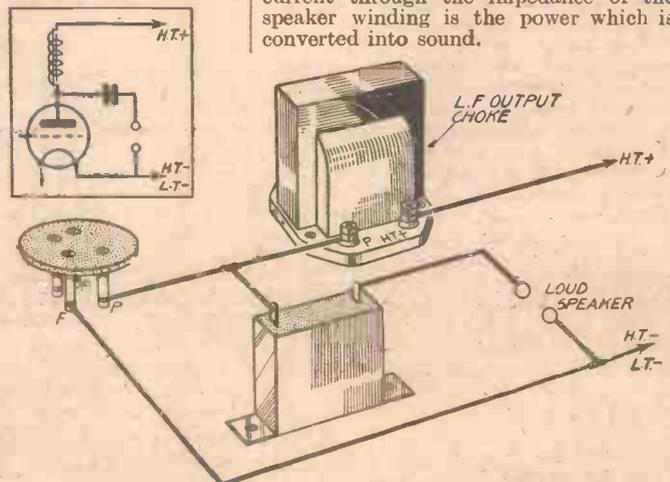


Fig. 3.—Choke-condenser method of connecting speaker.

QUALITY REPRODUCTION

THOSE whose chief interest in radio is directed towards research in better reproduction would do well to consider the results of a highly-organised demonstration which took place in America, some time ago, between Philadelphia and Washington. For want of a better term, the demonstration was called "Auditory perspective," and was a lesson in stereoscopic hearing. From the point of aural perception this compares with, say, viewing a coloured stereoscopic slide through a stereoscope when depth is imparted to the normal panorama.

In the experiments in question use was made of landlines similar to those now installed by the G.P.O. for B.B.C. use, and having a frequency range of 40 to 16,000 cycles. Three separate channels, each 150 miles long, and each with five intermediate amplifiers en route, were employed, each line commencing at a microphone with its own amplifier and terminating in a further amplifier bank of loud-speakers, and controlled by one master volume control. Thus for any one programme three separate transmitting channels were used, each covering the same complete spectrum of sound frequencies.

Provision was made for a total magnification of 1024, equivalent to a volume output of about ten times that of a large orchestra. To compare with the usual arrangement of an orchestra, the loud-speaker banks (each giving 80 watts for the higher notes and 200 watts for the lower notes) were installed at each end of a large stage, and the third group in the centre raised up some feet above the others.

Tests were conducted in collaboration with the Philadelphia Symphony Orchestra, the volume being controlled by Dr. L. Stokowski at the receiving end. The enormous amplification, up to 80 decibels, was provided for unusual tonal effects, but was in no sense the chief technical consideration. Various "turns" put over, such as a singer slowly walking from one microphone to another, created a most uncanny effect. Similar experiments have since been effected by the Marconiphone "stunts" department here in England with numerous loud-speakers, and making an aeroplane "fly around a room," the volume increasing until the machine had completed its flight by crashing.

With regard to the Philadelphia Orchestra, this gave the impression that it filled the stage, and the effect was heightened by the fact that each loud-speaker was only called upon to deal with a limited number of instruments, corresponding to those nearest each microphone group at the transmitting end. Several interesting conclusions can be drawn from the above-mentioned tests, not the least of which is that no one loud-speaker, however perfect its response, can hope to produce the illusion of breadth with respect to the physical space over which the original sounds are created. It also follows that if only one

An Interesting Account of Some Experiments for Demonstrating the Inadequacy and Limitations of Having Only One Sound Output Point.

transmission is received and two "perfect" loud-speakers are employed, spaced as described, they cannot produce the same illusion.

Using Two Loud-speakers

The reason this latter system fails is, of course, due to the fact that sounds from any one instrument are reproduced equally in the two loud-speakers and one cannot mentally assign the sounds to two points at once. It is assumed that the loud-speakers do not focus at a fixed point but give equal sound radiation. On concerted orchestral renderings the effect may sound convincing, but the arrangement fails when an instrumental obligato occurs. Nevertheless, it will be agreed that the general effect of two loud-speakers suitably separated but connected to one amplifier is considerably better than one. The reader may well imagine if a separate microphone, transmitter, receiver, amplifier, and loud-speaker is assigned to each musical instrument or person transmitting, the ultimate effect would nearly be the same as the original.

these frequencies equally. Where the station received produces a large signal input and is not situated in wavelength close to another powerful transmitter, it is usually possible to decrease the selectivity of the tuned receiving circuits to achieve this effect, and without heterodyne interference, because the powerful transmission received will demodulate in the detector any weaker signals which may tend to be picked up. Consequently, quite simple tuning systems will provide the best overall frequency response, as no attempt need be made to provide a flat-topped, steep-sided resonance curve. What happens, though, when a further powerful transmission occupies an adjacent wavelength only 9 kc. away from our existing one? The simple tuning system mentioned will obviously be covering a broader frequency band than 9 kc. and, due to the carrier waves overlapping, heterodyne interference will result in an audible whistle at 9 kc. or higher.

Actually these whistles are existent in the ether between most stations only 9 kc. apart, but the reason why they are rarely heard is that on most commercial sets the received frequencies are limited to usually slightly less than 9 kc. The set designer attempts to provide the full 9 kc., but, due to technical difficulties in designing a true vertically-sided band-pass filter (two coupled tuned circuits), the ultimate selectivity is about 8.5 kc. with a decreasing response up to 9 kc. Herein, then, lies the chief reason for a limited upper register. In practice the results are not even quite so perfect as would be assumed here, as the usual addition of an intervalve single tuned circuit tends to convert the band-pass filter response to a steep single peaked curve, which has inferior frequency characteristics.

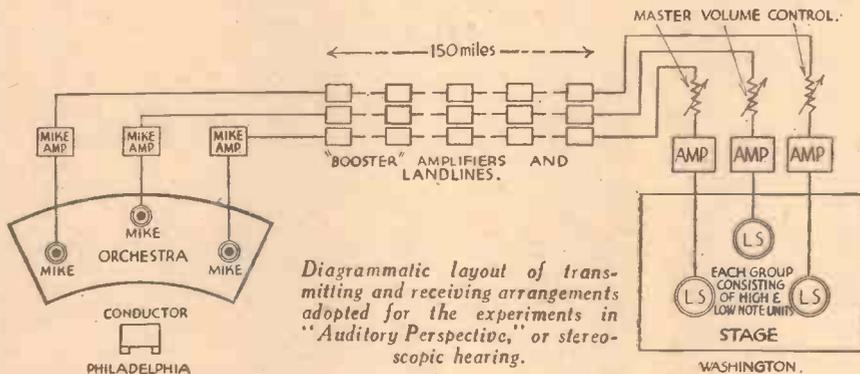
Quite properly, we can omit questions of the detector circuit here, because the advent of the modern diode now allows for

linear rectification without overloading or distortion. A properly-designed L.F. amplifier circuit can also be passed without comment, as this can be made to provide straight line amplification. The question of frequency correction devices incorporated in the L.F. stages is one which is wrapped up with the design of the H.F. amplifier and, to a limited extent, the frequency response can be modified to correct for irregularities, particularly with regard to the loud-speakers.

The Superhet

With few exceptions the set of the moment is the superhet, which is certainly capable of providing a degree of reproduction quite equal to a "straight" circuit. In the opinion of the writer, the chief failing of this class of receiver, a failing shared by all multi-valve affairs, is that the background noise level, due to the valve hiss, spoils illusions of reality, even when operated at a low level of sensitivity.

(Continued on page 827)



The word "nearly" is used advisedly, because allowances have to be made for the unequal response of microphones at various sound intensities, for unequal response in the landline or receiving set and amplifier, and coloration due to the loud-speakers, apart from the numerous minor considerations. Now let us examine a really modern radio receiving equipment and see how far it goes towards producing a true rendering of the original. Assuming the transmission it is desired to receive is by radio, and that the frequency range covered by the modulation is the highest present-day standards, it is necessary to reproduce the signal exactly as transmitted, at the detector input. For this purpose the selectivity of the tuned circuits in the receiving equipment must be such as to embrace all the transmitted frequencies without attenuation.

Overall Frequency Response

On the medium waveband the usual B.B.C. standard is about 60 to 9,000 cycles, so that the tuned circuits must reproduce



FOR THE EXPERIMENTER

SERVICING SETS FOR PROFIT.

10.—A Radio-frequency Oscillator or Signal Generator

BEFORE commencing the description of the next instrument which will complete the range of test equipment dealt with in this series, I wish to clear up one or two misapprehensions which appear to exist over the calibration of the 10-volt range of the multi-range D.C. meter. Readers will have noted the amended circuit diagram recently published in the correspondence columns, and will have seen that, in essentials, it is similar to the resistance meter described in the second article. Therefore, when selecting the series resistance for the 10-volt range, the meter should be adjusted first to give a full-scale deflection with the clips joined, and then a resistance selected which will reduce the current to .31 mA when inserted in the clips. This will be the correct resistance to extend the scale to read 10 volts.

Uses of the Instrument

I have several times referred in this series to the necessity for a steady signal when adjusting the ganging of a receiver, or observing the effect of changing the values of components in a receiver with a view to improving the performance. Usually, the experimenter has to rely on the B.B.C.

tuning note, which is only radiated for very short periods, or else use the heterodyne note produced by two interfering stations. This is generally unsatisfactory, for it is impossible to find out whether the incoming signal is fading or not, and it usually vanishes just when adjustments are being made, and the experimenter is left metaphorically "in the air."

