THE AUSTRALASIAN

Radio World

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VOL. 12 ..... NO. 9

FEBRUARY 15, 1948

* ADVANCE ANNOUNCEMENT

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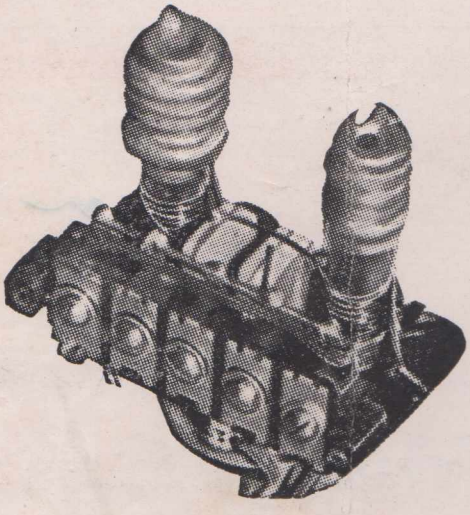

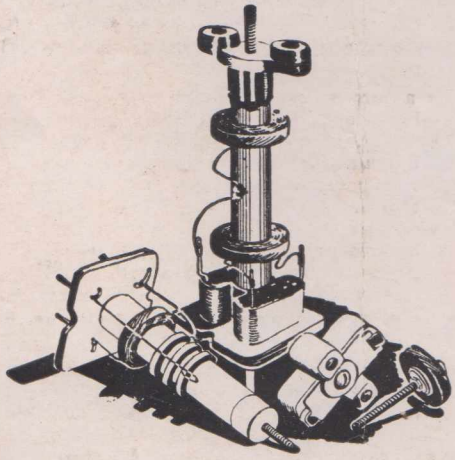

P.C.53 Aerial Coil	8/9
P.C.54 R/F Coil	8/9
P.C.55 Oscillator Coil	8/9
P.T. 31 I.F. Transformer 455 K.C. 1st	13/9
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Vol. 12 FEBRUARY, 1948 No. 9

CONTENTS

EDITORIAL

It is a lot of fun being a publisher of a technical radio magazine but there are one or two tight corners which you have to be careful to keep out of.

To give you two examples, I might mention that quite a number of letters have been received lately which tend towards being abusive (in a nice way, of course) because I won't put down in black and white which I think is the best pick-up, and because I haven't yet published an article on how to make your own wire recorder.

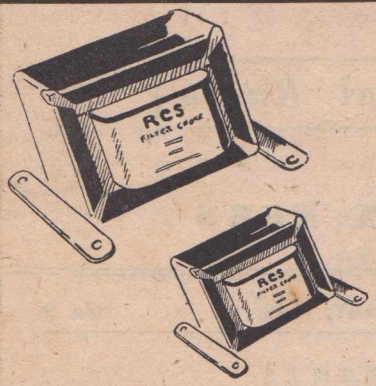
The pick-ups are a proper headache. For days past I have been running one of the latest type of amplifiers with triodes and inverse feedback, trying out in turn the "Lexington" and "Connoisseur" pick-ups against my old favourite crystal job which I picked out of a batch after running them on frequency test records with a v.t.v.m. in circuit. There is no doubt about the latest English pick-ups scraping highs off the records which you never hear with ordinary pick-ups, but it is hard to say whether it can be considered desirable, especially with ordinary records. By cutting the highs you can only get back to where you started. A tuned scratch filter seems to be the only answer.

Making up a wire recorder at home is a far more complicated job than you might imagine from looking at a diagram which has been sketched out to show the fundamentals of the idea. You can't just use any old bits of wire and you need a lot of precision work of a mechanical nature.

—A. G. HULL.

CHOKES · TRANSFORMERS · COILS

FILTER **AUDIO & VIBRATOR** **FILAMENT** **AUTO SPEAKER** **AUDIO & VIBRATOR** **LINE** **LINE FILTER** **ETC.**



FILTER CHOKES

These quality components incorporate heavy copper wire wound on trolitul bobbins. The use of trolitul eliminates electrolysis, ensuring much longer effective life.

Sizes 2¾ x 2⅜ x 1⅜

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Type TC60 30 Henries 250 ohms D.C. Res. 100 M/A 13/6

Type TC80 30 Henries 150 M/A 21/-

Type TC81 30 Henries 200 M/A 25/-

Specially designed for use in conjunction with speakers.

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Type TC66 20 Henries 650 ohms D.C. Res. 60 M/A 10/-

AUDIO CHOKES

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Type TP1 2.5 volts, 2 amps, 7 watt 11/6

Type TP2 4 volts, 1 amp, 7 watt 11/6

Type TP3 6.3 volts, 3 amps, 7 watt 11/6

Type TP55 6.3 volts, 3 amps, 15 watt 12/9

(Note: Last item—size 2¾ x 2⅜ x 1¾)

SPEAKER TRANSFORMERS

Laminated with high grade stalloy iron and complete with mounting clamp, are available in a range to match any output valve and speaker combination, both single and push pull.

Sizes 2¼ x 2 x 1½

Type TS23 Single low impedance triode 10/-

Type TS24 Single high impedance triode 10/-

Type TS25 Push Pull low impedance triode 10/6

Type TS26 Push Pull high impedance triode 10/6

Type TS27 Single low impedance pentode 10/-

Type TS28 Single high impedance pentode 10/-

Type TS29 Push Pull low impedance pentode 10/6

Type TS30 Push Pull high impedance pentode 10/6

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Suitable for valve replacement.

Size 2¼ x 2 x 1½

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Long experience in the production of highly efficient transformers combined with extensive research into raw materials and design has resulted in the production of Audio transformers of excellent performance and complete reliability.

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Type TB42 A class single, 3 to 1 ratio 21/-

Type TB43 A class Push Pull, 3 to 1 ratio 22/6

Type TB44 B class Push Pull, 1½ to 1 ratio 21/-

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Designed to supply correct voltages and current for the receiver, the finest grade materials procurable are used in their construction. They are given individual tests during manufacture, as well as rigid tests and inspection before shipment.

Sizes 2¾ x 2⅜ x 1¾

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LINE FILTER

The R.C.S. Line Filter is specially designed and constructed to eliminate all noises which occur by reason of feedback from power mains . . . electric motors . . . refrigerators . . . elevators . . sub-stations . . . high tension wires . . . irons . . . and jugs! Easy to install —it connects between the radio and power point.

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Type F132 Single low impedance triode 5/6

Type F133 Single high impedance triode 5/6

Type F134 Push Pull low impedance triode 6/-

Type F135 Push Pull high impedance triode 6/-

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Type F137 Single high impedance pentode 5/6

Type F138 Push Pull low impedance pentode 6/-

Type F139 Push Pull high impedance pentode 6/-

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STIR IN HI-FI CIRCLES

Distortion Standards Upset by Triodes with Feedback

A MINOR sensation has happened in amplifier circles since the news has got around that the use of inverse feedback with triode amplifiers gives a reduction in distortion which is noticeable to the ear in spite of previous acceptance of a fable that distortion from 2 to 5 per cent could not be distinguished by the human ear.

The reason for all the hubbub can be traced back to the circuit which we published in our August, 1947, issue, having reprinted same as an item of interest from the English "Wireless World" of April and May, 1947. Designed by a Mr. D. T. N. Williamson, late of the Marconi-Osram valve factory, this circuit was presented as featuring low distortion, but since it is so easy to get amplifiers with low distortion this circuit did not arouse any terrific amount of enthusiasm until one or two of our deepest-dyed quality enthusiasts actually built it up and got to work on it. Then the startling fact was revealed that in spite of all tales which have been current to the contrary, the human ear can tell the difference when distortion is reduced from 2 or 3 per cent. to less than a quarter of a per cent. Possibly phase shift has something to do with it, too, for this amplifier has a feedkack circuit which means that trouble is encountered if the phase shift is not held to a minimum. Having taken trouble in the design to minimise phase shift in order to get the feedback circuit working properly, the nett result of the low harmonic distortion, wide frequency range and small phase shift is something which is appreciated as soon as it is heard.

O.P.T. Important

Essential for the proper operation of the amplifier is an efficient output transformer with low leakage inductance and high primary inductance. On account of the in-

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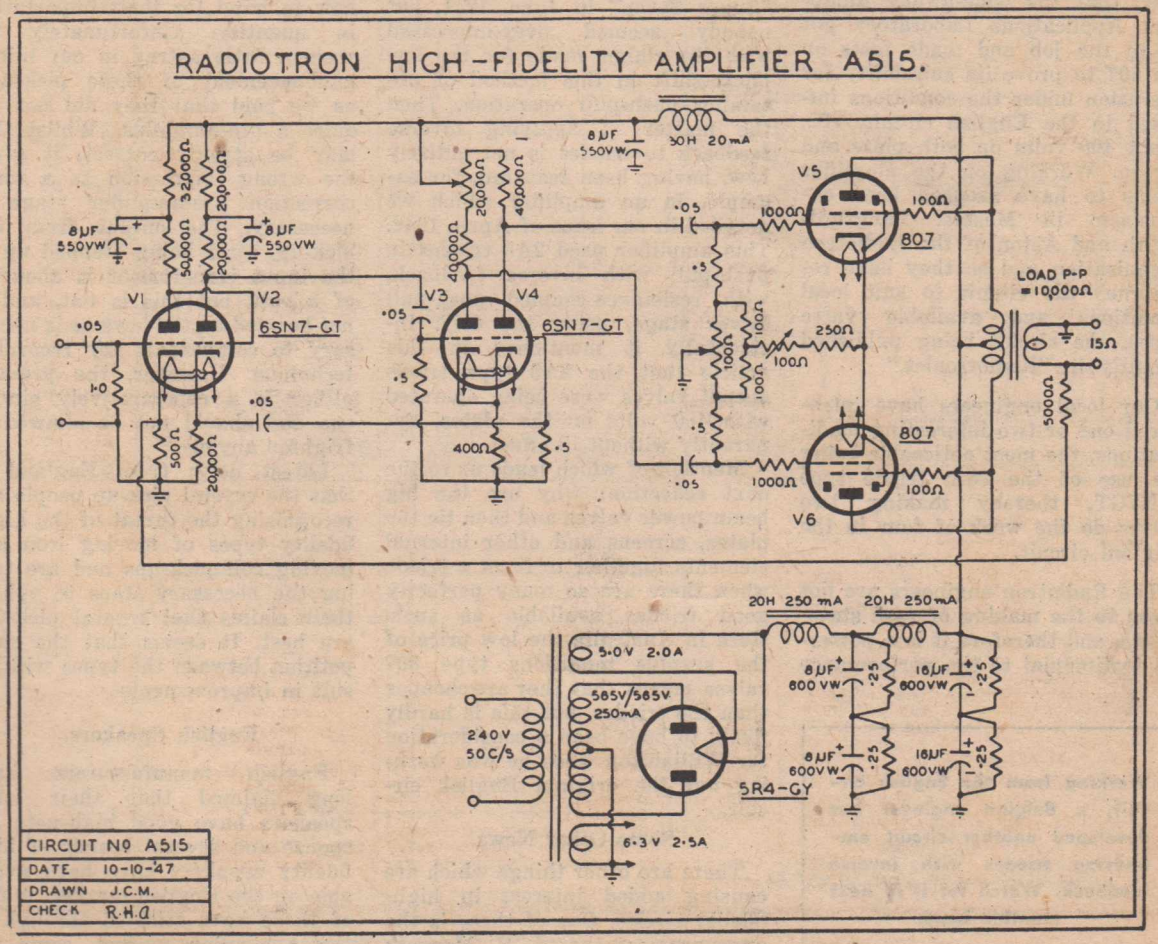


Modified "Williamson" circuit as published in "Radiotronics."

(Continued)

terest aroused by the circuit the Red Line people went into production with a special output transformer to suit this type of circuit. Known in the Red Line brand as type AF10, this transformer is a massive job, weighing 7 lbs. and listing at £6. With a frequency response of within .2 db. from 20 to 30,000 cycles per second this output transformer is the last word in such things.

Radiotron Effort.

The original English amplifier circuit used English valves of types KT66 and L63, and when reprinting the article we took the chance and mentioned that, although not identical, it appeared that the local 807 and 6J7G types could be used as substitutes. So much interest has been shown in the circuit, however, that the wide-awake Radiotron Applications Laboratory got on to the job and made tests on the 807 to prove its suitability for operation under the conditions imposed in the English circuit, viz., about 400 volts on both plate and screen. Working on the amplifier seems to have aroused keen enthusiasm in Messrs. Langford-Smith and Aston of the Radiotron organisation and so they have redesigned the circuit to suit local conditions and available valve types. the circuit being published recently in "Radiotronics."

Our local engineers have introduced one or two interesting modifications, the most noticeable being the use of the twin triode type 6SN7GT, thereby making two valves do the work of four in the original circuit.

The Radiotron engineers are not given to the making of rash statements, and therefore it is a powerful testimonial to the performance of the amplifier when they put it down in black and white that this amplifier "is by far the best which we have ever tested." Summing up, they state, "It not only gives extraordinary linearity and lack of harmonic or intermodulation distortion, but is comparatively simple, and involves no special problems except the choice of output trans-transformer."

Working from the English circuit, a Belgian engineer has developed another circuit embodying triodes with inverse feedback. Watch for it in next month's issue.

Reflections

Those who have kept in close touch with progress in amplifier circuit design find it a little hard to understand one or two points about the latest circuit. In the first place, why have the main features of the amplifier been so consistently passed over in days gone by? For example, the circuit uses a direct-coupled phase-splitter of the type first published by us in our May, 1940, issue. We battled for this cuircuit for several years, featuring it in such circuits as the "Super Seven" in June, 1941, but nobody seemed over-impressed with the claims made for the low phase-shift in this method of obtaining push-pull operation. Then the matter of applying inverse feedback to triodes is not entirely new, having been featured, for example, in an amplifier which we detailed in our issue of April, 1942. This amplifier used 2A3 triodes in push-pull with inverse feedback, with resistance-coupled push-pull driver stage, using the 6N7. Incidentally it mentioned in this article that the 2A3 type triode output valves were being operated with 400 volts on the plates, apparently without ill effect.

Mention of which leads us to the next reflection: why use the big beam power valves and then tie the plates, screens and other internal elements together to form a triode when there are so many perfectly good triodes available as such. Here in Australia the low price of the surplus munitions type 807 valves means that they are cheaper than the triodes, but this is hardly likely to have been a consideration for Williamson when he was working out the original English circuit.

Some Other News

There are other things which are causing added interest in high-fidelity circles. One of these is the announcement that J. H. Magrath & Co. recently landed a small shipment of English "Connoisseur" pick-ups which are of the miniature moving iron high-fidelity type of a kind which has not been prominent in Australia in the past. A short time ago news was received from Mr. Rom Errmann of the Lintas Advertising Agency in London that these English "Connoisseur" pick-ups were the answer. Mr. Errmann was a prominent member of the Sydney Recorded Music Society in the good old days of about 1934 when he was associated with Gordon & Gotch in Sydney. Knowing that Mr. Errmann would not say such things unless the pick-up was something out of the ordinary, steps were taken to get a small shipment through, just a dozen, and reserved for "Radio World" enthusiasts, as mentioned in our query columns in the November issue. There was a scramble for these samples, and they have proved so successful that arrangements are now in hand for their importation in quantity. Unfortunately we were a little astray in our initial announcement of these pick-ups, as we said that they did not require a pre-amplifier. Whilst this may be strictly correct, it gives the wrong impression as a tone-correction pre-amplifier stage is necessary. The output from the pick-up, after being stepped up in the input transformer is about .7 of a volt, but this is flat, and is not boosted on the lows as is necessary to compensate for recording technique. However, the pre-amplifier is a comparatively simple one and should not be allowed to frighten anyone.