The instrument about to be described produces, in conjunction with the beat-frequency oscillator already dealt with, a steady signal over the whole range of approximately 150 metres to 3,500 metres, which can be modulated to produce an audible note in headphones or loud-speaker of any frequency within the range of the beat-frequency oscillator. Not only can it be used to check alignment of circuits, but an idea of the selectivity and sensitivity of any receiver can be gained, and comparisons made between individual receivers. This will, of course, be invaluable to a service-man, for he can compare the

performance of a receiver which he knows is up to standard with one which he suspects is failing, and carry out adjustments to

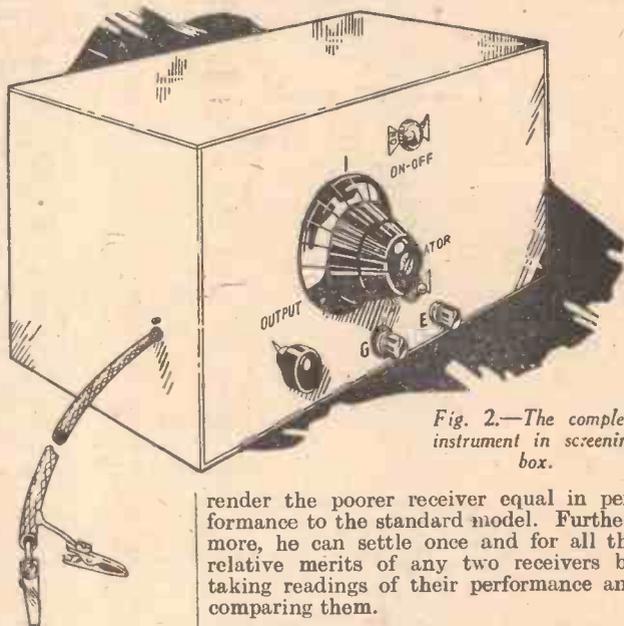


Fig. 2.—The complete instrument in screening box.

render the poorer receiver equal in performance to the standard model. Furthermore, he can settle once and for all the relative merits of any two receivers by taking readings of their performance and comparing them.

The Hartley Circuit

On examining the circuit used, shown in Fig. 1, readers will see at once that it is the familiar Hartley oscillator using centre-tapped coils of the plug-in variety to cover the wave-range required, and tuned by a .0005-mfd. variable condenser. As neither set of vanes of this condenser is at earth potential, it is necessary to insulate them from the panel, and for this purpose the condenser is mounted on a "universal" bracket screwed to the baseboard and provided with an insulated extension spindle which passes through the panel and engages with the vernier dial which is mounted externally.

In order to modulate the oscillator, terminals are provided on the panel which are to be connected to corresponding terminals on the beat-frequency L.F. oscillator, and the voltages available from the latter source are injected into the grid circuit of the H.F. oscillator. Grid circuit modulation is not always suitable, but in this case we are not dealing with a power oscillator, and the output from the beat-frequency L.F. oscillator would not be large enough to modulate the H.F. oscillator if anode modulation were used. A switch mounted just above the modulator terminals serves to short-circuit them when not in use, and the .001 mfd. condenser acts as an effective by-pass for the high-frequency component when the modulator is in circuit.

Turning now to the anode circuit of the valve, it will be seen that this is connected

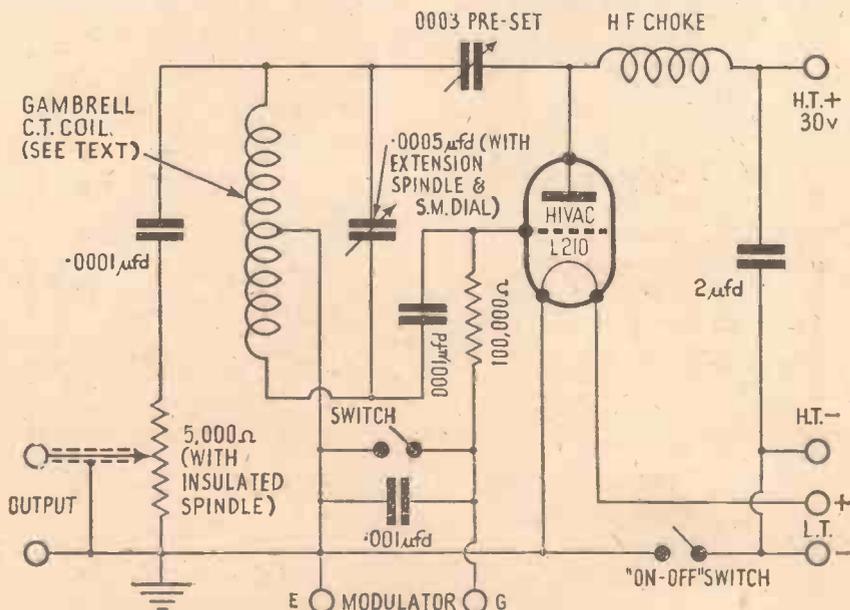


Fig. 1.—Theoretical circuit diagram of the H.F. oscillator.

via an H.F. choke to H.T. positive, and the plug-in coil is parallel-fed through a .0003-mfd. pre-set condenser. The reason for this is that when a Hartley circuit is set up with a direct drive the grid of the valve is sometimes over-run and "squegging" commences. By varying the feed by means of the pre-set condenser, we can control the oscillation of the valve and arrive at a setting which will give smooth oscillation over the whole wave-band.

Output

The output from the oscillator is taken from the anode end of the plug-in coil, and fed to a 5,000-ohm potentiometer through a .0001-mfd. condenser. This form of feed is open to criticism, as the condenser does not allow a constant load

order suitable screening-boxes from this source if they experience any difficulty in obtaining this component.

Choice of Coils

One point regarding the coils is worthy of mention. No doubt readers will have suitable plug-in coils, but care should be exercised in the selection of these, as the whole frequency stability and calibration of the oscillator is dependent upon the coils used, and it may be impossible to cover the whole wavelength range with but three coils of other make. Nevertheless, before buying special coils it may be as well to

have intermediate frequency stages which often require adjustment, and are tuned to 465 kc/s (645 metres) or 110 kc/s (2,727 metres). Also, when testing very sensitive receivers it may not be possible to reduce the output from the signal generator sufficiently when working on its fundamental, and the second harmonic, equal to half the wavelength, may be selected and used for adjustment, as it will be much weaker.

The construction of the apparatus should not be difficult if Figs. 3 and 4 are studied closely. Fig. 2 illustrates clearly the screened lead passing through the side of the box.

Final Adjustments

First of all, check through all the circuits with the resistance meter of the multi-range tester, and pay particular attention to the insulation of the anode circuit of the oscillator valve. With no batteries or valves in circuit, there should be no deflection apart from an initial "kick" of the needle due to the charging of the 2-mfd. condenser when the resistance terminals are joined between anode and negative L. T. If all is in order, connect up the batteries to their appropriate leads, and insert the valve in its socket. Unscrew the pre-set condenser to minimum capacity, and close the switch short-circuiting the modulator terminals. Then with the B coil in the coil-holder, and the .0005 tuning condenser at minimum capacity, connect the 10 mA range of the D.C. meter between the 30-volt tapping on the H.T. battery and the H.T. positive lead. If the oscillator is now switched on a current of 3 to 5 milliamps will be indicated, and no change in the current should be noted when the grid terminal of the valve is touched with a wet finger.

Now commence to screw up the .0003-mfd. pre-set condenser, and it will be noticed that at one point the anode current falls to a lower value, which rises again when the wet finger is applied to the grid. The instrument is now oscillating, and the .0005-mfd. variable condenser should be rotated over the whole of the scale to ensure that oscillation is maintained. If oscillation ceases at any point, the .0003-mfd. pre-set condenser should be screwed up until oscillation commences again.

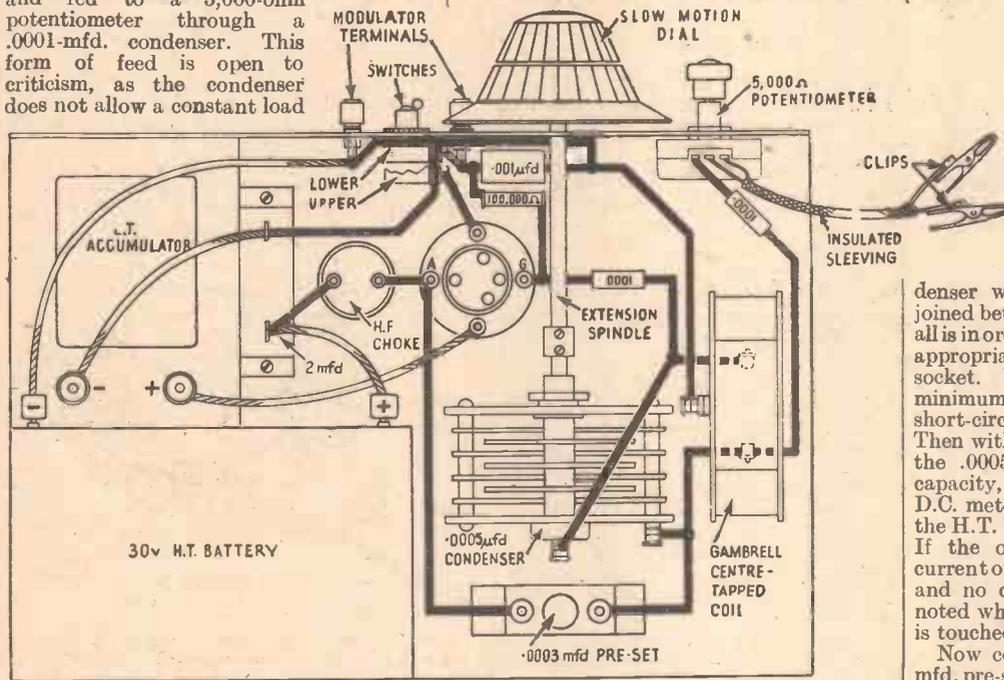


Fig. 3.—Wiring diagram of the H.F. oscillator.

on the oscillator at all settings of the potentiometer, and will be found to exercise some control over the wavelength emitted by the oscillator. This is not serious, however, and, provided the potentiometer is set at a fixed point while making a wavelength calibration, no trouble should be experienced. From the slider of the potentiometer a screened lead is run through the side of the screening-box, and care should be taken to make a good connection between the screening braid on this lead and the case. It is suggested that a 4 BA clearance hole is drilled close to the hole through which the screened lead passes and a soldering tag secured by a bolt and nut fixed in place. The screened lead should then be bound with some thin tinned copper wire and soldered to the tag. At the other end of the screened lead two crocodile clips should be attached, one to the central wire itself and one to a wire soldered to the screening braid. The length of screened lead outside the box should be sufficient to enable connection to be made to components inside a receiver, but not so long that undue losses are introduced. About 2ft. should be ample.

The size of the screening-box will be governed by the sizes of the accumulator and H.T. battery which readers select, and therefore no hard-and-fast dimensions are laid down. The panel and lid should be a good fit, and all the joints should preferably be made with brass angles or welded throughout, if possible. I can provide the name of the supplier of the original box, and readers will be able to

try those which are available, and the nearest sizes in ordinary plug-in coils are Nos. 50, 150, and 500. Readers may wonder why it is considered necessary to cover the whole wave-band between 150 metres and 3,500 metres when broadcast receivers usually tune between 200-550 metres and 1,000-2,000 metres. I must remind them, however, that superheterodyne receivers

LIST OF PARTS REQUIRED FOR THE SIGNAL GENERATOR.

- Three centre-tapped plug-in coils (sizes B, E1 and G) (Messrs. Gambrell Bros. and Co., Ltd., Merton Road, Southfields, S.W.18.).
- One coil-holder (with provision for centre-tap terminal connection) (Messrs. Gambrell Bros. and Co., Ltd., Merton Road, Southfields, S.W.18.).
- One potentiometer, 5,000 ohms (ungraded), with insulated spindle. (Reliance Manuf. Co., Ltd., Walthamstow).
- One 4-pin valve-holder (W.B.).
- Two .0001-mfd. fixed condensers } Bulgin
- One .001-mfd. fixed condenser } PC301
- One 2-mfd. fixed condenser } SC201
- One 100,000-ohm 1/2-watt resistanc } Bulgin
- One 100,000-ohm 1/2-watt resistanc } HW25)
- One H.F. choke (Bulgin HF18).
- One .0003 mfd. (max.) pre-set condenser (Premier Supply Stores).
- One .0005-mfd. variable condenser (Premier Supply Stores).
- One "Utility" micro-vernier dial.
- Two "on-off" switches (Bulgin S80).
- Two terminals (one with insulating bush) (Belling-Lee).
- One screening-box (see text).
- One 2-volt unspillable accumulator.
- One 30-volt H.T. battery.
- One "Hivac" L210 valve.
- Sleeving, wander plugs, screened lead, two crocodile clips, insulated spindle and universal bracket.

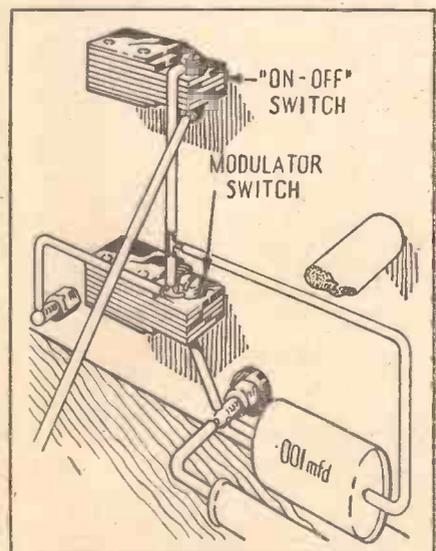


Fig. 4.—Details of the wiring connections to the switches of the H.F. oscillator.

to the positions of the coils, it is a good plan from the point of view of efficiency to place one underneath the chassis and the other on top. There is an obvious objection here, however, when plug-in coils are to be used, in that it is not an easy matter to change that which is mounted underneath. The difficulty can be met to a certain extent by mounting the underneath coil socket on a bracket, so that the coil can be reached from the back of the set, or through a hole in the side of the chassis. Alternatively, a simple vertical screen could be placed between the two coils, although it is often sufficient to mount them one on each side of the valve, since the metallising of that provides a certain screening effect.

It is scarcely necessary to add that all resistances must be of the composition or non-inductive type, whilst the fixed condensers should be non-inductive tubulars.

Suitable valves for the four positions are: first, Cossor 210 P.G. or Osram X.21; second, Cossor 210 V.P.T., Hivac 215 V.P.; or Osram V.P.21; third, Osram H.D.22; fourth, Cossor 220 H.P.T., Hivac Y.220, or Osram P.T.2.

Leaves from a Short-wave Log

INTEREST on the ultra-short wavelengths is so much on the increase that it is well worth devoting some few hours to searching on these high frequencies from time to time. In addition to the ever-growing number of amateur transmitters experimenting on the 5- and 10-metre bands, there already exist a few commercial and broadcasting stations trying out these wavelengths.

U.S.S.R. Transmissions

In the U.S.S.R. even lower wavelengths are being tested, as in the new official Berne lists we find registrations of UKICS and UKICT at Leningrad, on 3 metres (100,000 kc/s), with telephony on a power of 3 watts; and in Moscow, UE3CO, with 500 watts, experimental telephony on 3.890 metres (77,120 kc/s), and 3.800 metres (78,945 kc/s).

Between 11 and 14 metres details are now given of a number of new telephony transmitters, either under construction or planned, and there seems little doubt that by the end of the year the ultra-shorts and shorts will provide many more opportunities to the compiler of radio logs.

This year the short-wave listener can always find broadcasts of transatlantic programmes by lunch time; W8XK, Pittsburgh (Pa.), on 13.93 metres (21,540 kc/s), is on the air from G.M.T. 12.00-14.00 daily, but if you do pick up its signals, do not try for a verification, as I understand that the station will not now answer reception reports. An alternative will be W2XE, Wayne (New Jersey), taking the WABC, New York, C.B.S. programmes on 13.98 metres (21,460 kc/s), which, suspended during the winter months, is, it is stated, to come back to the ether again shortly.

On the 16-metre band there are but few alterations with the exception that W2XE, having been permitted to use 16.89 metres (17,760 kc/s), has already been heard over here between G.M.T. 16.00-18.00.

The Italians have been very active lately, and with a view to extending their network of communication with their North African Colonies, and possibly the war area, have

been trying out a number of low channels. Of these the following has been logged: IRY, Rome, 18.61 metres (16,120 kc/s), with Asmara, giving gramophone records.

French Stations

The French Colonial stations at Pontoise, near Paris, are again using a three-tone whistle as a call and interval signal. For some reason they have abandoned the call letters FYA and are known as TPA2 (19.68 metres, 15,243 kc/s); TPA3 (25.23 metres, 11,880 kc/s); TPA4 (25.6 metres, 11,720 kc/s).

Two harmonics of medium-wave stations which have been regularly found recently are the 4th of Radio-Toulouse, 328.6 metres (913 kc/s), on 82.15 metres (3,652 kc/s), and the 6th of Bordeaux P.T.T., 278.6 metres (1,077 kc/s) on 46.43 metres (6,462 kc/s). The latter has misled me on more than one occasion as it comes in just above

HJ5ABD, Cali, on 46.22 metres (6,490 kc/s), and HJ1ABB, Barranquilla (Colombia) on 46.58 metres (6,440 kc/s). Incidentally, it has been helpful in searching for a new Costa Rican station, namely, TI8WS, installed at Puntarenas, and advertised to be working on 46.3 metres (6,480 kc/s) between G.M.T. 23.00 and 02.00. I am informed that the call is *Radioemisora Ecos del Pacifico*.

Another new Santo Domingo transmitter, HI4V, is advised on 46.51 metres (6,450 kc/s), a channel shared with HJ4ABJ, Ibague (Colombia), of which the interval signal consists of four or five chimes. The station is on the air nightly between G.M.T. 01.30-03.30, and as a slogan styles itself: *Ecos del Tolina*.

Rome appears to be trying out another channel in the later evening hours for the I2RO transmissions, as it has been heard working on 49.3 metres (6,085 kc/s).

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Balance in 6 monthly payments of 7/-

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Practical Television

March 14th, 1936. Vol. 2. No. 23.

Time Base Improvements

THE time base equipment as associated with cathode-ray tubes, in order to impart the required vertical and horizontal motions of the electron beam and trace out the necessary scan area on the front fluorescent screen, is a very important piece of apparatus. It must carry out its particular function with absolute consistency, otherwise the resultant television picture built up from the incoming modulation signals will be marred. In addition,

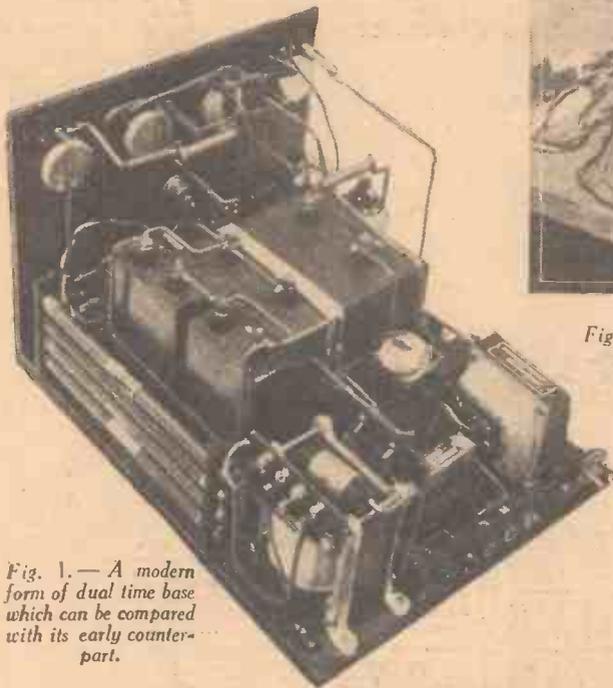


Fig. 1. — A modern form of dual time base which can be compared with its early counterpart.

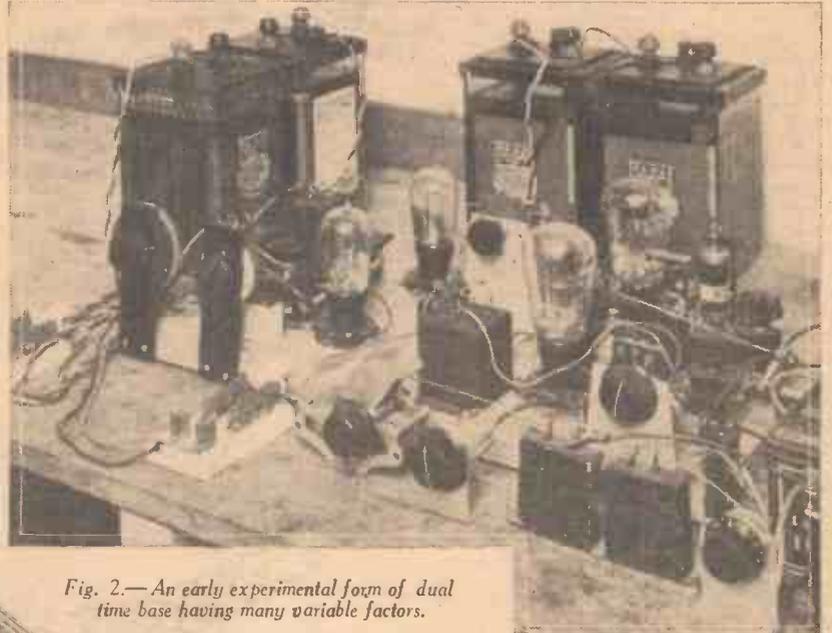


Fig. 2. — An early experimental form of dual time base having many variable factors.

unless it is truly linear there will be a peculiar "bunching" effect at one side and at the bottom of the picture.