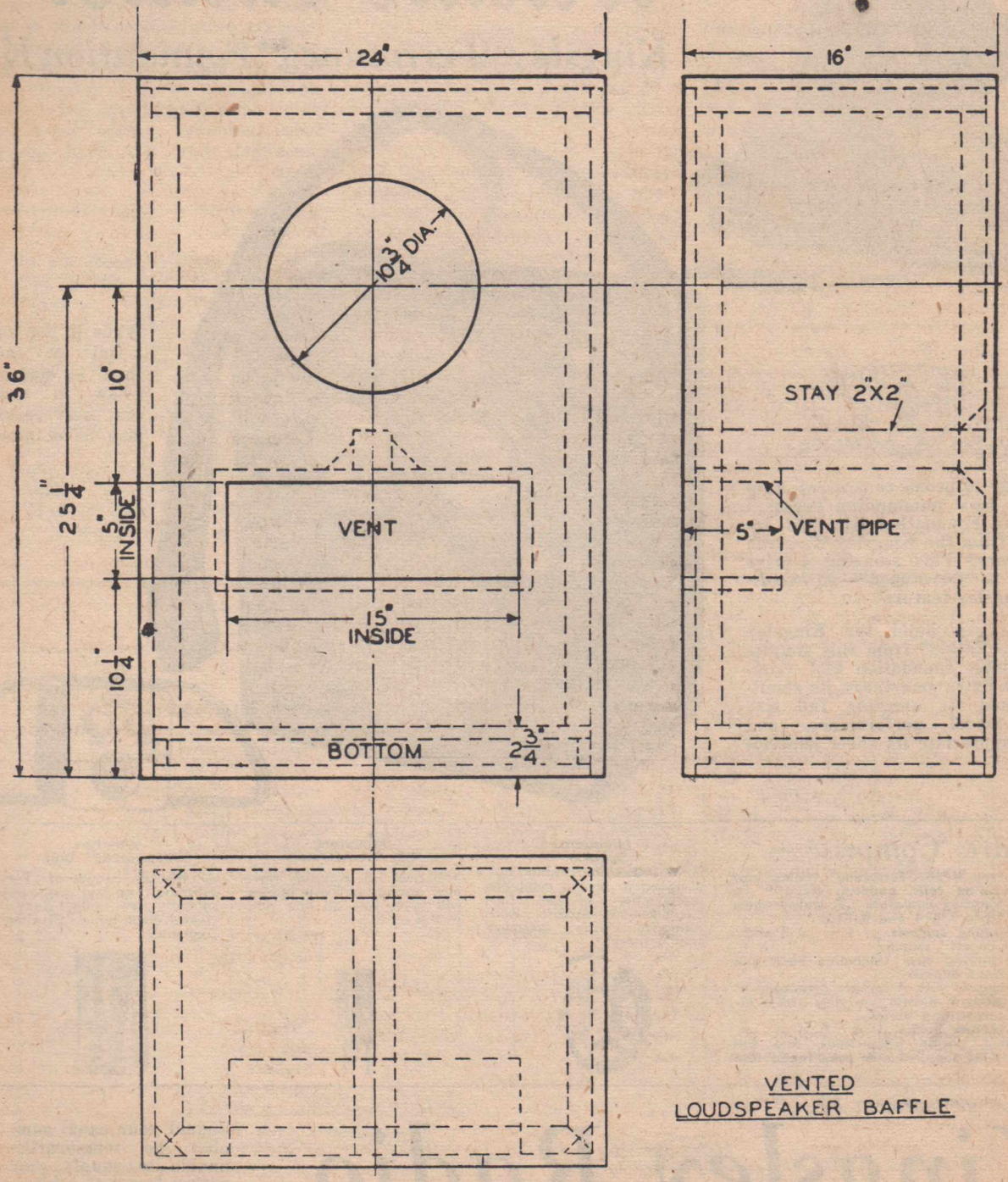
Latest news from England is that the crystal pick-up people are recognising the threat of the high-fidelity types of moving iron and moving coil pick-ups and are taking the necessary steps to uphold their claims that crystal pick-ups are best. It seems that the competition between the types will result in improvements.

English Speakers.

English manufacturers have long claimed that their loudspeakers have good high-note response and several brands of high fidelity speakers have been available on the English market. A few of these have trickled through to the Australian market, some undoubtedly good speakers, others not

up to expectations. Possibly the expectations were too high. Recently a few of the Goodmans high-fidelity speakers have arrived, one of them finding its way into the "Radio World" laboratory, another reaching the Radiotron Applications Laboratory, where it has received an enthusiastic reception, judging by remarks made in recent issues of "Radiotronics." They are using it in a vented baffle which gives a resonant frequency of 45 cycles per second, and mention that it shows signs of frequency doubling at 20 cycles per second! We understand that details about Goodmans' speakers can be obtained from Mr. John Bristoe, of Denham's, Maryborough, Queensland. Mr. Bristoe writes those fine articles on signal tracers which we have featured in the past.

Indications point to a happy season for the enthusiasts who pursue the utmost realism in recorded music.



Design for vented baffle built of 5/8" plywood, glued and screwed.

Now you can build your "Walkie-Talkie!"

Kingsley "Ferrotuned" Foundation Kit!

When in use loop aerial as indicated in diagram below in order that best results may be obtained.

WALKIE TALKIE

Kingsley is proud to present Australia's most outstanding Personal Portable Foundation Kit, just released from the Kingsley Research laboratory! This amazing 4-valve midget is "ferrotuned"—an exclusive Kingsley feature!

Anyone can build the Kingsley "Walkie Talkie" from this simple-to-assemble foundation kit! Compare its extra smartness, its smallness, and its amazing full size mantel-model performance, and you'll appreciate its sheer superiority!

Parts Comprise—

1—type KFJB "Ferrotune" tuning unit including coils, padders, etc.
2—Kingsley miniature I.F. transformers types KIF14 and KIF15.
2—tuning controls.
1—"on-off" switch.
1—carrying case (including back and front panels).
1—chassis with 4 sockets attached.
1—modern plastic carrying strap incorporating aerial.
1—battery holder.
Circuit, wiring instructions, and full parts list supplied with each foundation kit.

Miniature Speaker

Three inches in diameter, but designed to give a complete reproduction of all frequencies—big-speaker performance with amazing compactness!

Miniature I.F. Transformers

The best I.F. Kingsley have ever produced. These 'babies' will give you all the gain in the world!

Miniature "Ferrotune" Unit

All the advantages of "Ferrotuning" packed into this splendid new midget unit—crystal clear tuning of every frequency!

Another achievement by

Kingsley Radio

KINGSLEY RADIO PTY. LTD., 380 ST. KILDA RD., MELBOURNE

Should your usual supplier be temporarily unable to supply you with a foundation kit—or any Kingsley Parts—drop us a line giving his name and address.

"WALKIE-TALKIE" *by Kingsley*

Self-contained battery-operated "personal" portable receiver

IN the December issue we published preliminary details of the Kingsley "Walkie-Talkie" receiver and we present the concluding article giving the point to point wiring, schematic diagram, parts list and alignment data, also photos of the receiver in various stages so that little difficulty will be encountered even by the most inexperienced builder in constructing this outstanding personal portable.

In our December issue in Part One of the description of the Kingsley "Walkie-Talkie," we included a circuit diagram to illustrate certain points. It should be clearly understood that the circuit was only a provisional basic circuit and not to be regarded as the final, fully-checked circuit from which to build the "Walkie-Talkie." The circuit issued with each "Walkie-Talkie" foundation kit is shown on this page.

This is Part Two of the description of the Kingsley "Walkie-Talkie" which commenced in our December issue and intended to be completed in our January issue. Owing to the intervention of the holidays, it was not possible to have the material ready for publication in our last issue. The following article should be read as a continuation of that published in December.

Loop Aerial

In keeping with current trends, the Kingsley Miniature Ferrotune Unit was produced to incorporate a loop aerial of low impedance. The area of the loop, within limits, is not extremely critical and for general usage the loop has been designed and included in the shoulder strap. For optimum results, it is advisable to maintain the loop as near as possible to a circle and in a vertical plane. Obviously, if the shoulder strap loop is twisted together or not representing as far as possible a circle, the inductance and the impedance of the loop is altered, for the reason that the induced voltage (example—pick-up) is propor-

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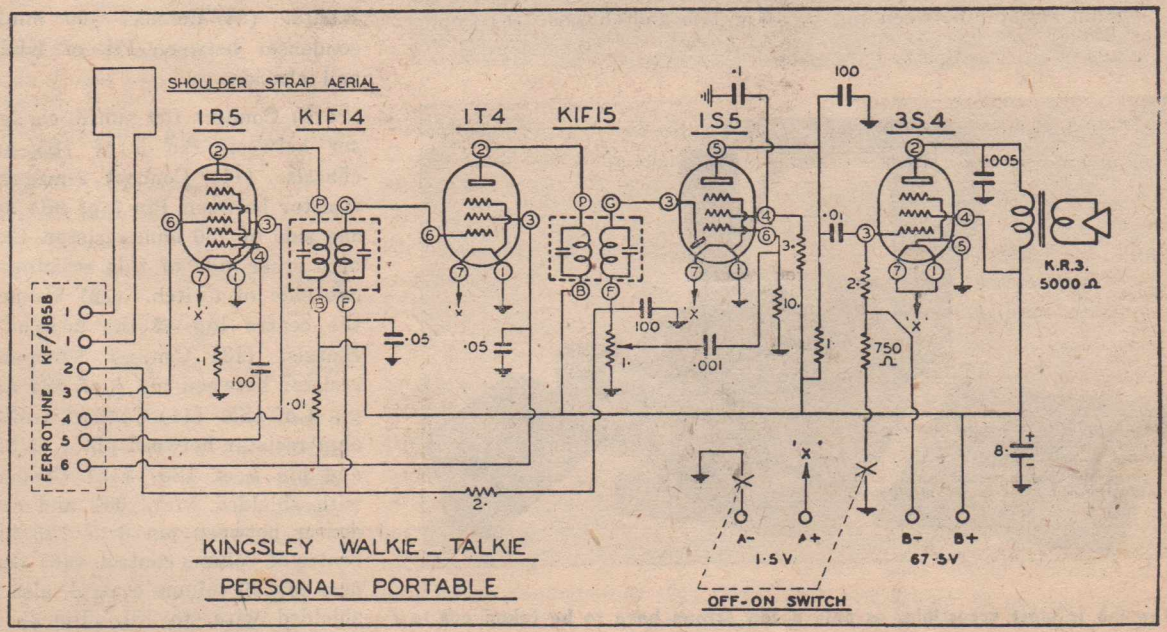

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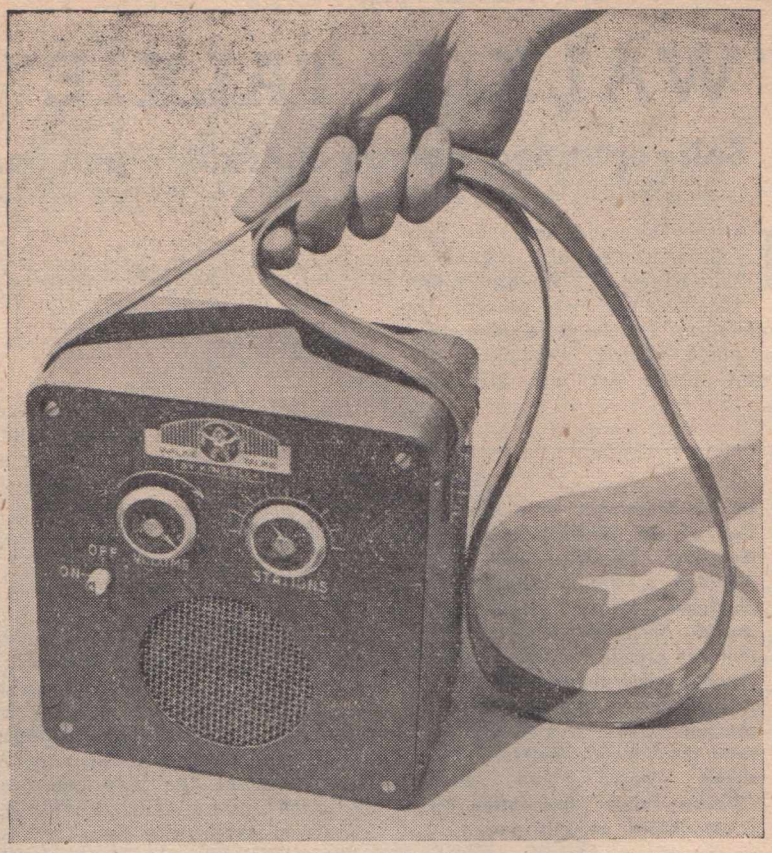
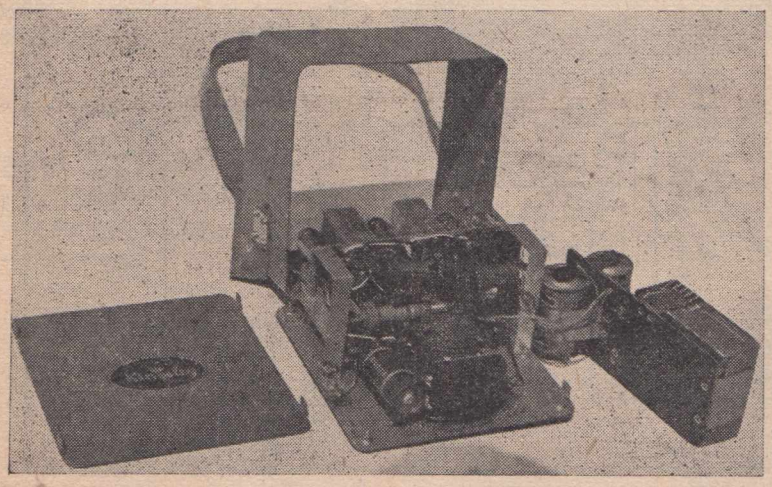


tional to loop area. The low impedance loop has the same directional properties as the ordinary high impedance loop.

The following procedure should be followed to enable easy wiring of the receiver: (1) Connect the centre shields of all tube sockets to the chassis, together with the following points: Pin No. 1 of 1R5, 1T4 and 1S5 sockets, and Pin No. 5 of 3S4 socket. (2) Connect together the following: Pin No. 7 of 1R5, 1T4, 1S5 and Nos. 1 and 7 of 3S4 sockets. These are the filament positive connections. (3) Connect together the RED lugs of both I.F. Transformers and to Pin No. 4 of 3S4. (4) Bend and solder together the following points: (a) Pin 2 of 1R5 and plate (green) lug of KIF14 (1st I.F.); (b) Pin 6 of 1T4 and grid (brown) of KIF14; (c) Pin 2 of 1T4 and plate (green) of KIF15 (2nd I.F.); (d) Pin 3 of 1S5 and grid (brown) of KIF15. (5) Connect 2-megohm resistor between the filament (black) lugs of KIF14 and KIF15. (6) Connect 10-megohm resistor between pin 6 of 1S5 and chassis. (7) Connect 100,000 ohm resistor between pin 4 of 1R5 and chassis. (8) Connect 10,000 ohm resistor between pin 3 of 1T4 and H.T. (RED) lug of KIF15. (9) Connect 100 mmfd. condenser between Fil. of KIF15 and chassis.



The job is most accessible, as only a few screws have to be taken out to allow the whole job to come to pieces like this.