It will be appreciated, therefore, that many people regarded this piece of apparatus with a measure of suspicion. Early photographs of dual time bases tended to con-

firm this, for the components and layout looked extremely "experimental" in character, a conviction readily borne out by a reference to Fig. 2. This shows a dual time base fed from L.T. accumulators and H.T. batteries. Gas filled relays of the mercury vapour type were used, and in order to ascertain correct performance factors, many of the resistances and condensers incorporated were made variable. Since then, however, considerable improvements have been made.

Not only do they obtain their power from the mains, but the complete unit is compact, efficient and reliable in performance. This will be substantiated by referring to Fig. 1, which illustrates a modern type time base for television work for use in conjunction with a cathode-ray tube dependent upon electrostatic deflection. A greater degree of simplification may be expected before the television service starts, but it is reassuring to learn that progress is being made in all auxiliary equipment associated with the working of modern cathode-ray tubes.

Satisfactory Progress

SATISFACTORY progress is being made in connection with the tall lattice mast which is to carry the two aerial arrays at the Alexandra Palace. It replaces the previous pyramid-shaped steeple on the top of one of the towers and the erection has been no mean engineering feat. Two aerial arrays will be supported by this mast, the lower one being for radiating the sound signals on a wavelength of 7.2 metres, while the upper one will broadcast the vision signals on 6.6 metres. In an effort to secure equal signal radiation in all directions, and so cover a wide service area, it is anticipated that an array of eight separate vertical dipole aeriels will be employed. The balancing of the feeder arrangements for a scheme of this nature will not be an easy matter, and no doubt once the radio transmitters are installed a series of field strength measurements will be undertaken in order to determine the overall efficiency and locate "blind spots." Work of a similar nature is being carried out at present from the ultra-short wave radio transmitter on the roof of Broadcasting House, and according to reports, both the quality and strength received is quite satisfactory.

TELENEWS

B.B.C.'s Film Unit

IT is learned that a film unit has been formed by the B.B.C. in connection with the high-definition television service. Since the new standard contract drawn up by the cinematograph exhibitors prohibits the televising of films until they have been seen throughout the country in the cinemas, such films would have no programme value. The formation of a film unit would appear to be the B.B.C.'s answer to this opposition. No doubt in the early days of the service several stage items will be arranged so that they may be televised by direct pick-up methods. At the same time that this is happening an ordinary film camera will record each item and so build up a stock of short programme numbers in celluloid for use on tele-cine apparatus as required. The establishment of a unit of this character is certainly a step in the right direction and will enable the B.B.C. to be independent of outside sources for their film material if such a course is felt to be desirable.

In the U.S.A.

IT has been stated that negotiations for an association of television interests are now taking place between the Radio Corporation of America and Western Electric. The idea seems to be that if the arrangement materialises, then those cinemas having sound equipment manufactured by either of these two firms will be able to secure apparatus which combines the best of both corporations. Too often is television's development associated only with a source of amusement in the home, but it must be realised that the cinema field is a very vast one which can become a large market for equipment capable of receiving radiated television signals, and translating them in such a way that they can be seen as full-size pictures in the cinema. No attempt will be made to supplant the present form of cinema entertainment but rather to supplement the novelty appeal so that patrons will have a greater incentive to attend instead of staying at home. It would appear that technicians and others on both sides of the Atlantic are alert to these developments, and anxious to be the first in the field from the point of view of installation.

QUALITY REPRODUCTION

(Continued from page 821)

Designers have recently overcome this objection on the more expensive superhet radiograms by providing a switch to reduce the number of valve stages on the "locals," the circuit being converted to a straight one, with a minimum of tuned circuits. A similar arrangement adopted by the writer has proved extremely effective and has avoided the necessity for a purely local station quality receiver.

Owing to the various degrees of selectivity provided, adjustable whistle filters are essential and, due to certain poor continental transmissions, provision is desirable for modifying the frequency characteristics of the amplifier. The inclusion of the latter control is not an unmixed blessing, as one is sometimes hard pressed to know where to adjust the balance for correct reproduction. It would seem that the most desirable feature is automatically to arrange the amplifier for straight-line amplification on the local setting of the "local distance" switch and throw the tone control out of action. If the reproduction is sometimes woolly on certain doubtful local programmes, one can at least be certain that it will be correct on those transmissions, such as from the Queen's Hall, where proper acoustics and every technical transmitting refinement are in evidence.

Loud-speaker Equipments

This discussion has led us somewhat away from our objective, namely, the commercial receiver, so let us turn back and examine present-day tendencies in loud-speaker equipments. On the higher priced sets two or more loud-speakers are incorporated as a matter of course, and groups of three or four are not uncommon. The intention of each designer is to overcome the defects in any one speaker, and it must be admitted that the results generally justify this conclusion. To a small extent, the distribution of several sound units over a reasonable baffle area, as on certain large radiograms, has also produced a greater area of sound (not necessarily a greater intensity) which is all to the good. One or two makers only have thought to limit, by electrical filters, the frequency overlap between the loud-speakers, relying instead on the frequency discrimination of each unit. A high note "tweeter" with a medium-sized moving-coil middle register speaker and a larger similar energised moving coil unit for the lower middle and bass frequencies usually constitutes the group employed.

A number of these combinations have been heard, and in nearly every case the tweeter output was considered either too shrill or directional. Subsequent private tests by the writer on his own outfit have shown it highly desirable to severely limit the input to a tweeter, otherwise it is liable to over-compensate for the falling characteristic of the middle register unit. A further necessary refinement is a frequency discriminating network to prevent other than high notes being fed to the tweeter as otherwise it tends to rattle on sustained notes.

Considerable improvements have been effected in overcoming cabinet resonances by the use of open backs and dispensing with bottom shelves, and in some cases by making the sides shallow, the cabinets being legitimately "faked" to provide the necessary top depth for the pick-up and turntable equipment. Cross battens and sound absorbing materials for the interiors are also now in common use.

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LETTERS FROM READERS

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



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

Charging Accumulators

SIR,—Mr. Beveridge's criticism on my letter in your issue of February 15th, gives a misinterpretation as to its contents.

He writes: "Simultaneously grasping the live circuit ends after disconnecting the accumulator, and accidentally touching one main of a leaky system has confused the issue."

This statement is erroneous. I said in my letter: "If one did accidentally touch the live ends on the accumulator terminals, the shock received would not be drastic, provided the insulation on the main supply at this instant was in good condition."

It's obvious, if an "unsuspecting mortal" did grasp the live circuit ends, he certainly is asking for trouble. Also, Mr. Beveridge comments on my letter being "lengthy"—possibly the length has confused him.—**R. BOLTON (Sanghar).**

Modernising the Speaker Opening

SIR,—I hasten to pass a few remarks regarding the article on page 575 of the current issue of PRACTICAL AND AMATEUR WIRELESS. Though the article is headed: "Modernising the Speaker Opening," it is no modern idea (this—by the way). The point I wish to make clear is this. If the reader makes the shutters as described, he will, on switching on his set, hardly fail to hear the metallic noises accompanying the broadcast. These being caused by the vibration of the speaker-cone on the metal used in construction (even a loose tuning-scale will make a tiresome noise). The remedy, which I have proved by experience, is to fix thin rubber washers where the metal would otherwise come in contact.

Another suggestion I would make is to use bronzed finger-plates for fixing on doors, and these can be obtained cheaply and in various designs.—**ALEC DAVIE (Edmonton).**

Back Number Wanted

SIR,—I shall be greatly obliged if any reader could supply me with an unwanted copy of PRACTICAL AND AMATEUR WIRELESS for October 27th, 1934.—**ALEX. NEILL (Belfast).**

A Multi-valve All-wave Superhet

SIR,—I wrote to you some months ago and told you I was making a multi-valve all-wave superhet, such as some of your readers showed interest in, and you said you would like to have details when tests were completed.

I have now completed the set, a nineteen-valve outfit, using Ostar Ganz valves. The trouble is that at the moment I am compelled to use only an indoor aerial so that I cannot give you an account of the true capabilities of the set. I am shortly leaving for India where I intend to operate with a Rothermel "Noise-Master" aerial, and should then be able to tell you what the set could do when given a chance.

So far the only stations outside Europe (apart from commercial morse), which I have received at good entertainment strength are New York City (WEL and WEM), which I tuned in at 09.15 hours on the morning of the funeral of King George V

when they were picking up the funeral broadcast, and from GSB and relaying it to Pittsburgh, Schenectady, and Boston. I have also had Caracas, Venezuela, but it was almost completely smothered in static, and I was only just able to catch the announcement. I have not really tried to tune in the more difficult stations as I do not think it is worth the trouble on my present aerial.

However, a remarkable feature of the set is the absence of valve noises, of which one might expect quite a lot with so many valves. Reproduction of gramophone records, using a Rothermel de-luxe pick-up, is really brilliant.

These valves have a great advantage to the constructor in that one has the advantage of mains operation, but can start with one rectifier and, if necessary, a single detector operating headphones, adding to the set as finances allow until you reach the limit for one rectifier when you get another and carry on, the troubles involved by the use of mains transformers and barretters for normal universal valves being absent.—**A. R. C. BUTTERWORTH (Wisbech, Cambs.)**

[We shall be glad to have further particulars of your set after you have tested it in India.—ED.]

Returning Borrowed Back Numbers

SIR,—In the February 29th issue of PRACTICAL AND AMATEUR WIRELESS I notice in particular, on page 776, re Letters from Readers, a letter from A. Nicklen, of Huddersfield, re returning of borrowed issues. I would like to couple my name with that of A. Nicklen. I myself have been a reader of your valuable journal since the first issue, and have every number from the first right up to date, with the exception of one number, May 26th, 1934. This number I lent out with other back numbers at different times, but this one was never returned, and some I had returned were mutilated, which is not very encouraging. As stated by A. Nicklen, I shall myself be only too pleased to oblige any reader of this journal by loaning him any back number I possess on condition that they are returned undamaged. I would also ask readers when returning the back numbers not to forget to return the blueprints when one is loaned with the issue. I might also state that any reader borrowing a back number should defray the cost of postage.—**S. NISBET (Alvaston).**

A Short-wave Log from Chingford

SIR,—I noticed that F. Andrews, in his letter in a recent issue, mentioned that he had not seen a log from this district before. The log given below is of stations which I have received recently: **DJA, DJB, DJD, DJN, HBR, HBL, HBP, HVJ, 2RO, RNE, FYA, W2XAD, W2XAF, W8XK, W2COS, W3BSH, W1FE, W3WF, W3DF, and F3KR.** Also a number of amateurs.

My receiver is a det. L.F., using a seven-foot aerial, and a sheet of copper for an earth. I am fifteen years old and have been reading your excellent journal for just over a year.—**A. H. DOYLE (Chingford).**

S.W. Reception in Devon

SIR,—Perhaps the following survey of short-wave stations, heard during the last month, will interest fellow readers. The 13-metre band has been hopeless, W8XK being heard only twice, and then only about R3. On the 16- and 19-metre band reception was much better, especially W3XAL, W2XAD and W8XK. On Sundays HAS3 has consistently provided an R9 signal.

The local stations on 25 metres have been very variable, PHI, 2RO and DJD being the most outstanding. Out of the "long-distance" stations W1XAL comes through very well; W2XE and W8XK being seldom heard at any strength. The band providing most entertainment was the 31-metre one. Rome (1) 2RO, DJA, DJN, GSC, GSB, and W2XAF providing many R9s to the log. W1XK, PRF5 and LKJ1 have also been very well heard. On Sundays, what a thrill, VK2ME, Sydney, always providing a solid hour and a half's good entertainment. On the 49-metre band very good local signals have also been heard.

I might add that my set is the "Home-Made Coil Two," with which I am very pleased.—**F. W. MOORE (Exeter).**

Blueprint Wanted

SIR,—I am desirous of obtaining a blueprint (AW 375) and book for the Melody Ranger 4-valve S.G. Det., R.C. and trans. Date of issue January, 1933 (approx.). Can any reader oblige me?—**R. A. BAGLEY (139, Bulstrode Avenue, Hounslow, Middx.).**

Correspondent Wanted

SIR,—I should like to get in touch with a listener in this district, preferably one who is interested in short-wave reception.—**S. BURNARD (Valency House, Boscawen, Cornwall).**

[Will any interested reader in the district please note.—ED.]

CUT THIS OUT EACH WEEK

Do you know

—THAT the tuning of a superhet may be flattened, for quality reproduction on the local, by modifying the coupling in the I.F. transformers.

—THAT special components utilising the above principle are now on the market.

—THAT although a push-pull amplifier will function with one valve removed, this should not be done in view of the risk of overload in other parts of the circuit.

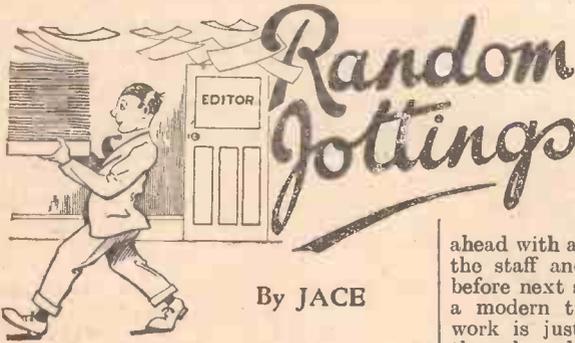
—THAT a cone having curved sides is claimed to provide better reproduction than the orthodox straight-sided cone.

—THAT crackling caused by a faulty L.T. switch may be identified by a fluctuating anode current.

—THAT temporary condensers may be constructed from any metal separated either by air or some insulating material such as paper, etc.

—THAT the capacity of a small variable condenser may be increased by placing paper or similar material between the vanes.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Neumes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.



By JACE

Significant Developments at Slough

It has been known for some time past that McMichael sets have been gaining ground on all fronts, and their twin-speaker instruments—the 15-guinea superhet and



Len Bermon, late of Henry Hall's Dance Orchestra, listens to some of his recent recordings on a new Pye radiogram. With him is Mr. Hornby, Manager of the Brighton Hippodrome.

the new radiogram—seem to be exceptionally popular.

The McMichael factory at Slough has grown enormously in recent years and very up-to-date methods of production are employed throughout, although it should be noted that mass production, as it is generally accepted, has found no place there, hand construction and assembly by skilled workers being one of McMichael's strongest sales arguments. Just now

Slough is the scene of more than usual activity; extensive plans are being prepared for next season and the McMichael works are receiving their share of attention. No less than four new bays are at present being added to the production and research buildings, and construction is being pushed

ahead with all speed with a view to getting the staff and plant comfortably installed before next season. A further addition is a modern two-story building, on which work is just beginning, to accommodate the enlarged office staff. The total area of additional floor space amounts to over 10,000 square feet, and the whole contract has been placed with Tyson Chambers, Ltd., who also received the contract for building the Slough Municipal Offices. It is expected that the constructional side of the work will be completed in three months.

"Queen Mary" Broadcasts

THE B.B.C. announces that, in co-operation with Cunard White Star, Limited, arrangements are in hand for broadcasting from the *Queen Mary* each evening during her maiden voyage from Southampton to New York. During the trip Mr. R. H. Eckersley, Assistant Controller of Programmes, will act in a supervisory capacity to all programmes, Mr. John Snagge will represent the O.B. Department, with Mr. John Watt as producer. Mr. R. H. Wood (engineer in charge O.B.) with two assistants will be responsible for all technical arrangements. Many parts of the ship will be wired for microphones. There will be twenty-eight points available, including main ballroom, first-class dining-room, first-class lounge (for light music, etc.), verandah grill, covering main dance band on sun deck, swimming pool, embarkation deck at Southampton, and covering the deck for disembarkation in New York, and crew's nest.

According to present arrangements, the departure from Southampton will be described in commentaries both from ship and shore. On the second night out from Southampton it is proposed to broadcast a feature programme, in which listeners will be conducted on a tour of the ship. The programme will last forty-five minutes. On each night of this maiden voyage a short "flash" will be included in the news bulletins. It is hoped also to include a broadcast of the arrival in New York.

ACKNOWLEDGED THE BEST

B.T.S. TRIPLE RANGE S.W. COIL
 Revolutionary advance in S.W. technique, simplifying and increasing efficiency of reception to enormous degree. Renders coil changing unnecessary. With low loss a.t.c. capacity switch. Single hole fixing. Range 1. 12-25, Range 2, 19-40, Range 3, 30-80 metres. Type *SCU* **12/6**

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 Rigidly constructed, functions with a complete absence of crackle. Owing to its small size the radiated field is very small. Provided with moulded knob, and slit at the top for screw-driver adjustment. Type *UTC* **2/9**

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 Specially designed half-wave doublet aerial, incorporating all the features necessary for short and ultra-short-wave work. Essential to perfect short-wave reception. Supplied absolutely complete with coupling unit and instructions. Current **21/-**
 Feed or Voltage Feed type.

Send 3d. in stamps for No. 1 of the B.T.S. magazine. "Short Wave Constructor," containing 3 entirely new S.W. Circuits.

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An interesting public address van produced by Messrs. Stewart & Ardern, Ltd. Particulars of this were given in a recent issue.

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Phonola Radio

An Interesting Receiver Designed to Cover the Short and Medium Broadcast Bands

WE have recently had the opportunity of testing a receiver of Canadian design in which a number of interesting arrangements were incorporated, and which set this particular model apart from the standard which we are accustomed to in this country. As may be seen from the illustration of the model below, the cabinet work is quite different from the usual table model, and the tuning dial is arranged on slightly different lines. Although of the "clock-face" type, the actual calibrations are carried out in two separate scales, each marked in kilocycles (and megacycles in the case of the lower short-wave band) and the colouring is green in respect of the lower broadcast band and red for the short waves. The dial light illuminates the entire dial, leaving the figures clearly silhouetted in their respective colours, and in the small slot seen at the lower part of the dial a wave-range indicating plate comes into view according to the setting of the wave-range switch. Thus, when turned to the broadcast band, the opening is covered with a green plate bearing the word "broadcast" upon it, and even without reading the wording the indication that the green portion of the scale is in use is sufficient for station selection. As with the majority of Canadian and American receivers, there are no long waves on the receiver, and the absence of the complication of switching results in a more efficient short-wave performance.

Circuit Details

There are four valves in the receiver, plus a valve rectifier, and the use of multiple electrode valves results in the employment of a circuit in which there are actually eight separate valve functions. The ganged tuning condenser is of the three-section type, and the screening is most comprehensive. The four control knobs beneath the tuning dial are, reading from left to right, combined tone and on/off switch, volume control, tuning control, and wave-range switch. It will be noted that the on/off switch is combined with a tone control, and not a volume control as is usually the practice in this country. In our opinion this is an improvement, as many listeners use the receiver for the reception of the local station for the majority of the listening period, and the volume control may be left at the most suitable setting and does not have to be readjusted every time the receiver is switched off. The range of control obtained on the tone control is most complete and appeared to extend farther in the upper and lower ranges than on the majority of commercial receivers.

Test Report

The brilliancy of the upper register is enhanced by the fact that a very small one is employed on the 6in. loud-speaker, whilst a well-balanced

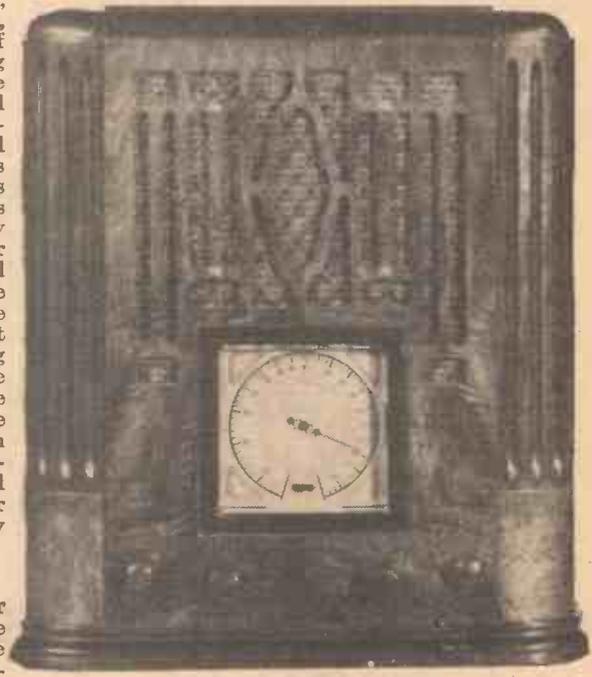
colouration produces the effect of a full bass response. The tonal balance is very good indeed, and there is a complete absence of cabinet boom or resonance.