(10) Connect 100 mmfd. condenser between Pin 5 of 1S5 and chassis. (11) Connect 2-megohm resistor between Pin 3 of 3S4 and one side of 750 ohm resistor. Connect other side of this resistor to one side of switch. (12) Connect the centre lug of the switch to chassis. (13) Connect 3-megohm resistor between pin 4 of 3S4 and pin 4 of 1S5. (14) Connect 1-megohm resistor between pin 4 of 3S4 and pin 5 of 1S5. (15) Connect, with shielded wire, .001 and condenser between pin 6 of 1S5 and centre of volume control. (16) Connect top of volume control, also in shielded wire, to Fil. (Black) of KIF15. (17) Connect bottom of

KINGSLEY "WALKIE-TALKIE" FOUNDATION KIT PARTS LIST

1 only KF/JB5B tuning unit complete with volume control and switch.

1 only Chassis with four sockets mounted.

1 only Battery carrier.

1 only Case complete with back, front panel, colored front panel and 2 Grommets.

1 only Carrying Strap with aerial incorporated.

2 only Strap plates for attaching strap to case.

2 only Plated tuning knobs.

2 only I.F. Transformers KIF14 and KIF15.

1 only Speaker grille.

3 only Spacers for attaching chassis and unit to front panel.

ADDITIONAL PARTS REQUIRED TO COMPLETE THE RECEIVER:

1 only 1R5 tube.

1 only 1T4 tube.

1 only 1S5 tube.

1 only 3S4 tube.

1 only 67½ volt Minimax "B" battery.

2 only DR2. 1½ volt torch cells.

Hook up wire. 4 yards.

Shielded wire. 1 foot.

1 piece grille material, 3¼" x 3¼".

CONDENSERS

1 only 8 mfd. electrolytic.

1 only .1 mfd paper. 200 volts working.

2 only .05 mfd. paper. 200 volts working.

1 only .001 mfd. mica.

1 only .01 mfd. mica.

3 only 100 mmfd. mica.

1 only .005 mfd. 200 volts working.

RESISTORS

1 only 750 ohms 1 watt or ½ watt carbon.

1 only 10,000 ohm ½ watt carbon.

1 only 100,000 ohm ½ watt carbon.

1 only 20 megohm ½ watt carbon.

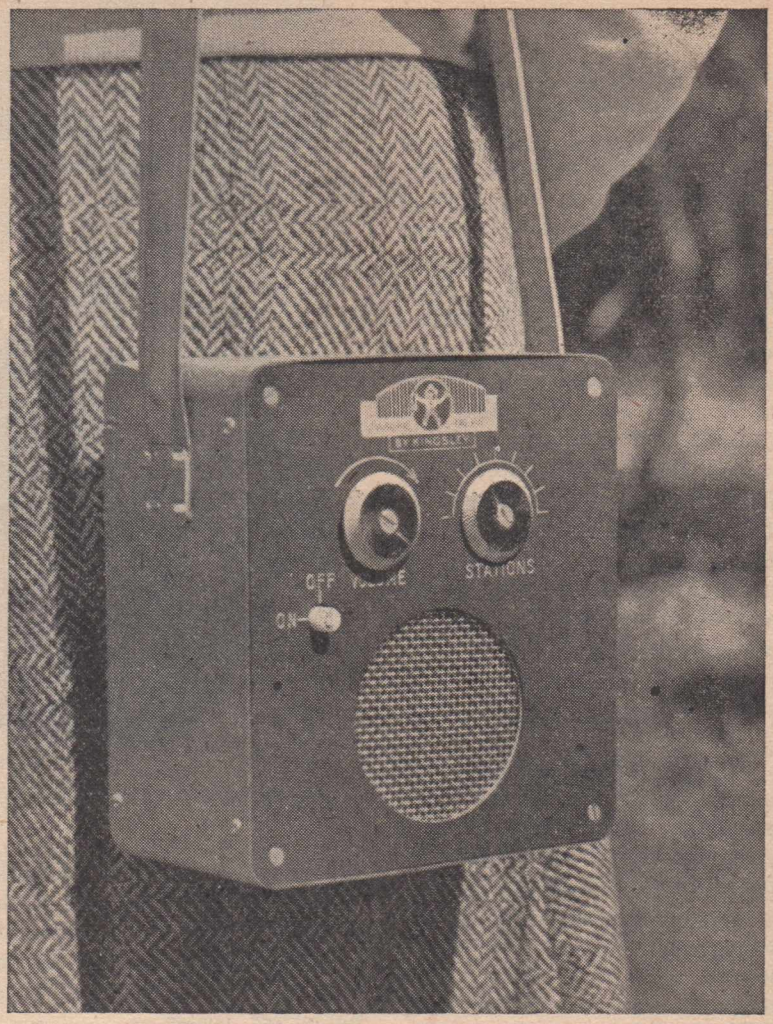
1 only 10 megohm ½ watt carbon.

1 only 3 megohm ½ watt carbon.

1 only 1 megohm ½ watt carbon.

2 only 2 megohm ½ watt carbon.

1 only Kingsley KR3 loudspeaker, 5000 ohms.



volume control to chassis. (18) Connect .01 mfd. condenser between pin 5 of 1S5 and pin 3 of 3S4. (19) Connect .1 mfd. condenser between pin 4 of 1S5 and chassis (front mounting lug of KIF14).

(20) Connect .05 mfd. condenser between pin 3 of 1T4 and chassis (pin 1 of 1R5). (21) Connect .05 mfd. condenser between Fil. (black) of KIF14 and chassis. (22) Connect .005 mfd. condenser between Pin 2 of 3S4 and chassis. (23) Connect pin 6 of 1R5 to No. 3 terminal of tuning unit. (24) Connect Fil. of KIF14 to No. 2 terminal of tuning unit. (25) Connect one side of 100 mmfd. condenser to No. 5 of tuning unit. Connect other side of condenser to pin 4 of 1R5. (26) Connect pin 3 of 1R5 to terminal 4 of tuning unit. (27) Connect pin 3 of 1T4 to terminal 6 of tuning unit. (28) Connect one side (nearest the switch) of speaker transformer to pin 2 of 3S4. (29) Connect other side of speaker transformer to "B" battery positive.

(30) Connect pin 4 of 3S4 to positive side of speaker transformer. (31) Connect positive of 8 mfd. condenser to positive side of

(Continued on next page)

(Continued)

speaker transformer. (Lay this condenser against front panel on the left side of the speaker.) (32) Connect negative side of the 8 mfd. condenser to chassis. (33) Connect remaining side of switch to "A" negative. (34) Connect pins 1 and 7 of 3S4 to "A" positive. (35) Connect junction of 2 meg. resistor and 750 ohm resistor to "B" negative. (36) Connect loop aerial ends to terminals No. 1 of tuning unit. (37) Carefully check your wiring, making sure that no leads can foul the movement of the tuning unit. The unit and IF. transformers have been thoroughly lined and tested before leaving the factory and the receiver should now operate satisfactorily.

Alignment Data

Units are aligned at the Kingsley factory by crystal oscillator standards, and then given a generator test for sensitivity and image ratio; hence when the customer receives the Ferrotune, it is pre-set and should under average layout, need no further adjustment. However, due to the capacitance variation occurring between the test chassis and to that in which it is eventually wired, a compensating adjustment of the unit's trimmers may be necessary. It is important to note that this variation will be small and only slight alteration should be attempted. The oscillator trimmer is below, and that of the signal circuit aerial on the right, viewing the Ferrotune from the back of chassis.

The aerial or signal circuit is adjusted for maximum signal response at the H.F. end of the band. This operation is best carried out on a distant station around 1500 kC/s. On NO ACCOUNT should the tuning cores or the shunt inductance core be shifted. If this warning is unheeded, eventual misalignment will occur and the unit will have to be returned to an authorised dealer.

Replacement of batteries is easy when the back is removed, as shown here.

Conclusion

This Kingsley "Walkie-Talkie" personal portable has met with real approval and many sales have been made to a large number of satisfied users. As a matter of fact, the whole pre-Christmas production of the factory was completely sold out and, now that production is again in full swing, shoals of congratulatory letters from enthusiastic home constructors are pouring into Kingsley Radio Pty. Ltd. An excerpt from one letter is: "As I pen this note I have my Kingsley 'Walkie-Talkie' beside me. It is one of the finest all-round sets that I have seen. Tuning and tone is superb and the 'Ferrotuning' system is sharp and works smoothly. The tone of the Kingsley KR3 speaker is outstanding." We tender congratulations to Kingsley Radio on their achievement with this outstanding personal portable.

AUSTRALASIAN RADIO WORLD

Australasian Radio World is again in short supply, due to the necessity for paper conservation under economic measures applied by the Federal Government in its effort to assist Britain.

It is, therefore, suggested that you ask your newsagent to reserve your copy.

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HINTS FOR CONSTRUCTORS

By

PAUL STEVENS

INSTABILITY is a trouble often encountered in compact mantel sets, because it is simply impossible to avoid all inductive and capacitive stray couplings in such a crammed space. There are, however, two simple methods which, according to the case, are sure to be a cure for your problem child: If oscillation occurs only on the lower frequency end of the broadcast band, between about 700 kC and the 550 kC end of the dial, it is almost certain to be caused by inter-action of the aerial primary coil and the IF channel. Certain brands of aerial coils resonate at a frequency pretty close to the standard IF, and if the tuning of the grid coil toward the end of broadcast band approaches that frequency too, enough energy might be fed back to cause the set to oscillate. In most cases, a 5000-ohm resistor between aerial and chassis will stabilise the set without causing an undue loss of gain, in fact the loss is so small that it can only be detected by instruments and not by the human ear. Another distinctive feature of this type of instability is also the fact that it is accentuated by certain lengths of aerial, the capacity of which tunes the aerial coil exactly to the IF (usually between 15 and 20 feet). A sure-fire method against general instability is to reverse the phase of one of the IF circuits, usually the plate coil of the converter. This turns positive into negative feedback, as long as two stages are involved and makes the set completely stable. However, we often encounter a big loss of gain that way. This is due to the often-present capacitive coupling between the hot ends of the IF transformer in addition to the inductive coupling. These small capacities, caused by the leads from the top coil passing the bottom coil on their way down to the terminals, are normally in phase and increase the coupling; but they get out of phase as soon as the coils are reversed and form a more or less strong opposition. This loss of coupling has to be made up for by increasing the inductive interaction of the coils. As I described in another article, this can be achieved by putting one or both coils of the particular IF transformer on the inner setting, meaning to screw the slugs right through the coils till they come out on the inside, between the coils, and tune them to the IF in this position. The iron between the coils then gives additional coupling, which restores the normal gain. If a common cathode bias is used for both converter and IF valve, the bypass condenser should not be less than .5 mf. Single stage feedback involving only the IF valve can hardly occur, if the simplest rules for layout and wiring are observed. If you have to use a single-ended valve and encounter instability, it serves you right. The best remedy is to throw the valve out of the window.

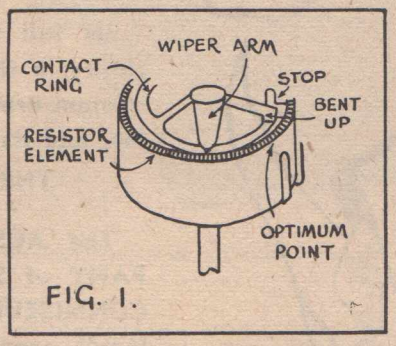


FIG. 1.

Minimum Bias for Sets Without AVC

These sets use more often than not a bias volume control consisting of a 2500 to 500 ohm potentiometer in the combined cathode return of converter and IF valve. Usually there is a small wire-wound resistor in series with it to provide the initial bias, when the volume is fully turned on. If this resistor is omitted, the volume will fall off again when the control is advanced past a certain optimum point and the bias approaches zero. For four-valve sets, this optimum position of the control is rather critical, as it is essential with these sets to get every ounce of gain out of them, but at the same time the falling off of volume past that point is an undesirable feature. Now the initial resistance of a potentiometer of this kind varies a great deal; there is often 100 or more ohms to go, even with the wiper hard up against the stop, while in other cases the resistance is almost zero. It is therefore desirable to have a means to individually adjust your bias volume control for maximum gain without dropping off. The RCS volume control with its contact ring provides an excellent and simple means to achieve this very end: Fig. 1 shows how it is done. The potentiometer, installed without additional resistor, is set to maximum gain and the position marked. It is then turned back and with a pair of long-nose pliers the contact ring is bent up vertically just past the point of maximum gain. The bent-up portion makes an excellent stop for the wiper arm and at the same time leaves the right amount of resistance in the circuit for initial bias.

NEED FOR IGNITION SUPPRESSION

Vehicles fitted for radio communication in the fighting services incorporate effective suppression of ignition radiation. All metal joints are carefully bonded and wiring of any kind fully screened. Result is the ability to work even with comparatively weak signals whilst on the move. That's how things **should** be and in the future world of television, etc., there will need to be more than a passing thought for the problem of ignition QRM from nearby and even distant motor vehicles. F.M. will, of course, take the listener a long way toward QRM-free sound reproduction, but man-made interference can cause havoc with video screens. It should be law that electrical appliances are produced with integral QRM filters, and there is no reason why car manufacturers should not include suppression as standard practice.

HIGH FIDELITY FROM CRYSTAL PICK-UPS

That it is possible to get high fidelity from gramophone recordings without pick-ups which need pre-amplifiers is claimed in this article from England. It is interesting to note that the Acos (usually known as Cosmocord) pick-ups are now being handled in Australia by the well-known firm of Amplion Pty. Ltd., and doubtless the high-fidelity types such as the Acos GP12 will soon be available here.

By

L. J. WHEELER

and

K. G. LOCKYER, B.Sc.

(Research Dept., Cosmocord Ltd.)

IT is not realised as widely as it should be that the piezo-electric crystal pickup operates on a principle fundamentally different from that underlying the moving coil, or other electro-magnetic types of pickup, and that attempts to treat it on the same footing are foredoomed to failure. It is the purpose of this article to discuss this difference, and to show that, combined with suitable electrical networks, the crystal pickup can give results at least as good as those obtainable from the electro-magnetic types, together with the advantages of high sensitivity, and the possibility of dispensing with coupling transformers, hum pick-up and other troubles.

Commercial recordings are generally made with electro-magnetic cutting heads. It is a characteristic of this type of head that constant input to the recording amplifier (here assumed to be linear), does not produce constant amplitude of vibration, but constant "velocity" of the stylus point. This velocity is the rate of change of displacement as the cutter passes through its mid position in each half cycle, and is represented by the slope of the sine wave at this point. It can be shown mathematically, or seen by inspection of Fig. 1, that to keep the velocity (i.e., slope) constant, the amplitude must increase as the frequency is decreased and vice-versa. In the example shown, the two sine waves have the same velocity, but it will be seen that there is a 2 : 1 ratio of amplitude and a 1 : 2 ratio of frequency. It is clear that for adequate amplitude at the higher frequency end of the spectrum, the amplitude at the lower frequency end would become excessive, with the possibility of break-through into adjacent grooves. Because of this it is commercial practice to modify the amplifier and produce a constant-amplitude cut below a certain frequency (the turn-over or cross-over frequency).

Every commercial record is therefore a mixture of constant-amplitude and constant-velocity cutting, and the shape of the recording characteristic is entirely a matter of one's point of view; i.e., whether one chooses to put amplitude or velocity on the vertical scale. This is illustrated in Fig. 2; it will be noted that the turn-over frequency is at 250 c/s. in accordance with general practice in this country, though turn-over frequencies of the order of 300, 500, 800 and 1,000 c/s. are used commercially and by amateurs.