Sensitivity is well up to standard, and on the short waves particularly it was possible to obtain practically any desired station simply by adjusting the pointer to the desired frequency. Various aerials were tried, and it was found that there was little modification in the performance, and quite as good results were obtained with 18in. of wire as with a full broadcast aerial. There was no trace of pulling between circuits, and it appeared that the wiring had been very carefully carried out in order to permit the screening between circuits to be perfectly maintained.

A useful chart of short-wave stations is supplied with the receiver, together with hints on the reception of these stations and the most suitable times at which to listen. The receiver may be obtained from Messrs. Dickson and Self, of 216, Earl's Court Road, London, S.W.5, and the price of this particular model is £12.

Other Models

There are a number of similar receivers in the Phonola range, and in addition the chassis are incorporated in floor type cabinets, although not employing a gramophone section. The large cabinets have very large speaker openings, and the cabinets are designed, in conjunction with the loud-speaker which is employed, to provide an unusual form of reproduction which is described by the makers as "Tone Perspective." There are two special receivers in which the supply of all voltages is obtained from an ordinary 6-volt accumulator, a motor generator inside the receiver then developing the necessary H.T. and bias voltages. This arrangement is, of course, ideal for the listener who has no electric mains facilities.



The Phonola Model T.P.-56.

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 CARDIFF AND DISTRICT SHORT-WAVE CLUB

ANOTHER very successful meeting of the above society was held at the Barry's Hotel, St. Mary Street, Cardiff, on Thursday, February 6th, at which the attendance was thirty-six. Mr. W. Sutton gave a very interesting talk on "How to Learn Morse," and followed this with some code practice at speeds varying from one to thirty words per minute. He continued these practices and lessons in morse at the meetings held on February 20th and March 5th, and is giving another one on March 26th. All readers of PRACTICAL AND AMATEUR WIRELESS are cordially invited to attend. There is no subscription for membership of the club, and all interested are asked to get in touch with the Hon. Sec., Mr. H. H. Phillips, 132, Clare Road, Cardiff, who will be pleased to give any information regarding the club.

THE RADIO, PHYSICAL AND TELEVISION SOCIETY

A LECTURE and demonstration on "Home Recording" was given by Dr. C. G. Lemon at a meeting of this society held on Friday, February 7th. The lecturer described the first methods of recording and the apparatus used by Edison. A wax cylinder was used after Edison's tinfoil, and finally, on account of its smaller size, the disc as we now know it was evolved.

A demonstration was given of the latest recording discs evolved by the lecturer and which were not yet marketed. The discs are transparent and completely flexible, while they are of the thickness of a sheet of paper. In spite of this, however, they may be played with a steel needle several hundred times after hardening with a special solution. The background hiss with this disc is negligible, and records of B.B.C. items and members' "turns" were made after the lecture.

The annual subscription payable on membership is 2s., but visitors are under no pecuniary obligations. Headquarters are at 72a, North End Road (off Talgarth Road), West Kensington, and lectures commence at 8 p.m. Further details may be obtained from the Hon. Sec., M. E. Arnold, 12, Nassau Road, Barnes, S.W.13.

A CLUB FOR WYTHALL

A FEW more members are required for the formation of this proposed club in the Hollywood and Wythall district, nr. Birmingham, and interested readers in the locality are invited to write for further particulars to J. Aulton (2AGV), "Jesmond Dene," Shawhurst Lane, Hollywood, nr. Birmingham.

THE CROYDON RADIO SOCIETY

LOCAL talent caused a good attendance at the Croydon Radio Society's meeting in St. Peter's Hall, Ledbury Rd., S. Croydon, on Tuesday, February 25th. The occasion was the topic "Reproduction," given by Mr. R. C. Mordaunt, and Mr. J. Thomas, of Purley Radio, Ltd., with their Purley Radio Paraphase Amplifier and associated loud-speakers. On Tuesday, March 17th, the programme is "Reproduction" by Hartley-Turner Radio, Ltd.—Hon. Pub. Sec.: E.L. Cumbers, Maycourt, Campden Road, S. Croydon.

THE INTERNATIONAL BROADCAST SHORT-WAVE CLUB

A CHAPTER of the above club has now been formed in England. There are no entrance fees or dues of any kind, the membership being absolutely free. There are, of course, conditions to membership; these are, to be a member, one must forward:—

1. At least five verifications from short-wave broadcast stations at least 6,000 miles away.
2. A photograph of the operator and/or his listening post. When applying for membership please enclose 1d. stamp for the return postage of your verifications.

All applications for membership must be made to John Taylor (Vice-President), "Hollinwood," Ridge End, Marple, nr. Stockport, Cheshire.

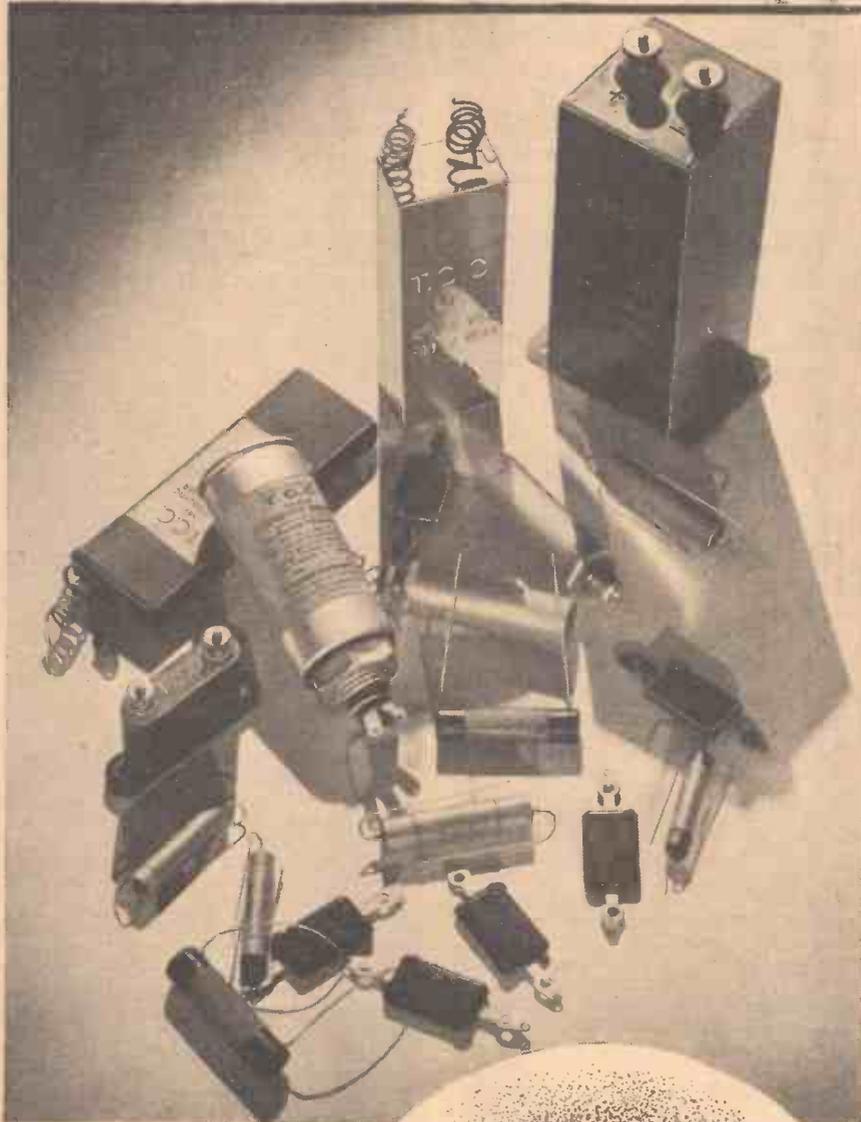
SOUTHEND AND DISTRICT RADIO AND SCIENTIFIC SOCIETY

AT a meeting held at the society's headquarters, "Cotgrove's Restaurant," High Street, Southend-on-Sea, on Friday, February 14th, a talk was given by Mr. S. Rutherford Wilkins on "The Design of Amplifiers for Television." Mr. Wilkins dealt particularly with the problem of obtaining adequate amplification over the exceptionally wide frequency range in such amplifiers. Field days are now being planned for the summer months, and the Hon. Secretary, Mr. F. S. Adams, Chippenham, Eastern Avenue, Southend-on-Sea, will be glad to hear from prospective members.

SALISBURY AND DISTRICT SHORT-WAVE CLUB

THIS club is now in full swing, and meetings take place every fortnight on Tuesday evenings, commencing at 7.45 p.m. We arrange to have two lectures, and morse practice each meeting. At the last meeting, which took place on February 25th, a lecture was given by Mr. C. A. Harley on "Detection of Wireless Signals." Diagrams to illustrate various points were drawn on a blackboard. The other lecture was given by Mr. B. Shilton on "Moving-coil loud-speakers," a home constructed moving-coil speaker being shown in sections. Sir Oliver Lodge, D.Sc., LL.D., F.R.S., has consented to become "Foundation Patron" of the club.—C. A. Harley, Hon. Secretary, 85, Fisherton Street, Salisbury, Wilts.

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Facts and Figures

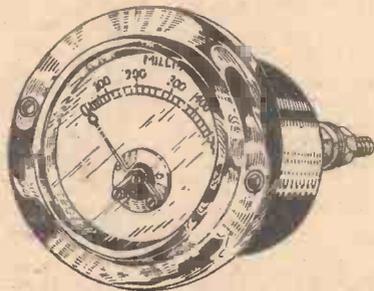
COMPONENTS TESTED IN OUR NEW LABORATORY

Philco Short-wave Booklet Re-issued

MORE than 250,000 copies of the short-wave booklet, produced by the Philco Radio and Television Corporation of Great Britain, Ltd., last year as a guide to short-wave listening, have been supplied by request to the public in all parts of the world.

On account of its popularity and the heavy demand that still continues, this booklet, "Glorious Adventure at Home," has now been fully revised and extended to twenty-four pages, and is available to the public either direct or through Philco dealers at 2s. a copy.

Publication coincides with the announce-



A good meter is indispensable to the keen experimenter. This component is selected from the Raymart range.

ment by Philco of a Universal Empire Six and an Empire Five, which complete a range of Philco all-wave receivers and radiograms extending in price from 15 to 100 guineas. It describes in detail the new world of entertainment available to short-wave listeners, tells the romantic history of short-wave development, explains in simple language the technicalities and terms connected with transmission and reception, and includes a world-map of broadcast and experimental short-wave stations together with up-to-date list showing their frequencies and wavelengths. Other features include advice on aerials, a time-conversion log, an alphabetical list of long- and medium-wave stations, and radio illustrations from distant lands.