A piezo-electric crystal is one which, when strained, produces electric charges on certain of its faces, the magnitude of these charges being directly proportional to the strain. This over-simplified picture gives a clue to the behaviour of the crystal pickup. In actual practice, two slabs of a piezo-electric salt (usually sodium potassium tartrate, otherwise known as Rôchelle Salt) are cemented together with one electrode between the slabs, and another in contact with both outer faces. The slabs are cut in such a manner that a torque (in the case of a "twister" crystal) or a flexure (in the case of a "bender" crystal) will produce a potential difference across the electrodes. This assembly is known as a bimorph, the torsional (or "twister") variety being used in most crystal pickups. Clearly, therefore the output from a crystal pickup is directly proportional to the amplitude and not the velocity of the stylus displacement. In this fact lies the difference between crystal and electro-

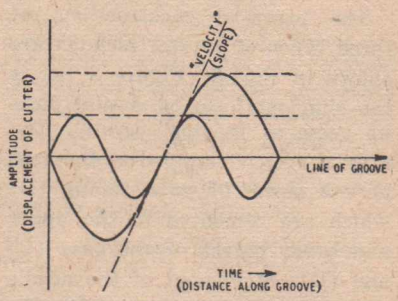


Fig. 1. Illustrating the relationship between "velocity," amplitude and frequency.

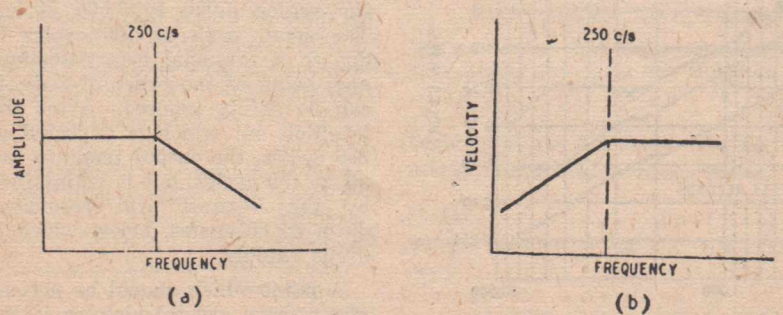


Figure 2.

(Continued on next page)

magnetic pickups, since the output of the latter is directly proportional to the velocity of the stylus displacement. In the region below 250 cycles per second, where these pickups require correction, the crystal pickup gives constant voltage output, but in turn requires correction above 250 cycles. It is of interest to note that, if considered in octaves, this point lies only one octave below the middle of the recorded spectrum.

The practical constructions of three types of crystal pickups are shown in Fig. 3. Figure 3 (a) is the simplest form of crystal pickup using a "twister" crystal. The crystal (A) is clamped at the rear of two pieces of p.v.c. tubing (B) which are cemented to the upper and lower halves of the case (C) and (D). Movement of the needle (E) is applied by the reed (F), the crystal being protected from the hard metal surface of the fork in the reed by a wrap of rubber (G). The reed moves in the rubber sleeves or bearings (H) which are clamped in the case. The electrodes from the crystal are brought out and soldered to a terminal board (K), which itself is clamped in the case.

A more modern version of this assembly is shown in Figure 3 (b). The back mounting of the p.v.c. has been replaced by a moulded rubber block (B) specially shaped to touch the case only at its four corners. The wrap of rubber has been replaced by a moulded rubber transmission member (G) which, whilst transmitting needle vibrations, will absorb undue shocks. This type of construction is extremely robust, the crystal being virtually unbreakable. In a high-fidelity unit the mass of the moving parts must be kept as small as possible. One method of achieving this is by making the assembly as shown in Figure 3 (C). The conventional reed, needle screw and removable stylus have been replaced by a thin beryllium copper transmission strip (F) into which is welded a thin-walled metal tube (E) carrying a ground and highly-polished sapphire tip, the front end of the transmission member being supported by a moulded rubber block (M). Some degree of protection for the stylus is supplied by the two blisters (L) moulded in the lower half (D) of the case. The rest of the assembly will be obvious from the drawing.

Some Comparisons

It may be of interest to note the relative masses of the moving parts in the assemblies as shown in Figures 3 (a) and 3 (c). The mass of the needle, reed and needle screw used in the former totals 1.22 gm., whereas the combined

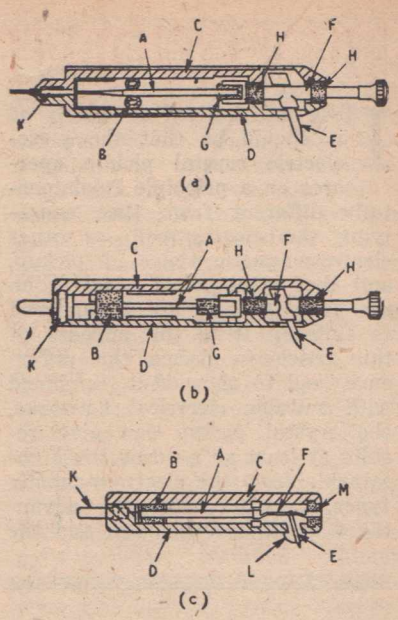
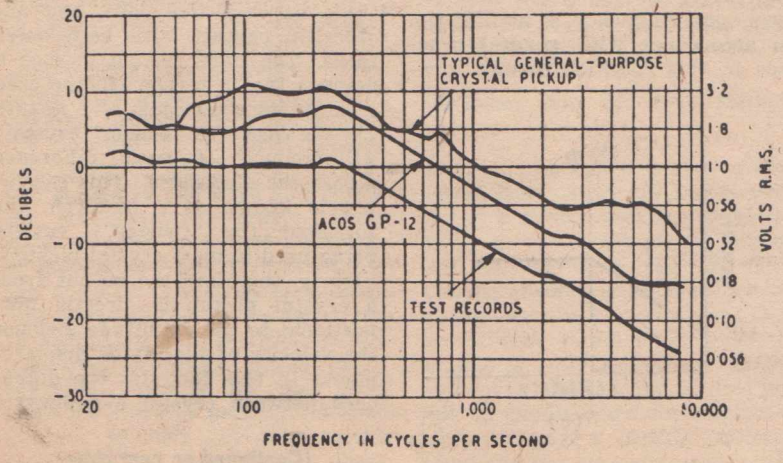


Fig. 3. Constructional details of some piezo crystal pickup types.

mass of the equivalent parts of the latter is 0.186 gm.

Ideally, the frequency characteristic of a crystal pickup when measured on a commercial record would be as Figure 2 (a). This ideal is approached very closely in some of the modern high-fidelity crystal instruments (e.g., the Brush PL50 and the Acos GP-12). A response curve of the latter instrument is shown in Figure 4: plotted on the same ordinates are the characteristics, on an amplitude basis, of the test records (H.M.V. DB4034/7), and also of a general purpose unit crystal pickup. The vibratory system (i.e., needle, needle screw and reed) resonates between 5,000 and 6,000 cycles per second, thus accounting for the levelling out of the response curve from 2,500 cycles upwards, and the rapid drop through the region 7,000 to 8,500 cycles. The small peak at 700 cycles is due to a torsional arm resonance and, being of the order of 2 db, it can be safely ignored. After the levelling out which is expected at 250 cycles, the output tends to fall off at 100 cycles, but is maintained by the flexural arm resonance down to 60 cycles, below which it drops rapidly.

A point which should be noticed about these crystal pickups is the very high output; at 1,000 cycles

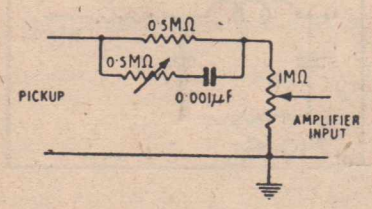


it is .7 volt for the high fidelity unit and 1.0 volt for the general-purpose unit; at 250 cycles it is 2.5 volts and 3.2 volts respectively.

These response curves show that to obtain faithful reproduction there is a need for a levelling of the output to produce a linear input to the amplifier grid.

The general-purpose instrument is often used without any correction at all, since the fall in top will appear to reduce needle scratch, and will minimise the unpleasantness of "pentode top" so often associated with the less expensive and older radio receivers. Should some degree of top correction be required, the simple circuit shown in Figure 5 will be found completely satisfactory.

For those requiring an extremely high standard of reproduction, the high-fidelity instrument (Acos GP-12) with full equalisation will be chosen. Though simple, equalisation should be a matter of some care; tuned circuits and iron-cored components should obviously be avoided. The simple circuit shown in Figure 6



Suggested correction circuit for ordinary crystal pick-ups.

is recommended, and a response curve of the high-fidelity pickup using this equaliser is shown in Figure 7. It will be seen from this that the overall output level has dropped to 0.1 volt, which is, of course, what would be expected.

It is often stated that the overriding disadvantage of crystal pickups is that they introduce

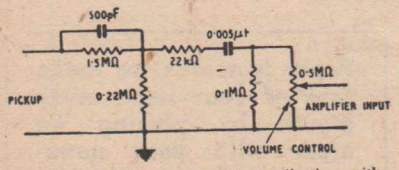
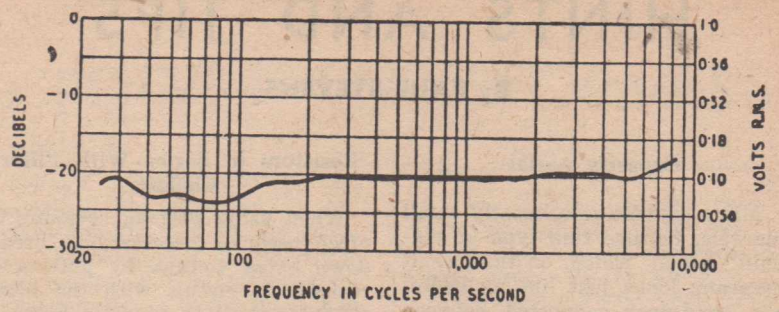


Fig. 6. Circuit giving full equalization with Acos GP-12 high-fidelity pickup.



Ferequency response of the high-fidelity type of crystal pick-up when used with equalisation, as shown in figure 6.

severe harmonic distortion. The authors have taken many cathode ray oscillographs over a wide frequency range, and have come to the conclusion that with a well-designed (though not necessarily expensive) crystal pickup, the wave-form distortion is negligible, being well under the limit of 2 per cent. accepted by the industry for high-fidelity apparatus. Much harmonic distortion is introduced in the first amplifier stage, where the high output from the pickup overloads the input valve. This trouble will not be encountered if the input circuits (Figures 5 and 6) recommended above are used.

The piezo-electric crystal is inherently capable of the highest fidelity of reproduction, and when housed in pickup cartridges of modern lightweight design will prove by its performance that it is worthy of the serious consideration of quality enthusiasts.

—"Wireless World," London.

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HINTS AND TIPS

By PAUL STEVENS

Capacity Aerial

Many modern sets, mostly small mantels, feature this type of "in-built" aerial, which, on the circuit diagram, looks just like an ordinary condenser connected between one side of the power line and the aerial terminal. If you tried this on your set you will probably find it to be a sad failure. The reason is that for this type of aerial a low impedance input coil has to be used, as with the standard high impedance type the shunt capacity of the power transformer acts like a dead short. Fig. 2 shows the simple circuit. As there are no

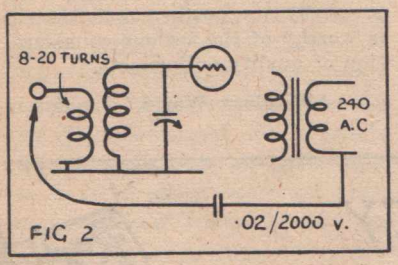

FIG 2

low impedance input coils on the market, we can simply adapt one for our purposes by winding a few turns of wire, between 8 and 20 (you have to try for best results), closely around the cold end of the grid coil. Connect one end to earth, the other via a .01 or .02 condenser to one side of the power line. The coupling condenser must be of good quality and at least 2000V test. The power line thus acts as an aerial, the chassis of the set as counterpoise. An iron cored coil must be used to enable the resetting of the coil inductance, which will be upset by the process. The high impedance input coil remains unused. This type of aerial should only be used on carry-around midgets, as it is inherently more noisy than any other type as far as man-made static is concerned. The small counterpoise, the set itself, also limits its efficiency; but in a quiet location and for local reception it is certainly a good thing.

Resistors in Series With Filter Chokes

When using permag speakers it often becomes necessary to break down extra voltage by putting a resistor in circuit with the filter choke as the transformers on hand are still largely of the 325 or 385 volt variety. To do this you have to be very careful where you put it. Fig. 3 shows the usual way, the resistor in series with the choke between the two filter electrolytics. Although theoretically this should actually improve the filtering, it only does so in very few cases. Mostly, especially when back bias is used, it definitely increases the hum. May it be that the additional resistor upsets some sort of balance that exists within the filter circuit or some resonance between the choke and the filter electrolytics? Whatever it is I leave it to the theorists to work out. To my experience the filtering improves if the extra resistor is shorted out for AC by putting an 8mf electrolytic across (Fig. 4). This third electrolytic could, of course, be put to better use by connecting it between the resistor-choke joint and minus (Fig. 5). If no extra electrolytic is to be used, the connection as shown in Fig. 6 gives the best results. It converts the condenser input from the rectifier to resistance input, which, apart from further breaking down the voltage, adds another link to the filter chain. But permag speakers, chokes and resistors, all these came as a bad second to the good "old-fashioned" electro magnetic type, as far as I and many, many other radiomen are concerned, for it still gives far better filtering for less money and less bother in spite of all claims to the contrary.

Speaker Baffling in Small Sets

The usual way to build a mantel set is to make speaker and chassis one unit by mounting the former on the latter, and then push the whole thing into a cabinet. Thus, more often than not, the speaker never makes real contact with the baffle opening in the front of the

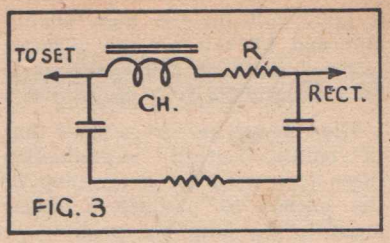

FIG. 3

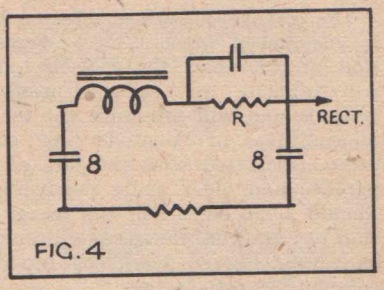

FIG. 4

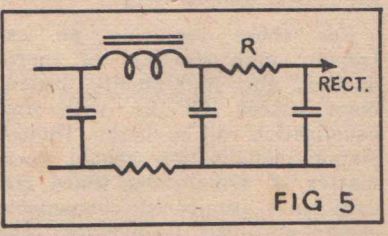

FIG 5

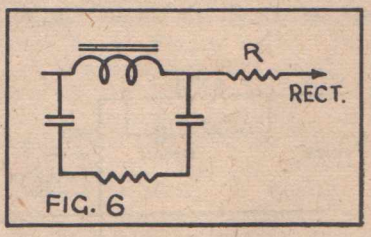

FIG. 6

cabinet, and, if it does so, only on one point. To get reasonable bass response out of small speakers housed in small cabinets, the baffling has to be the best possible under the circumstances. To achieve this, the speaker has to be tightly screwed on to the front of the cabinet, for this is the only way to ensure proper all-round contact. It makes things a little more complicated, but the improved response makes it worth while, and turns a squeaker into a speaker.

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HOW TO MAKE:—

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In the recent scramble for back numbers, the greatest demand was for the January, 1945 issue, with the article on winding power transformers. At the request of dozens who were unable to get the back number, we are reprinting the article in full.

By

J. G. DuFAUR

A POWER transformer is a piece of equipment by means of which alternating current may be changed from one voltage to another and consists essentially of a laminated steel core, a primary winding which is generally tapped for connection to supply mains of various voltages, secondary windings for supplying high tension and filament voltages and the insulation between these components.

The Laminations

The core which is made of thin laminations of special steel (generally silicon steel) acts as a closed magnetic circuit around which the coil windings are formed. If a primary is wound around the core and connected to an a.c. line of suitable voltage, current will flow in this coil and magnetise the core. This current is known as the exciting current.

The magnetic flux produced by the exciting current will be of an alternating nature and any turn of wire surrounding the core will have a voltage induced in it by this varying flux. If a second coil (called the secondary) is also wound around the core, it will have a voltage induced in it by the alternating flux produced by the current passing through the primary. The magnitude of the secondary voltage will be proportional to the number of turns on it and inversely proportional to the number of turns on the primary.

When the primary of a transformer is connected to a suitable a.c. supply, the magnetic flux produced, which may be referred to as increasing and decreasing lines of magnetic force in the core, cuts the primary windings twice for every cycle of supply frequency; the flux produces a back voltage in the primary (commonly known as back e.m.f.) which is in direct opposition to the supply voltage.

Core Losses

If the core is made from high quality steel which has only small losses induced in it by the fluctuating magnetisation effect, the back e.m.f. will be almost equal and opposite to the primary applied voltage and thus the current passing through the primary winding will be proportional to the difference of these two voltages. The magnetising current therefore is generally small because in a properly designed transformer little difference exists between the two abovementioned voltages. In the same way as the back e.m.f. is generated in the primary coil, an e.m.f. is also induced in the secondary coil, since it is also cut by the flux established by the primary.

No current can flow in the secondary unless a load such as a resistance is placed across its terminals. When a load is applied,

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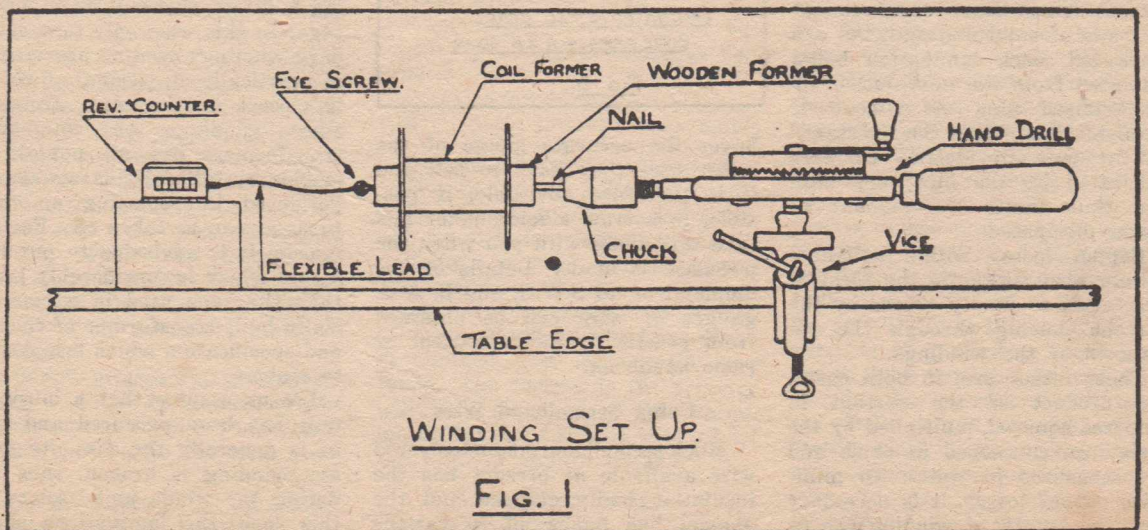

WINDING SET UP.

FIG. 1

TRANSFORMERS

(Continued)

current flows through the secondary winding and sets up a further flex which is opposite to that produced by the primary. This causes an overall reduction of flux in the core and thus the amount of current flowing in the primary increases to restore the original flux density caused by the magnetising current. It can therefore be seen that the greater the current drawn from the secondary winding, the greater will be the current which flows in the primary.

Steel cores will only carry a limited amount of magnetic flux and if the flux density is increased beyond a certain point, saturation occurs. With this condition, the core is conducting all the flux it is able to carry and the number of magnetic lines of force cannot be further increased.

Various losses occur in all transformers—these are of three main types—eddy current, copper and hysterisis losses.

Reason for Lamination

Eddy current losses appear as heat in the steel core and are caused by magnetic lines of flux cutting the core and producing currents in it as the core tends to act as a short-circuited coil of one turn. These currents flowing through the core dissipate energy in the form of heat. For this reason, transformer cores cannot be made of solid material, but are laminated, each lamination being insulated from the next, either by an oxidised film, or a coat of varnish. This makes the resistance of the core to electric currents generated by the flux very high and thus limits the amount of power dissipated.

Copper losses within a transformer also appear in the form of heat and are simply caused by the current flowing through the resistance of the windings.

These losses are, in both cases, the product of the current in amperes squared, multiplied by the resistance concerned in ohms and are measured in watts. To minimise copper losses, it is necessary that the length of windings be as small as possible and that the wires used be as large in cross section as practicable so as to minimise the resistance.

Hysterisis losses in the core result from the fact that energy is required to carry iron or steel through cycles of magnetisation. They may be minimised by a careful selection of the type of material used for the fabrication of the core.

Obtaining Material

As it is now difficult for set builders to obtain power transformers, it is proposed to give practical details of how to make these components at home. The process is a rather long and tedious one, but very efficient units can be accomplished if sufficient time and care is taken.

The first matter for consideration is where to obtain the necessary wire, laminations and insulation.

Secondhand wire is generally not difficult to procure, as most radio shops can supply limited quantities, either enamel or cotton insulated. The main difficulty is that shops are often unable to tell the

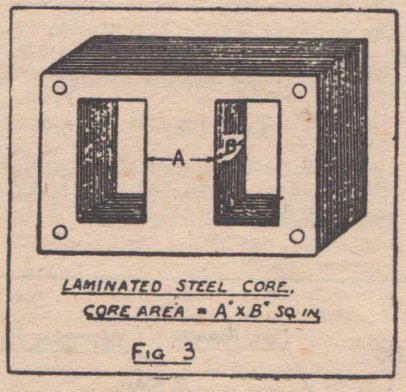

FIG 3

buyer the accurate gauge of the scrap wire they have to sell and it is therefore advisable, if possible, to borrow a micrometer and take this along with you when the purchase is made. Details of the diameter of all S.W.G. and B. & S. gauges of wire can be obtained from practically any electrical or radio handbook.

Using Secondhand Wire

Much secondhand enamel-covered wire available at present has the insulation badly chipped and the enamel has flakes off in various places. This wire is very unsatisfactory for winding transformers, in fact, if a short circuit occurs between two adjacent turns, the unit will overheat and be quite useless in practice. Therefore, when buying enamel-covered wire, make sure that the insulation is in good condition. Cotton and silk covered wires, if obtainable, are less susceptible to this trouble, but as their covering is considerably thicker than enamel, difficulty may be experienced in putting the required number of turns around the core in the space available.

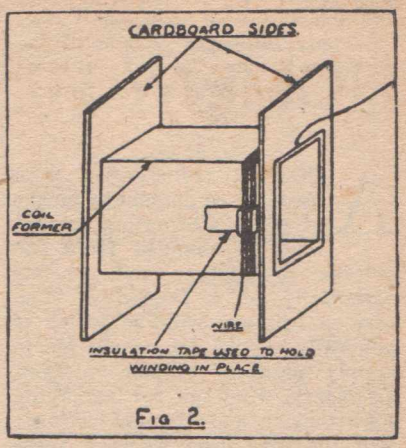

FIG 2.

Salvage Cores

Laminations may be easily obtained by purchasing a burnt-out power transformer — these are readily available from secondhand wireless shops at a small cost. If you are able to procure a transformer in which the primary winding is intact, this will be an advantage; in this case only new secondary windings need be provided, as in practically all cases the primary is closest to the core. However, since windings on commercial transformers are all put on by machinery, difficulty is always experienced in replacing as many turns as can be taken off. For this reason, it is advisable to purchase a core which is considerably larger than the type used in a commercially built transformer of the size and specification which it is desired to make.

Let us assume that a burnt-out unit has been procured and that, as is generally the case, its primary winding is broken, thus rendering the whole unit useless. In this case, the laminations should be taken out and put on one side.

Then proceed to unwind the wire and put it on to reels, as it may be handy later on. When all the wire has been taken off, a cardboard or processed paper former, hereafter referred to as the "coil former," will remain. A piece of wood which will tightly and completely fit inside this former should now be made, its length being two or three times that of the former (see Fig. 1). A nail, preferably 2in. or 3in. long and at least ⅛in. diameter, should be driven into the dead centre of this piece of wood in such a manner that it lies along the axis of the former. The head of the nail is now cut off with a hacksaw so that the remaining shaft will fit tightly into the chuck of an ordinary hand drill (see Fig. 1).

Next, procure two square pieces of thick cardboard to act as sides and cut holes in their centres so that they fit snugly over the ends of the coil former. These should be just small enough in overall length to allow the core laminations to be assembled over them, without touching. The sides should be fitted and glued to the ends of the former and the whole assembly set up in a vyce (as shown in Fig. 1). The core former can now be made to rotate uniformly by turning the drill handle at a pace which will enable the windings to be applied fairly quickly.

Revolution Counter Desirable

If possible, a revolution counter should be procured and connected by means of a piece of flexible wire to the rotating former so that the number of turns wound will be registered. If a revolution counter cannot be obtained, one can often be purchased cheaply in an electrical junk shop as part of an old watt-hour meter. If no revolution counter is available, it is necessary to count the windings as they are applied and this becomes tedious in cases where the number of turns exceeds a few hundred, not to mention the fact that if the count is lost, one must start all over again.

It is now proposed to give simple details of how to determine the number of turns and the most suitable gauge of wire for each winding.

Having selected a laminated core, determine its total cross sectional area. This is the area of the middle leg of the core which is generally equal to twice the area of each outside leg (refer Fig. 3). It should be at least 1¼ square inches, as any reduction in core size below this value will be poor economy, necessitating an increase in the number of turns on every winding.

The number of turns for the primary is determined solely by the core area and can be calculated from the following equation:

Primary turns =

$$\frac{5.8 \times \text{Primary Supply Voltage}}{\text{Core area in square inches.}}$$

Thus, if the core area is 1¼ sq. inches and the supply 230 volts, the primary turns will be 1069. If a highly efficient power transformer capable of producing good wave form is required, the number of primary turns may be increased by approximately 20 per cent. The above formula assumes that the frequency of the supply is 50 cycles per second.

The number of turns for each secondary winding is determined as follows:

Secondary turns=

$$\frac{\text{Prim. turns} \times \text{second. volts} \times 1.05}{\text{Primary volts}}$$

This formula assumes that 5 per cent. additional turns are required on each secondary to allow for voltage drop in the winding when the load is applied and will be found to work out quite well in practice.

To determine the gauge of wire required for each winding, it is first of all necessary to know the current which will flow.

With regard to the primary, the current can be determined as follows:

Current in primary =

$$\frac{1.25 \times \text{Secy. volts} \times \text{Secy. amps.}}{\text{Primary supply voltage.}}$$

The factor of 1.25 allows for eddy current, hystersis and primary magnetising current losses.

If there is more than one secondary winding, the product of the amps and volts required from each of these windings will have to be determined and their total sum found. The current in the primary will then be equal to this figure, multiplied by 1.25 and divided by the primary supply voltage.

Calculating Gauges

Having ascertained the primary current, the correct gauge of wire to use is deducted from the table in the text. In practice it is not advisable to use wires thinner than 38 SWG, as these are too easy to break when winding by hand. The gauge of wire used is not critical and may be anything equal to or thicker than the recommended size shown in the table. In any particular instance, the thicker the wire used, the better will be the regulation of the winding and the lower will be the losses caused by current flowing through it. However, it is desirable to use the sizes recommended as if larger wire is used, difficulty may be experienced in fitting the necessary number of turns into the space available.

S.W.G. Wire Gauge	equivalent Nearest B. & S. Wire Gauge	Maximum Current R.M.S. permissible in winding
14	12	5.4 amps.
16	14	3.4 „
18	16	1.9 „
20	19	1.1 „
22	21	0.65 „
24	23	0.40 „
26	25	0.27 „
28	27	0.18 „
30	28	128 m.a.
32	29	97 „
34	31	71 „
36	32	48 „
38	34	30 „

Table showing current carrying capacity of wires for transformer winding.

When the current flowing in each secondary winding is known, the correct gauges of wire for these windings can also be determined from the table. The figures shown are based on the assumption that all windings are capable of carrying one ampere per 1,200 circular mills of cross sectional area of wire.

If a centre tapped high tension secondary winding is desired for supplying a full wave rectifier, the current in each half of this winding is 0.78 times the rectified D.C. current; in a winding required to supply high tension to a half wave rectifier, the current is 1.58 times the D.C. output current. These factors must be taken into account when deciding the correct gauge of wire to use for high tension secondaries.

(Continued on next page)

TRANSFORMERS

(Continued)

When sufficient of the correct gauge of wire for the primary winding has been obtained, a hole should be made with a pin through one of the cardboard sides of the coil former and the end of the wire pushed through from the inside (see Fig. 2).

Insulating Core

Before starting to wind the primary coil, which is generally applied first, it may be advisable to wrap a layer of friction tape around the original coil former if this is not in good condition and will not act as satisfactory insulation alone between the primary and the steel core of the transformer. This insulation should be at least $\frac{3}{32}$in. thick and before the winding procedure is started, it should be made absolutely certain that the windings will not in any way contact the steel laminations when they are later fitted.

Primary Winding

We can now commence to wind the primary coil by turning the drill handle and guiding the wire uniformly on to the coil former as it rotates; the wire should be kept taut so that the winding occupies a minimum of space. It should commence directly at one end of the former and be applied uniformly over the surface, care being taken that no turns fall on top of one another. When a complete layer has been finished, a piece of heavy brown paper should be cut the width of the layer and wrapped around it for insulation purposes before proceeding to wind the second layer back over the first. This brown paper should be coated with shellac after it is applied, the varnish improving its insulation properties and helping to hold it in place.

The above procedure is continued until the total number of turns required for the primary windings have been completed, when the wire is cut and a further hole made through the cardboard side of the former through which it is inserted, thus holding the winding tight.

Primary Tappings

If it is desired to make tappings on the primary winding so that the transformer can be used on different supply voltages, external wires must be soldered to the winding at the appropriate number of turns and brought out through the cardboard side in the same manner as the ends of the coil are treated. Any flux remaining after the soldering has been completed must be cleaned off before proceeding further with the winding. At any place where a tapping or joint is made, this should be wrapped with two thicknesses of brown paper to act as insulation for the connection.

When the primary is finished, at least three layers of friction tape or alternatively seven or eight layers of brown paper are wound over it before any attempt is made to start winding the secondaries. The thickness of the insulation between the primary and secondary windings is more important and the constructor should not proceed with the secondaries unless he is thoroughly satisfied that adequate insulation exists between the two windings, as the primary is connected to the supply mains and therefore, lack of insulation between it and the secondary can be exceedingly dangerous. A breakdown between these two windings may place the chassis in which the transformer is to be used in direct connection with the mains.