Halcyon Converters

TWO short-wave converters are now being marketed by Halcyon Radio, Ltd. One of these is for A.C. operation, whilst the other is intended for battery use and is so designed that it may be used with a battery receiver or a D.C. or universal receiver. The price in either model is three guineas, and the coil which is fitted covers a waveband from 16 to 65 metres without switching. By replacing the coil an alternative waveband from 6.8 to 12 metres can be obtained. The converter is housed in a small cabinet designed to be placed under the ordinary type of table receiver and no metal is used in the chassis. There are three controls, these being tuning (fitted with a concentric trimmer), variable selectivity, and a change-over switch to put the converter out of action and

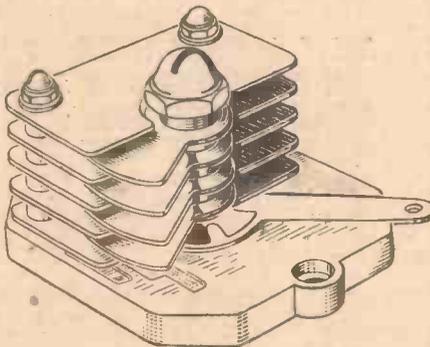
to bring the normal broadcast ranges into use.

Output Meter

ANOTHER interesting addition to the range of Service instrument manufactured by E.M.I. Service, Ltd., is now announced in the form of an output meter. This is of the "desk" type, having a meter mounted on a small sloping panel for ease of reading, whilst the instrument stands flat on a cabinet top or table. Two input terminals are fitted, with a "range" control situated centrally. The dial is calibrated direct in decibels and milliwatts (0.300 milliwatts and -20 to +8 decibels), and the scale has to be multiplied according to the setting of the range switch. This provides for two additional ranges, 0.30 milliwatts with -30 to -2 decibels; 0.3,000 milliwatts and -10 to +8 decibels. The impedance of the instrument is 5,000 ohms, thus permitting of its use with practically all standard types of apparatus. In use the two terminals are connected to the output anode and earth, and the price, complete with leads and instruction book, is £3 7s. 6d. Hire-purchase terms are available.

Mervyn Converter-Adapter

FROM Mervyn Sound & Vision Co., Ltd., comes the announcement of a dual-purpose unit for use with A.C. or battery-operated receivers, to enable short waves to be received without circuit alteration. The circuit is the standard converter arrangement with leads and plugs to enable the output to be taken from the anode or from the anode-choke circuit, thus permitting of the employment of the unit as a superhet converter when the receiver with which it is used has H.F. amplifying stages, or as an adapter, when it takes the place of the detector stage in the broadcast receiver. The tuning is carried out by means of a slow-motion drive fitted with concentric control, providing a reduction gear ratio of 100 to 1, whilst the reaction control is also provided with a 9 to 1 slow motion drive. Two wave ranges are provided, covering a total band from 13 to 35 metres by means of a switch, and the two condensers (tuning and reaction) are of all-brass construction. The entire unit is



With air dielectric, this useful pre-set condenser from the Bulgin range will be found very efficient.

housed in an aluminium case and costs 42s. complete for either model—excluding the valve.

Kabi Ganged Switches

THE miniature Kabi multi-contact switches recently mentioned in these pages may now be obtained in "ganged sections," any particular number being obtainable according to particular requirements. For many modern circuits it is a great convenience to have multi-units of this nature fitted, although, of course, some care is required to carry out the wiring to avoid interaction. The switches are obtainable with various contacts up to 19, and each unit has a single rotating selector arm. The overall diameter is only 1 1/2 in., whilst the depth of each unit is 3/4 in. Either brass or German silver contacts may be fitted, and as an indication of the price we may mention that a double-gang five-contact model with brass contacts costs 6s. 6d., whilst with silver contacts the price is 9s. 6d. A triple gang unit of similar design costs 16s. or 24s., according to the type of contact.

A Useful Meter

FOR transmitters and users of powerful mains apparatus a high-reading milliammeter is often found very useful, as against the use of slow-reading instruments with resistances in shunt. Shown in col. 1 is a meter from the Raymart range, giving a full-scale deflection of 500 milliamps (.5 amps), and this is known as Type F.19. The instrument is of the flush-mounting panel type, having an overall diameter of 2 1/2 in. and terminals are fitted to the rear of the instrument. The price is 6s. 9d. A slightly smaller model is available, having an overall diameter of 2 1/4 in., and the price is 1s. less, namely 5s. 9d. For those experimenters who require a much higher grade of instrument there is a special moving-coil model, in bakelite case, with zero adjustment and sapphire jewelled movement, suitable for D.C. only and in ranges from .1 m/A upwards. The price is 27s. 6d. from 5 m/A, and 30s. for .1 and 2 m/A ranges.

Baseboard Pre-set Condenser

FOR trimming variable condensers on short-wave receivers, and for use in the aerial circuit of similar apparatus, there is often a demand for a pre-set condenser which has extremely low losses. Obviously, one of the first requirements in a low-loss component of this nature is the removal of the usual composition dielectric, whilst all dielectric material which is employed in the construction of the component must also be of the highest efficiency. In the component illustrated on this page, and selected from the Bulgin range, air is employed as the dielectric, and the insulated mount is constructed from a ceramic material. The plates are rigidly positioned, and the base is provided with fixing holes so arranged that the condenser may be mounted either way up. It may be fitted to a wooden or metal base, and to enable it to be mounted beneath a chassis and still be of service the spindle is slotted on the underside. Thus a hole may be drilled in the chassis and the adjustment of the condenser carried out by means of a screwdriver or similarly shaped piece of wood. The lock-nut is also slotted for a similar purpose and the condenser has universal application. It may be obtained with various maximum capacities from 3.5 mmf. to 56 mmf., and the price is 3s. for capacities up to 14.5 mmf. and 3s. 6d. in the higher ranges.

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.

N. B. W. (Grantham). The letters stand for the ends of the primary and secondary windings. "I" stands for "In" or the beginning of the winding, and "O" stands for "Out" or end of the winding. The letters are not now used, and instead the makers adopt the letters P, H.T., G. and G.B. Generally speaking, the IP terminal corresponds to the plate connection, OP to the H.T. connection, OS to the grid connection, and IS to the grid bias connection. A general purpose or special detector valve is employed. In a one-valve set, although other types may be used in certain circumstances.

S. H. S. (Redcar). So far as we are aware the type of charger in question is not now on the market. We think that a similar type of unit was at one time manufactured and sold by the British Thomson Houston Co. Ltd.

J. W. (Salisbury). The carborundum crystal may be obtained from Electradix Radios, whose advertisement appears in these pages.

W. J. A. (S.W.8). We regret that the issue in question is now out of print and thus we are unable to supply any more complete details. What difficulties have you encountered? If you can state these, and enclose a stamped and addressed envelope, we will endeavour to help you.

H. J. B. (Hockley). We have only used the coils in one receiver, and, as the makers have informed you, the coils are now out of date and superseded by the G type. A circuit diagram appears on page 307 of our issue dated October 28th 1933, and a blue-print of this receiver may be obtained for 1s. (P.W.32).

F. W. F. (Sparkhill). The vertical aerial is probably to be found the most suitable in your case. The dual adapter in the light-holder will be quite suitable. If you fit a lightning switch it should be outside the house to afford complete protection.

A. J. G. (Forest Hill). The scheme does work in certain cases, but many listeners have experienced difficulty, and apparently the coils are not all-suitable.

C. V. B. (Windsor). Two valves may be used in the detector stage and the arrangement has been given in our pages. A special centre-tapped reaction winding is required, and full details will be found in our issue dated March 4th, 1933.

I. H. (Swansea). The components should certainly be of use in the construction of a mains set, but it would be essential to know all the characteristics of them, and this information will not be found printed or otherwise given. Without elaborate apparatus you could not ascertain the details and would have to communicate with the makers.

W. J. P. (Sidcup). The Paraphase amplifier was described in our issue dated January 18th last.

A. K. (Newcastle). The coils should certainly be suitable, but we cannot guarantee results unless you employ those coils which we used in the original model.

P. C. (Hayes). We regret that we have no details of the coil, and suggest you communicate with the makers, E.M.I., at Hayes.

J. E. (Shipley). If all components are in order, we suggest that you use a variable .0001 mfd. in place of the fixed coupling condenser in order to modify the coupling.

H. T. R. (Sparkbrook). We regret that your query is not clear. There should be no troubles from surge in the case mentioned by you.

J. G. G. (Bristol, 2). The present valve will be retained and is quite suitable for A.V.C. working.

W. V. (Birmingham). The receiver should function correctly, but in view of your difficulties we suggest you communicate with the makers as some circuit fault may have developed.

H. G. (Fulham). There should be no hum, and this would indicate an open grid circuit. Can you check all connections and components in this direction?

F. C. (Dalston). There would appear to be a circuit fault, but it is not identifiable from your remarks. Can you give further particulars, especially as to the source of H.T. supply.

J. F. (Manchester). We cannot give you details of an electrolytic charger of the output mentioned. Why not use a metal rectifier?

J. R. (Liverpool). The combination of coils and condensers should prove quite effective, but we have not tried them and cannot give any guarantee of the results to be expected.

W. A. H. W. (Bristol, 7). The shorting of the reaction condenser plates is no indication, and is, in fact, dangerous, as the H.T. is short-circuited, and there is a possibility of damaging the reaction winding on some coils. It would appear either that the H.T. is insufficient, or that the valve is unsuitable.

L. T. M. (Lincoln). The oscillator may be used to provide a constant signal at the aerial, and the output meter used to check ganging, or you can carry out the adjustment mentioned in our issue dated February 15th last, page 698.

R. S. (Plymouth). We suggest you construct the Converter-adapter which is the subject of blue-print P.W.48A.

G. S. (Sheerness, E.). The 4,000 ohms 'phones will prove most sensitive, and if you employ the low-resistance models you would need a special transformer in order to match the output valve.

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QUERIES and ENQUIRIES



Heterodynes or Oscillation ?

"Is there any adjustment in a single condenser tuning to stop oscillating on some stations which I cannot tune in—especially on the higher band? Also can you give me the address of the makers of the Alba Superhet radio-gram?"—G. H. (Coventry).