Secondary Windings

All the secondary windings required can be applied in the same manner as described above, sufficient insulation being applied between each.

Some difficulty may be experienced in tightly applying the heater windings, as they are generally made of heavy gauge wire. This may be easily overcome by looping a piece of friction tape around the first turn of a coil and then winding on the following turns so that they are applied over the tape and thus hold the coil in place (see Fig. 2). The end of each coil is held in position by applying a layer of friction tape over it.

Insulation

The thickness of the insulation between windings is determined by the peak voltages existing between them. The resistance between the high tension secondary (if there is one) and filament windings has to be high, as five or six hundred peak volts may exist between them. Filament windings alone, being of low voltage only, require a minimum of external insulation, with the exception of the rectifier heater winding which is normally at a high potential above earth.

When the windings have been completed, the laminated core may be assembled around them and bolted together; care being taken to see that the core does not touch any of the outside windings. Preferably a layer of insulation should be wrapped around the outside coils before the laminations are assembled.

After assembly, it is advisable to dry the transformer out in a very low oven for a few hours, particularly if it still contains wet shellac on the brown paper insulation between the windings. This drying out procedure will often raise to a considerable extent the insulation properties of the unit.

When the transformer is finished, it is more desirable that insulation tests be carried out before connecting it to the mains. An ordinary multimeter may be used for this purpose; the highest ohms scale should be used and the insulation resistance checked between each winding and the steel core. If the insulation is satisfactory, these resistance values will be so large that the meter will not indicate other than an open circuit. The resistance between windings and the core should be at least five megohms, but most commercial multimeters are incapable of reading as high as this figure.

It is generally not necessary to make a terminal board for mounting to a home-made transformer, as the ends of the windings can be soldered directly to the valve sockets in the set or test equipment in which the unit is to be used. It is advisable to cover the leads from the transformer with spaghetti insulation which should be pushed well up into the winding so that shorting cannot possibly occur between the leads and the chassis where the transformer is mounted to it.

If a terminal board is required for the sake of neatness, the one belonging to the original burnt-out unit can be re-used and mounted in the same way as before or, alternatively, a new terminal strip can be made up

(Continued on page 26)

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CONVERTERS FOR "SIX" AND "TEN"

Interesting English Circuits with 3 Mc. I.F.

By
W. J. CRAWLEY
(G2IQ)

THE most important item to consider in the design of converters for 28 and 58 mC is noise. Thermal agitation, which is most apparent in the first stage of the receiver, is unavoidable but may be reduced by making the first stage as efficient as possible. Valve noise can be cut down to a minimum by careful choice of valves and component values. Among valve noises, that of the mixer is likely to be most troublesome.

Mixer Noise

Generally speaking, the equivalent noise resistance of a pentode when working as a mixer is greater by at least two, and perhaps even four times the resistance representing the noise produced in the same valve when working as an RF amplifier. For this reason it is necessary to ensure that the equivalent noise resistance of the mixer valve is exceeded by the internal impedance of the signal voltage applied to its grid. This may be achieved by employing sufficient gain ahead of the mixer to ensure that the signal amplitude applied to the grid of the mixer is large compared to the mixer noise. The signal/noise ratio is thereby improved to the point where mixer noise becomes negligible.

One R.F. Ample

Once this point has been reached there is no point in striving after higher pre-mixer gain because it will not improve the signal/noise ratio. Indeed, it may impair the signal noise ratio by introducing regeneration. This may not show itself in actual instability, but the writer has often encountered high gain RF stages working near the threshold of instability and apparently giving extremely high overall amplification, but whose actual signal/noise ratio was quite poor.

There is an optimum, then, that the amateur constructor can obtain in his RF amplification.

Perfect stability with enough amplification to overcome mixer noise represents the ideal for our converters. Experiments over many months have led the writer to the conclusion that at 28 and 58 mC one carefully designed RF stage is sufficient.

The EF54 versus the E.G.T.

The two converters to be described are similar in many respects. Split-stator tuning is used in both units. An EF54 RF stage was found to do all that was asked of it at both frequencies. The writer cannot agree with those who claim enormous advantages from their earthed-grid triode RF stages at 58 mC, and respectfully suggests that they try the EF54! The advantage of improved noise in the earthed-grid triode does not begin to make itself felt until 100 mC or so is reached. The E.G.T. shows less than 1 dB improvement in noise over the EF54 at 58 mC, and in bad localities the wide passband of the E.G.T. is a positive nuisance and it there becomes distinctly inferior to the valve using the more selective input circuit.

Construction

Both converters are built on small Eddystone cast chassis and fit neatly into the corresponding Eddystone black crackle case.

For the 28 mC unit, the chassis is divided into three compartments, two pieces of 18-gauge aluminium, 5½in. x 3½in., being bolted to the chassis.

The R.F. and mixer compartments are 2½in. wide, leaving about 3½in. for the oscillator. These dimensions are not critical but 2½in. is the minimum for any section.

Corresponding strips of aluminium are placed under the chassis so that each stage is a separate screened unit. The screening between mixer and oscillator should be omitted, but it is better to know how much injection capacity is being used, rather than to rely on stray capacity.

To simplify this converter separate tuning has been used for all three circuits and any ganging troubles are thus obviated. The R.F. and mixer coils are standard 4 or 6 pin 1½in. diameter plug-in types designed to cover the 14 mC band with normal tuning. With split-stator tuning they cover the

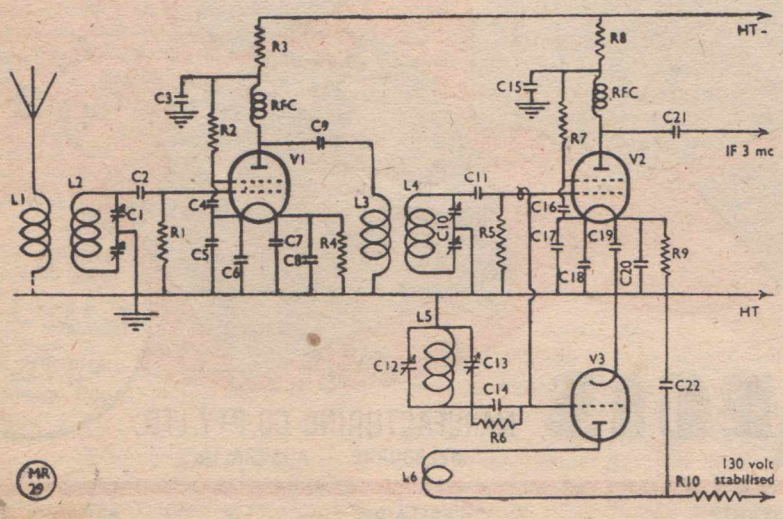

Fig. 1. Circuit of the 28 mc unit, as described in the text by G2IQ.

28-30 mC band quite easily. The size of these coils clearly indicates the advantage of increased coil inductance which split-stator tuning affords. The grid winding consists of 7 turns of 24 or 26 gauge SWG enamelled copper wire, but the aerial winding is a matter for experiment. The writer uses a balanced input with 300-ohm Amphenol line, and three turns have been found optimum for this condition. A 70-ohm line requires 2 turns. The split-stator condensers may be any design provided that the physical dimensions allow for mounting in the restricted space available. The writer uses an Eddystone 25 x 25 mmf. for the R.F. and a Polar 2-gang 25 mmf. condenser for the mixer. The oscillator coil is tuned roughly by a 50 mmf. midget air-dielectric type, whilst another 50 mmf., with all rotor plates but one removed, serves for bandspread. This capacity (about 10 mmf.) is sufficient to spread 28 to 30 mC/s over most of the 0 to 100 dial.

Points To Watch

Special points to note in wiring the converter are as follows: Keep all plate and grid leads as short and as rigid as possible. Where grid leads have to go through the chassis to the variable condensers, use either ceramic feed-through bushes or sheath the wire in polythene tube or similar low-loss insulant. Avoid all loops by having one common earth point for each stage. The best position for this is at the screw holding the valve holder in place and may be made by bolting three soldering tags to this screw and fanning them out for easy access. There are four cathode outlets to the EF54; bypass each tag separately to earth with a 500 mmf. mica condenser. If possible arrange one of these condensers to lie right across the valve holder so that it acts as further screening between grid and plate.

Mixer noise is reduced by the use of high-value cathode and screen resistors. In the interests of high conversion gain, high signal/noise ratio and low signal-grid current, single grid input is used in the mixer. This results in some pulling, but its advantages outweigh this one disadvantage. The use of a very small capacity reduces pulling to a minimum, and

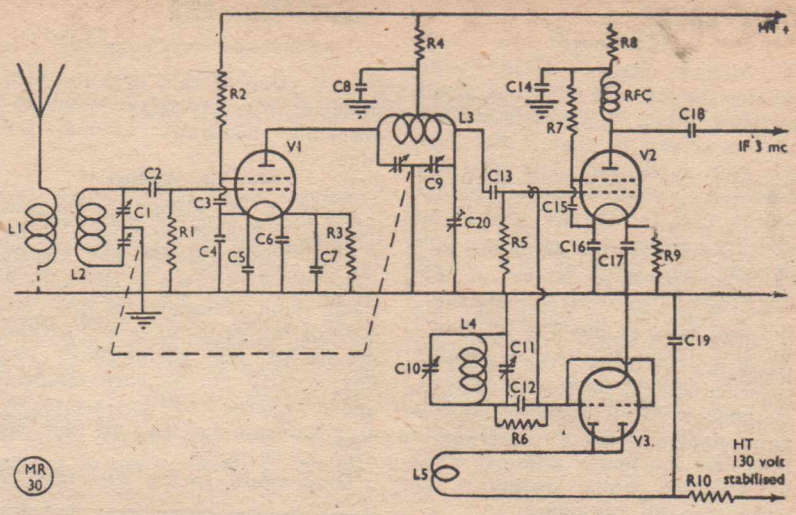

Fig. 2. The 58 mc converter circuit.

this capacity is obtained by wrapping a piece of insulated wire once around the mixer grid pin and connecting the other end to the oscillator grid. The choice of oscillator valve is not critical and the following types have been used with good results: 6C4, 9001, 9002, 9003, 6AG5, 6AK5, 6J6, all triode-connected. The photograph shows a 6AG5, triode-connected, in this position.

Operation

The writer uses an output frequency of 3 mC which means tuning the oscillator through 31/33 mC or 25/27 mC. With the oscillator coil specified, which has three turns for the grid winding and one turn tightly coupled for the reaction winding on a Denco standard former, the setting of the 50 mmf. oscillator condenser is about half-way in. If no wavemeter is available, finding the band is a matter of trial and error. The writer prefers to tune the oscillator through 31/33 mC and resonance in C1 and C10 is indicated by a sharp increase in background hiss.

The 58 mC Converter

The circuit of this unit is similar in most respects to the 28 mC set. The 6AK5 has been found an excellent mixer for this frequency and a 6J6 strapped as one triode, in which condition its mutual conductance is 10 mA/volt, is a strong and stable oscillator.

The coils, which in the case of the RF and mixer stages are mounted as near to the tuning condenser as possible, are self-supporting, wound with 16 SWG enamelled or silvered wire. The RF coil has six turns 1in. diameter whilst the mixer is made slightly smaller, namely 6 turns ⅞in. diameter. The reason for this is to dispense with the trimmer across the RF coil, and one trimmer only, that in the mixer circuit, is used. For the oscillator, where stability is the main consideration, three turns on a circular piece of distrene, ¾in. diameter, with one turn for reaction, are used. This coil is tuned by a Philips 30 mmf ceramic trimmer and a 4 mmf parallel condenser spreads the band about 70° on the 0/100° dial.

The ganged condenser used in the RF and mixer stages is a standard twin-gang unit, each section of which has been sawn into two parts with a thin hacksaw blade. The unit is thus converted into two split-stators, ganged. No aerial coupling winding is shown, as here again experiment with different sizes will pay dividends in the transfer of energy. As a guide, one turn is the optimum for a 70-ohm line.

The precautions taken in the construction of the 28 mC unit are duplicated in this set. The chassis is divided into two parts by a screen 5½in. wide and 3½in. deep.

(Continued on page 26)

CONVERTER

(Continued)

A further screen 4¼in. wide divides the RF and mixer. A small aperture 1½in. × 1⅛in. is cut out of this screen so that it fits over the twin condenser. The coils are mounted on small ceramic terminal blocks, that for the RF grid being directly above the tuning condenser and that of the mixer alongside the 6AK5.

The remarks on operation hold good for both units. For an output frequency of 3 mC, the oscillator trimmer should be two-thirds out. Resonance of RF and mixer is again indicated by an increase in hiss, but the mixer trimmer must be adjusted whilst swinging the gang through resonance.

The writer is a poor mechanic and has no doubt that many readers will be able to make far better looking converters than he has done. But it is hoped that the description of these units will serve as a guide to those who are striving for performance a little better than the average.

—"Shortwave Magazine," England.

TRANSFORMERS

(Continued from page 22)

from a piece of thin bakelite with soldering lugs riveted to it at appropriate distances around the edge.

Not for Audios

A word of warning! Do not imagine it is easy to wind a satisfactory audio transformer merely using the data given in this article. Good audio transformers are very difficult things to make and precise details of the permeability and flux density of the core material under various conditions are necessary before a satisfactory unit can even be designed.

Once again, as the wire used in these units is generally very fine and many thousands of turns are required, they are horrible things to attempt to make by hand. Practically any radio shop is able to supply new or second-hand audio transformers for a few shillings, which will probably be much more satisfactory than a home-made unit.

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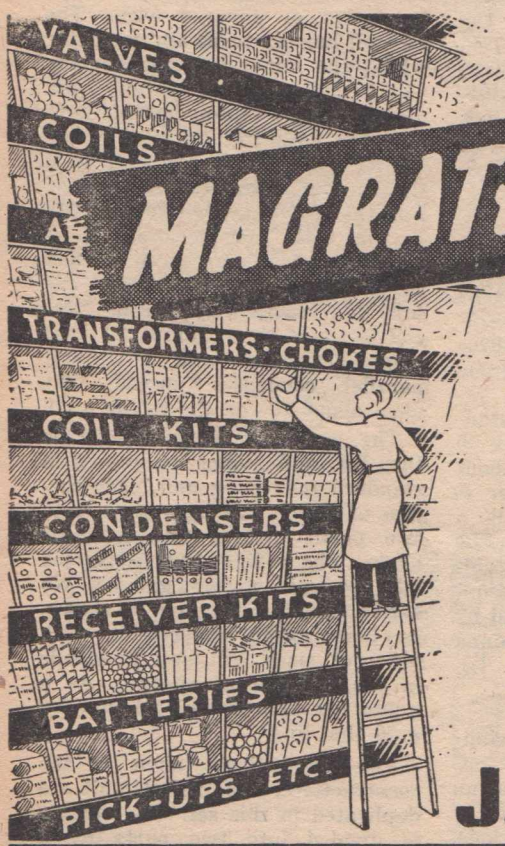

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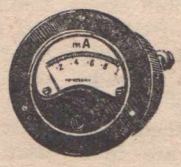

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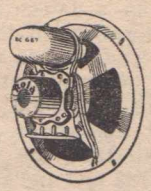

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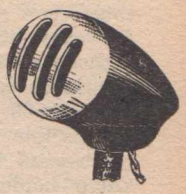

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A.R.R.L. Chief Calls For New Technique

In the latest issue of "Q.S.T.", K. B. Warner, Secretary of the American Radio Relay League, calls for everyone to rouse their brains to try and think up a method to permit phone and C.W. operation on the same frequency without interference.

THE radio world most desperately needs more spectrum space. If some solution is not found soon, working conditions will become intolerable for every radio service. With constant growth both in the number of stations and in the number of specialised new services, the physical provisions of the useful spectrum are pitifully inadequate for the world's requirements. All persons associated with frequency-allocation work in this country, particularly during the recent years of postwar planning culminating in the Atlantic City conferences, have known how intensely difficult it is to make adequate provision for national needs, even within the framework of a single national pattern of life. When the divergent ideas of seventy-nine nations were laid in parallel at Atlantic City it was small wonder that it took nearly five months to come to agreement. And that agreement, although a mammoth accomplishment in view of the difficulties, is in truth simply an

By

K. B. WARNER

Secretary

A.R.R.L. (U.S.A.)

aggregation of compromises and exceptions, a group of negotiated decisions that fail to meet adequately the needs and wishes of any country or any service. This unsatisfactory condition flows from one simple fact: the frequency spectrum isn't big enough. If there were ample space, a world conference would get through its allocation work in a single day. As it is, they are endurance contests, and the worst is yet to come.

The primary trouble derives, of course, from the demands of high-frequency broadcasting. If there were no need to make provisions for this alleged service, the spectrum would be just about sufficient, we think, to take care of the bona fide requirements of the communication services today; but as it is, the poor old spectrum just doesn't have enough stretch in it to do the job. It does no good to say that international broadcasting is futile or that the safety and communication services can spare no more frequencies. The broadcasting administrations of foreign countries, particularly in Europe and Asia, are determined to have more and more spectrum space, and in such countries they commonly outrank the government agencies dealing with communications. The net result is that the full voice and power of sovereign states are more and more being aligned in a common demand for greatly-widened broadcasting allocations, regardless of the injury to other services. And the international conferences are made up of sovereign nations, so that the votes of their authorised delegates decide what is done. If that's what the majority of nations really want, there is no visible way to stop them. At Atlantic City the governments with large commercial interests were extended to their utmost to prevent the destruction of the fixed, maritime and amateur services. At that, contrary to the wishes of the United States and Canada, h.f. broadcasting gained quite a few hundred kilocycles in the most valuable parts of the spectrum, at the expense of other services. It is difficult to portray adequately the greed, rapacity and general radio-dumbness of the average foreign spokesman for government broadcasting. With exceptions, of course, he is commonly a rather high-powered political character, not a real radio man and not a technical man, caring less than nothing for the communication services and rioting in the plenipotentiary powers given him by his government. Radio means only broadcasting to him and he doesn't care what happens to other services as long as he gets what he wants. Yet all too frequently he possesses the final say for his government in frequency matters, even disregarding the communication needs of other agencies of his own government and succeeding in committing his country to an extravagant position. In short, by the time the votes are counted most foreign countries are absolutely hipped on international broadcasting.

H.F. broadcasting, then, is the particular curse of an international radio conference. It has been reliably calculated by engineers that it would take about half of the h.f spectrum to set up, on sound technical principles, an idealised system meeting every nation's ambition of being able to propagandise every other nation. It has been estimated by us that it would take a fat three-quarters of the spectrum to give these guys what they want. The hell of it is that they are growing in power and influence, not losing, so that it is only a question of time until they will have their way unless something is done about it. Livid at Cairo, livider at Atlantic City despite their immense gains, the representatives of foreign broadcasting still feel that they got the short end of things here and are impatiently determined to use the power of their governments to get what they want next time. If the communication services do not watch out, some fine day the broadcasters will possess the spectrum, and the art born of Marconi and Popoff

(Continued on next page)

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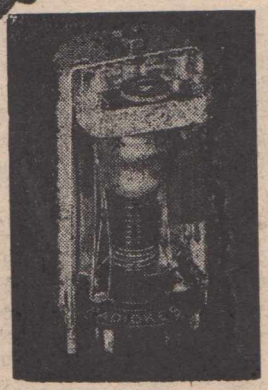

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INVENTOR (Continued)

and nurtured by generations of communicators everywhere will disappear from the earth and turn over its frequencies to syrupy voices selling coffee, purgatives and national ideologies.

Other Services

But that is only part of the story—there is more to it than broadcasting. Something similar is happening within some of the other services. Take the maritime mobile service as an instance. In that service there is a clash between radiotelephony and radiotelegraphy. There are those who hold that the important coming service is ship-to-shore voice communication, tied in to the land networks, so that passengers may talk direct by voice with correspondents on shore. At Atlantic City a goodly chunk of each maritime band was sub-allocated for this purpose. Again the pressure was so great that it didn't matter too much whether this was done at the expense of safety of life at sea or of record communication.

Phone v. C.W.

By this time a pattern is discernible and the alert reader will see that this trend is something with which we are already familiar in amateur ranks. It is only another aspect of our own old argument about how the ham bands should be allocated between 'phone and c.w. Now transmuted to world dimensions, the fundamental quarrel is between voice and record communication, and the pinch simply comes from the fact that the frequency requirements for voice communication are enormously greater than they are for telegraphy and that an overstretched spectrum can't yield any more. The danger is that in a world where power and money are determining, the older and more sedate services are likely to be exterminated eventually if some relief at the technical level is not found.

This problem of finding more frequencies for more stations—has been growing for at least twenty years. The attempted solution, up to date, has been to pack the stations in closer, by increasing the stability of transmitters and the selectivity of receivers. In other words, to "slice it thinner" by decreasing channel-widths. Another solution was suggested by the appeal this past spring of the chairman of the Federal Communications Commission to the convention of the Institute of Radio Engineers to find a means of taming the microwaves so that they would cover transocean distances. In other words, to extend the useful spectrum. You may have suspected that we want to propose still a third mode of attack. You'd be quite right: We propose that the technical means be found to split the spectrum lengthwise into two parts, each to be assigned to a different mode of operation that would offer no interference to the other, one for voice communication and one for telegraphy.

Brighter Outlook

We think that in that last sentence above we have expressed almost the whole of the problem confronting modern communications. We ask you to contemplate what a solution would do for a beleagured radio world. Take those maritime-mobile bands again for an example. The ideas of the proponents if ship-shore telephony could grow until they embraced the full width of the bands and nobody would care, because the whole of the bands would still be available to telegraphy. More fundamentally, the encroachments of broadcasting on the fixed service would be ended forever. All of those vast reaches of the spectrum necessary to carry on the world's fixed service could be made available to h.f. broadcasting, in widths beyond the dreams of even that particular kind of avarice, yet nobody would care, because all of those frequencies would still be fully available for the record communications so essential to world commerce and national well-being. An example closer home will perhaps be even more convincing: If such a system existed, the entire widths of amateur bands could be available for 'phone operation and no c.w. amateur would care, since the same full bandwidths would be available to him for telegraphy and there would be no mutual interference. Moreover, by that time there would be so much surplus space in the spectrum, through the possibility of overlapping the services, that there'd be room for more and wider amateur bands.

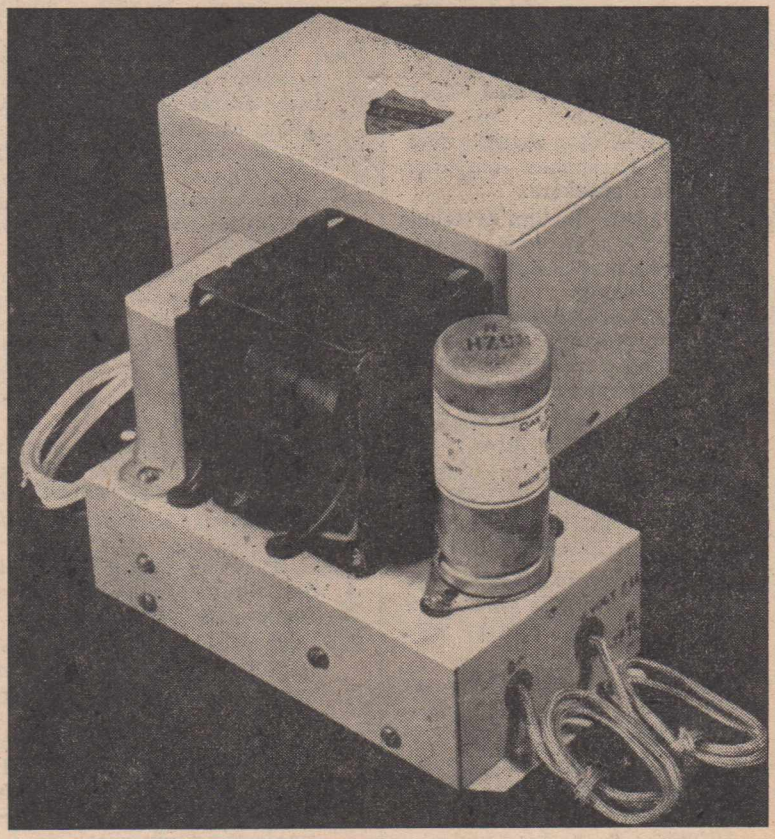
It is our belief that we, editorially speaking, survived the strain

of Atlantic City in fairly good fashion, and we offer assurances that we have not since taken up opium. It seems to us to be technically reasonable to hope for the development of two modes of communication, one for voice and one for telegraphy, that would offer no mutual QRM and that would yield the practical equivalent of two complete r.f. spectrums. We furthermore suggest that this is a job that somehow **must** be accomplished before there can be any peace in the radio world, and that if it is not done the communication services of the world are threatened with substantial extinction in the course of two or three more world conferences. If the tongue of "Q.S.T." can be heard around the world, if in some responsive quarter it can perhaps strike a spark, there may yet be hope for the sadly-pommeled radio set-up of this globe. What we have to have, it seems to us, is a new invention, a new bit of circuit wizardry, that permits the duplicate use of every frequency by these two modes of operation, with no detectable trace in either of the other. In a perfect solution of this problem it would be possible to tune a communication receiver smack on a local 100-kw. broadcasting station and hear not a smidgeon of response, yet when our communication circuit opened up, there it is, loud and clear. Similarly, when a broadcast receiver is tuned to a programme, no interference is to be received from a powerful telegraph transmitter next door on the very same frequency. That, and nothing less than that, will satisfy us as a solution to this problem, for what we require is an additional complete spectrum.

We can even take you, we think, the first tiny step toward that solution. We can say that, since h.f. broadcasting and the ship-shore 'phone service and most of amateur radiotelephony are already established on the basis of amplitude modulation, one of the modes to be provided for in our system is plain old A3 telephony. And that therefore what we need is a method of telegraphy that offers no resistance to A3 and receives none from it on the same frequency. A distinction in directions or phases or polarities immediately suggests itself to differentiate between the two methods. Considering that A3 is "up-and-down" modulation, one immediately thinks of something "crosswise" for the other mode, and of course some form of f.m. telegraphy or frequency-shift keying is immediately indicated. Indeed, we strongly suspect that when the solution of this problem is found it will involve the new techniques of limiters and discriminators and will be thought of as an application of frequency-modulated transmission. Already it is possible to have f.s.k receivers that do not respond to A3 emissions, but the second and harder half of the problem remains currently unsolved.

As we see it, this is the problem of the age as far as radio communication is concerned. It is worth anything it costs to answer it, because from the broadcasters' standpoint it offers everything they could wish and for the communication services it is a case of find a solution or eventually perish. We do not believe it is insoluble. Too many marvels of circuitry exist for us to think that for a moment. Provided only that the solution is within financial and technical grasp, we believe that the record communication services of the world, including amateur stations, would instantly embrace the new mode, whatever it is, and feel that they were well out of a bad mess. All it has to do is work. It can be done and it must be done. In the final analysis, over the long haul, we think there is no other hope for us communicators.

How now? Do we strike a spark anywhere? What about it, you young fellows? Do you have the beginnings of an idea? The world waits upon it, and it will also wait upon you and lay great fame and vast riches at your feet if you can turn up the answer — because never in the history of communication has anything been so badly needed as radio now needs a second spectrum.



HANDY VIBRATOR UNIT

This is the Aegis type VP1 vibrator power unit, available with 6 or 12 volt input and 150 or 250 volt output, fully smoothed, fitted in metal box with shielded leads. Overall size is about 7" long, 5" high and 3½" wide.

NOTICE

Back Number Clearance

Owing to the heavy demand for back numbers following our recent offer we have decided to change our policy in regard to these. In future our Back Dates department will stock only the six or eight previous issues. All earlier issues will be 6d. each or 5/- per dozen until stocks have been cleared. We will not make any effort to retain stocks of back numbers older than six months. If you want to complete your files, don't hesitate. The following issues are now available at 6d. each or 5/- per dozen, post free to any part of the Commonwealth.
These issues contain a wealth of technical data and information. Only small stocks of some issues are available, so don't hesitate.

December, 1939.—Loop portable 3, Junior class B battery amplifier, "Air-scout" communications six, multi-meter circuit.

November, 1940.—Trans-port a.c. portable, T.r.f. mantel 4, "Criterion Crystal," Two champion amplifier circuits, 8-valve battery superhet.

December, 1940.—"Tip-top" 3/4 superhet (one of our most popular circuits), tone-corrector for magnetic pick-ups.

February, 1941.—The Club Special, Local-tone Four (a.c), First article on tone compensation by inverse feedback.

March, 1941.—Second article on compensated acoustics, also the "Acoustic Compensated Superhet."

June, 1941.—Super-seven dual-waver, Paraphase amplifier, extension speakers.

December, 1943.—Design of folded horns, five-way tone control, High efficiency aerial for short-wave listening.

January, 1944.—Simple v.t.v.m. with magic eye, home-made high-fidelity pick-up head, all-wave two-valver.

February, 1944.—How to make a soldering iron, 12-valve super-quality amplifier.

March, 1944.—Making electric musical instruments. The Three-Two battery special.

April, 1944.—How to make an electric guitar, simple volume expander circuits, Mystery crystal set.

May, 1944.—Multi-vibrators, an amplifier beyond reproach, wide tone-control unit.

June, 1944.—Utility battery set, Direct-coupled t,r,f, 4, How to wind your own output transformer, etc.

July, 1944.—Simple v.t.v.m., Three circuits by Stevens, Home-built communications 13, scratch filters.

August, 1944.—Home-made hi-fi pick-up, wide-range audio oscillator, useful a.c. bridge, bass booster amplifier.

September, 1944.—How to design direct-coupled amplifiers, crystal circuit which receives N.Z., Eclipse champion amplifier, simple valve tester, R.f. heating.

December, 1944.—Victorian champion amplifier circuits, pick-up equalizers, English fidelity radiogram circuit.

May, 1945.—Reflex circuit with cathode follower, one-valve test oscillator using 6A8G, Audio oscillator circuit.

June, 1945.—Well-tried reflex circuit, Theory of microphones,

July, 1945.—Resistance and capacity meter, Tone compensation amplifier.

August, 1945.—The Decibel, Theory behind proper amplifier design.

September, 1945.—Camera-case portable, An answer to the cathode follower, Getting the best from a pick-up, Probe adaptor for v.t.v.m.

October, 1945.—Transitorn oscillator, Vibratory power supplies.

December, 1945.—The "Hammond" electric organ, Noise suppressors.

January, 1946.—Champion amplifier, Simple service oscillator, Home-made filter chokes.

February, 1946.—The "Antitheorist," Improving DX performance, Signal tracer in miniature.

June, 1946.—Signal tracer for battery operation, Receiving aerial for ten metres, exciter unit for mC/s, deaf aid amplifier, single-gang superhet, etc.

July, 1946.—Latest in direct-coupling, Absorption - type wave meter, powerful 8-valve circuit, ideal single-ender amplifier, servicing a.c. receivers, etc.