THE fact that you mention a superhet receiver after your query leads us to believe that you are experiencing the oscillation on this receiver, although the reference to single condenser tuning may infer either that the set is "one-knob" control, or refer to a one-valver. In the latter case, excessive reaction is indicated, due to too high a value of H.T. on the valve coupling between the H.F. choke and grid coil, or high minimum of the reaction condenser. In the case of a superhet, however, second channel whistles are responsible for the trouble, and a fault may be present in the receiver if these are excessive. Certain stations are heterodyned, however, by others working on a wavelength very close to those stations, and only a whistle filter in the receiver (which will also cut out top notes) will remove the trouble. The makers of the Alba receiver are A. J. Balcombe, Ltd., 52-58, Tabernacle Street, London, E.C.2.

A .006-mfd. Pre-set

"In your issue of the 14th January last you gave a list of parts to convert the Multi-range D.C. meter to enable A.C. voltages to be read. I have got all the parts but one and that is the .006 mfd. pre-set. My radio dealer tells me that no one makes such a condenser and I would like you to tell me the maker's name of the one used in the original set."—E. M. (York).

THE pre-set which was used by Service Engineer in the original meter was a Formo, but this particular capacity has now been discontinued. It may be obtained at some stores, but in the event of any difficulty a .002 mfd. pre-set may be used in parallel with a .004 mfd. fixed condenser and will provide sufficient variation in capacity. Alternatively, you could use two .002 mfd. pre-sets in parallel with a .002 mfd. fixed, but this is not essential as sufficient variation will be obtained with the above scheme.

Intermittent Contact

"A fault has developed in my A.C. set which I cannot locate. When I switch on signals will be very good, perhaps for all the evening. At some times, however, there is a little click, and a deep hum then starts and will not stop unless the set is switched off and allowed to get quite cold. Even if switched off for, say, two minutes, the hum is there directly I switch on again. I have tested the valves and cannot see any loose connections. Can you suggest anything, please?"—G. T. (Oundle).

THE trouble is no doubt due to a loose contact which maintains its position due to springiness in the contact until shaken by a loud signal. This breaks the contact and in view of the hum it would

appear to be in a grid circuit. Alternatively, the break may result in a short circuit of the H.T. supply, thus causing hum due to an overload of the mains section. In view of these facts check coils, transformer secondaries, and bias circuits, as well as H.F. chokes (especially where a metal screen is fitted) and decoupling condensers. There is just a possibility that the trouble arises when a certain value of current is passed, but in view of the fact that you state that on some evenings everything is in order, we suspect the volume difficulty above mentioned.

Short-wave Converter

"I propose to build a short-wave converter similar to that published by you some

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.

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

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

time ago. You used a standard H.F. choke and a short-wave choke in series, but I have a special all-wave choke in which two separate bobbins are used, and should like to employ this. Will it be in order to do so?"—G. W. Q. A. (Fulham).

IN this particular circuit it is essential to use two separate chokes, unless, of course, you can provide a tapping point at the correct position. Your all-wave choke in two sections is probably a very good choke, in which the two section scheme has been adopted to form an astatic inductance and thus reduce the possibility of interference with other inductive components. Thus a tapping at the junction of the two formers would not produce the desired effect. The short-wave choke (which is joined direct to the anode) is to stop the local oscillations from reaching the receiver with which the converter is used, whilst the standard choke which follows is simply the standard choke coupling to the H.F. circuit. You must, therefore, use the separate components unless you can obtain an all-wave component in which a suitable short-wave section may be tapped off.

Delay Voltage

"I have built a superhet and fitted A.V.C. from a double-diode-triode circuit. I find, however, that when tuning in there is a terrible noise between stations, and as a result I have to turn down the volume control and hope that I shall hear a station

when I get to it, then turning up the control. I believe there are several ways out of this trouble, but I have not been attending to wireless matters for some years and am rather out of date. What do you suggest as the best way out for me?"—B. de V. S. (Brussels).

A SIMPLE way out would be to fit a visual tuning indicator to show when a station was tuned in, turning off the volume control before adjusting the tuning control. There are several alternative types of indicator available, and fitting will depend upon the set and expense you are prepared to meet. On the other hand, the circuit may be improved if you fit a delay control, in which the A.V.C. does not come into effect until a certain signal voltage is obtained. Again, the delay voltage will have to be selected according to the power of the receiver and other circuit details. There are several methods of obtaining the required voltage, and we are unable to assist you without a wiring diagram of the receiver.

D.C. and H.F.

"I am enclosing a circuit of my four-valve set which I have built from various details given in your paper. This is the first set I have designed, and my efforts have not met with much success. Volume is terribly poor, less, in fact, than a good two-valve set, and there is much instability. Is there anything which is obvious from the diagram I enclose which might lead to the trouble?"—C. O. L. (Bristol).

WE note from the diagram that the filament return path is taken *via* the chassis. Although you have spelt the word wrongly, we imagine this to be the special metallised surface similar to that employed by us, and in view of the odd size of the chassis marked by you it would appear that you have cut this up and prepared your own. The metal coating is not to be recommended for the passage of the filament current or any similar high value of direct current, although it might carry it if not subjected to too much handling, etc. In view of the fact that you may have cut this about, the surface is probably broken in more than one place and thus it is perhaps of little use even for H.F. circuits. We therefore advise the linking up of all points marked M.B. on your sketch, when no doubt the whole of the trouble will disappear. It should be remembered that the metallising is intended for H.F. screening and H.F. circuit return paths only, in which respect it will be found to be ideal.

Meter Movements

"I am anxious to make up a special meter in which I need a good moving-coil movement. Is there any firm from which I could obtain the necessary moving coil and a suitable magnet? I have not yet worked out full details as it will depend upon the actual size of the parts I can get. I have tried making them, but find that it is a little too delicate for the tools which I possess."—B. G. (Handsworth).

WE believe a suitable movement could be obtained from Electradix Radios, 218, Upper Thames Street, London, E.C. So far as we are aware no other firm supplies the parts for a meter of the type described by you, although you could communicate with one or two well-known firms regarding the matter.

The coupon on cover iii must be attached to every query

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VAUXHALL.—Polar station named scales, for horizontal dials, latest settings; 1/9 each.

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VAUXHALL.—T.C.C. condensers, tubular, non-inductive, 0.1, 6d.; 50 mfd., 50v. working, 1/6; 50 mfd., 15v., 1/3; 0.05, 6d.; 0.002, 0.0002, 0.001, 0.0001, 4d. each.

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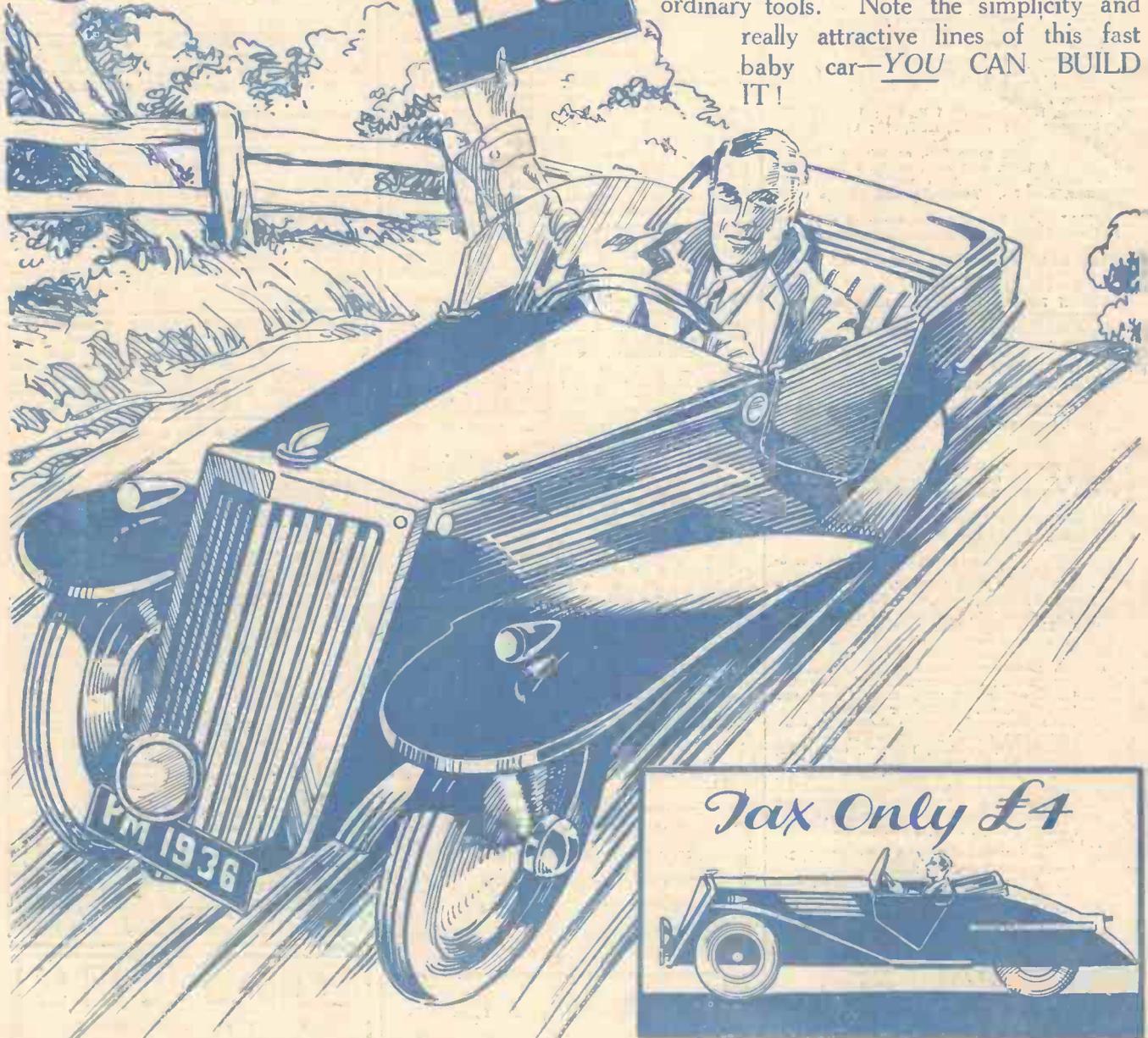
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Fully Described *In the March*

PRACTICAL MECHANICS

The Magazine of Modern Marvels

OUT NOW 6^{D.}

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