August, 1946.—Handy multimeter, All-wave band-spread 2 for battery operation, with coil data, Stroboscope speed indicator for turntable, "Ferrotune Reinartz," T.R.F. four-valver for battery operation, "Fidelity Broadcast 5," etc.

September, 1946.—Band checker for hams, Pre-selector unit, Effective noise limiter, "Connoisseur" a.c. five with tone compensation, "Sky - hawk" t.r.f. 4 for a.c., etc.

October, 1946.—"Max-Plus" by Paul Stevens. A.C. Bridge using magic eye, How to suppress man-made static.

November, 1946.—Circuit for a.c. or battery operation, Ferrotune mantel model, intro. to the F.F.R. amplifier.

December, 1946. How to build a multi-meter, the F.F.R. amplifier, to deliver 45 watts of super-quality.

January, 1947. Battery circuit design, the control of tone, list of Australian broadcasting stations in order of frequency.

February, 1947.—Simple super from the past, Inputs for the F.F.R., Two more "Connoisseur" circuits. Re-vamping the FS6.

March, 1947.—How to get the best fidelity from ordinary speakers, sensitive four-valve reflex circuit, Servicing the vibrator, how to make r.f. chokes.

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THE "TELECONDA" POWERPORT

How to Build a Power Unit to Allow a Battery-Operated Portable to be used with A.C. Power

THIS is a power unit which makes it possible to use any 4 or 5 valve portable radio (.25 to .3 amp filament current) direct from the AC mains, without the complicated series parallel switching of the heaters and alteration to the back bias arrangement, as it is necessary with the usual type of power pack. It can be simply connected in place

By

PAUL STEVENS

21 Fletchers Avenue, Bondi

of the A and B batteries, does not endanger the valves and is so foolproof that even connecting the 1.4 volt filaments of the valves directly to the B supply will not do them any harm, in fact will not even heat them up. With the Powerport your portable radio is not a week-end luxury any more, but is an everyday receiver for the home, running on house current just like any other set and saving the costly batteries for your outings.

The well-tried-out circuit is shown in Fig. 1. I say "well-tried-out," because I have been making these power packs as a sideline for the past four months—made about 60 or 70 of them—and can proudly state that up to this day not a single one of them has come back with a complaint or for service.

Now to the technical details: The power transformer is a special type with a 200 and 240 V primary, 2 x 140V and 2 x 4 V secondary and also a 5V heater winding for the 5Y3 rectifier. The B supply is simple and straightforward, the filter consisting of the usual 2 electrolytics (4mf, 350V will do) and a 2-watt 5000-ohm resistor, which can be made up out of 2 10,000 ohm 1-watters in parallel. The filtering here is absolutely 100 per cent., not a trace of hum coming from this part of the circuit. With the usual current drain of portable sets, the B voltage adjusts itself to between 85 and 95 volts. The A supply is a more complicated affair. For a current of up to .3 amps a valve rectifier was out of the question. The logical thing in this place is a metal rectifier. I made inquiries and found that there was a copper oxide type, the Westinghouse LT7, available, which gives .5 amps at a maximum output voltage of 2 volts, while for lower outputs the voltage could be higher. It is only a 3-plate type and in price comparable to the 5Y3 valve. But watch how you connect it. Its centre plate goes to negative, while the centre tap of the power transformer 2 x 4V winding forms the positive end, just the opposite to valve rectifiers. With the prescribed 2 x 4V RMS AC input, the DC output turned out to be about 3V at .25 amps, the current drain of a 4-valve portable. This leaves only 1.5V drop for the filter.

To get the best possible smoothing of the heater current, I decided to use 2 chokes in conjunction with two 500mf/12V electrolytics. So I got myself two 3-ohm chokes made, about the size of a small speaker transformer and with the highest possible inductance, which was near 1 Hy. These, together with the two 500 mf electros made a good filter for the A current. On my well-baffled 8in. test speaker, hum was only audible off stations and was negligible on a standard portable with a 5in. speaker. In practice it does not make the slightest difference, whether both 500 mf electrolytics are connected to the junction between the chokes, as in Fig. 1, or

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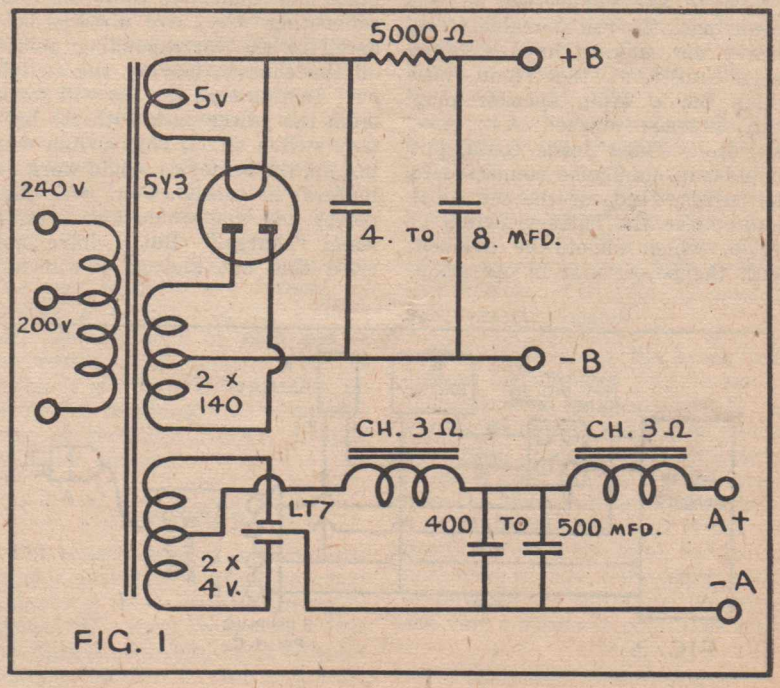


FIG. 1

(Continued)

one to the junction and the other to the output end, as in Fig. 2. The A voltage is about 1.35V for .25 amps (4 valves) and little less than 1.3V for .3 amps (5 valves). If one valve burns out on a 4-valve set, the voltage goes close to 1.5V, which is not harmful to the rest of the valves, especially for the short time it takes to realise there is something wrong, and to turn off the set. In fact a brand-new A battery will put the same voltage on the filament anyhow.

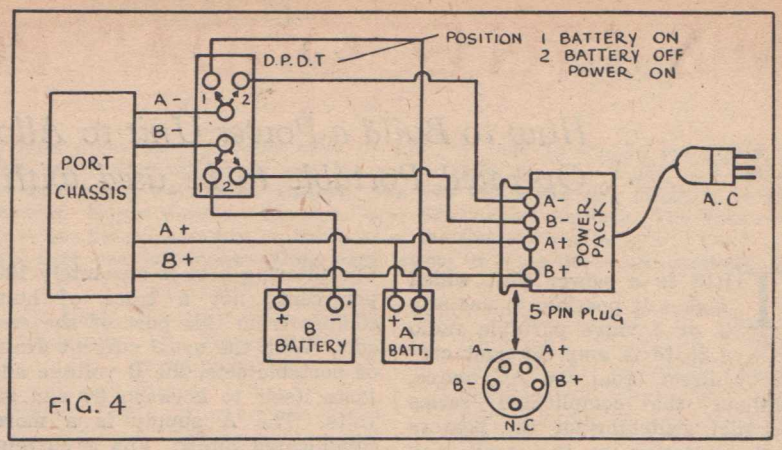


FIG. 4

You may have asked yourself by now where to take all these hard-to-get and special parts from, such as the transformer, chokes, 500mf electros, metal rectifier and last, but not least, the small metal box in which the whole affair is housed. Well, with the present non-existing demand, dealers cannot be expected to stock all these things. But as I am building these units commercially (they are marketed under a different name), I have all the stuff and am gladly prepared to let any reader of the Aust. Radio World have what he needs at a very cheap price, if he will get in touch with me.

Now to the connection of the power pack to the portable. The ones I am making have a 5-pin valve socket at the front, into which fits a 5-pin speaker plug with 4 leads marked A+, A—, B+, B—. These leads could, but should not, simply be connected to the battery leads of the set, as it would leave the battery switch in action, which should be avoided. With the power unit in operation, the set must be switched on and off at the point. It would also make it necessary to disconnect the batteries every time the power pack is to be used. A much better proposition is that shown in Fig. 3, where the batteries remain in place and connected, while the four connecting wires are directly soldered to the corresponding points on the chassis, leaving the switch out. In this case the set will work from the power pack with the battery switch off. If that switch was put on, the batteries would work as buffers in conjunction with the power unit and would also receive some "charge." But I have not tried this out and so I will not recommend it, although some people swear that it will do the batteries only good. With the switch incorporated in the volume control, this scheme is, of course, entirely impracticable. The most satisfactory way of connection is shown in Fig. 4, where a DPDT switch puts the receiver either on battery or power, the "power" position being at the same time the off position of the set for normal battery use. If the set is used that way, the 5-pin plug and leads can either be tucked away inside the set at a safe place, where they cannot cause any shorts, or plugged into a dummy 5-pin socket or 5 holes drilled socket fashion somewhere on the inside or outside of the cabinet.

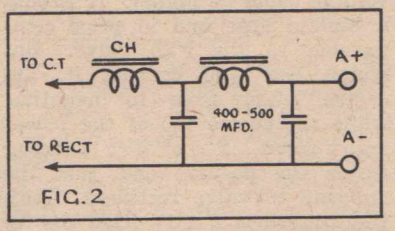


FIG. 2

Some semi-technical people had objections to the fact that the voltages on the power unit under no load conditions (the set not connected) rise to about 4 volts on the A supply and to about 160V on B terminals. This is only natural and nothing to worry about, as the voltages drop back to the normal values the very instant the set is connected up.

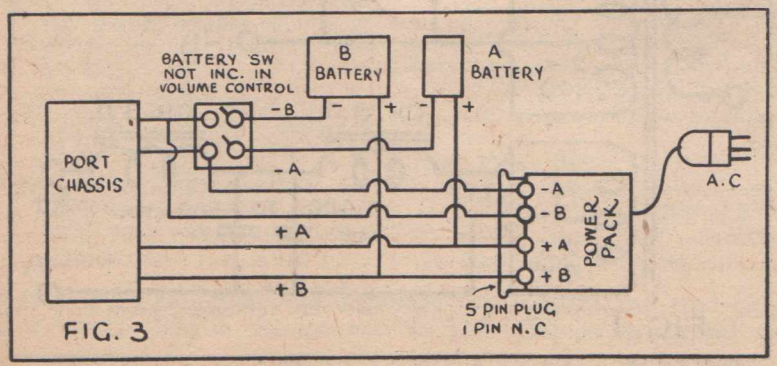


FIG. 3

GERMAN AMATEUR RADIO

The Americans have permitted the formation of the Deutscher Amateur Radio Club (D.A.R.C.) in their Zone of Germany, but transmitting licences are not yet being issued to German nationals. The HQ address of the club is D.A.R.C., Amerikanische Zone, Stuttgart-S, Christophstr. 27, Germany.

MAKING A MICROPHONE

ALTHOUGH cheap microphones give some sort of reproduction, the results obtained, although perhaps quite intelligible, may be nothing like the original sound. This may be quite all right if intelligibility is the only consderation, but where quality is also of importance, the cost of such instruments generally increases in proportion to their efficiency in this regard. There are a number of different types of microphones such as the ribbon,

By

G. W. BUTTERFIELD

A.M.I.R.E.

"The Broadcaster" West. Aust.

moving coil, crystal, and the well-known carbon types. Each of these is well suited for a particular job. The first three are the most popular as no external excitation is required and, although each has its own particular advantages, they can be all considered as good all-rounders. The ordinary carbon microphone, usually of the single or double button type, can only be considered as suitable for speech and even then only under conditions where high outputs are required for minimum amplification, such as in portable work, telephones, etc.

However, there is a type of carbon microphone that is not heard of much these modern days, but which found universal use for all quality broadcasts in the early days of radio before the variety of modern microphones was thought of. This is known as the transverse current type, which, although insensitive compared to the ordinary carbon mike, is capable of giving far superior. reproduction than the latter, and probably better reproduction than some of the cheaper modern type of microphones. What is more important from the home constructors' point of view is that such a microphone is probably the easiest and cheapest type to make, in fact the only expense worth considering is the carbon granules.

General Description

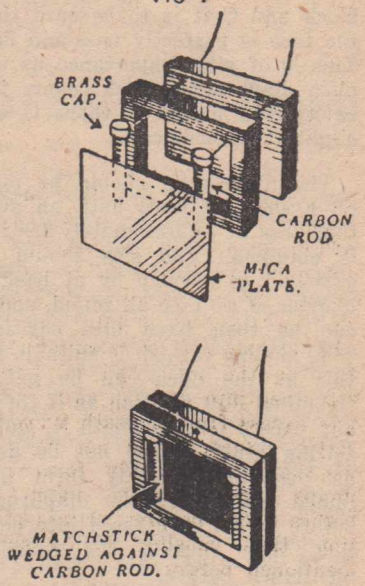
The carbon microphone works on the principle of the variation in resistance which takes place between the particles of carbon when subjected to varying pressure or vibration such as caused by the diaphragm. Thus, if a steady D.C. current is allowed to flow through these particles or granules, this current will vary in proportion. In the ordinary carbon microphone where maximum sensitivity and output are the main considerations the short conducting path between the front and back surface of the granules is used, sometimes with a carbon diaphragm also acting as the front contact, but in others the output is increased by a plunger action compressing the granules in proportion to the movement of a separate diaphragm to which it is in contact.

The transverse current microphone operates on the principle of the varying resistance of the carbon granules but, as its name implies, the action is across the mass instead of through it as in the type just described. This arrangement takes the form of a shallow rectangular recess which is cut out of some insulative materials and filled with fine carbon granules. The two contacts are formed by having a carbon rod in contact with the granules at each end of the recess. The agitation of the granules is obtained by placing an insulative diaphragm such as thin mica or stretched rubber, directly over the opening.

Construction

The construction of a transverse current microphone offers no great difficulties, the main point being to choose the right material. This can consist of a solid block of well-seasoned hardwood, such as jarrah,

FIG 1



Top): Microphone before assembly. (Bottom): Ready for mica diaphragm.

in which the cavity has to be cut. In the old days, a heavy block of marble used to be used, but there is really no need to use such hard workable material. The size of the block is governed by the size of the cavity you wish to use. This need not be large, although up to a certain point, the quality will be improved in proportion to the size. A reasonable size which has given good results without excessive loss in output is 2 by 2½in. The depth of the cavity can be 3/16th to ¼in. and this should be made as smooth and even as possible.

The thickness of the block will depend on whether you intend to suspend the microphone in a spring or other shock absorbing mounting, or whether you intend to use it just as it is. In the latter case the block will need to be from 2 to 2½in. thick so that it can sit firmly on a rubber base, as carbon microphones are very susceptible to any jar or vibration. There is one very important point that must

(Continued on next page)

CALLING CQ!

By Don Knock, VK2NO

LONG before these lines reach print trans-Tasman and interstate QSO's in the 50-54 mC/s band will be commonplace . . . they are almost that as this is written. It has long been expected that something of the kind would occur and to some of the old pre-war 5-metre addicts . . . the tie-up with N is the culmination of long weary periods of calling and waiting. It is likely that by early 1948 there will have taken place a few overseas contacts even farther afield. . . . KH6's have already been heard at various points in Eastern Australia. No better illustration of the doings in VK on "Six" can be given than the contents of a letter from Eric Ferguson, VK3BD, who tells the story of the big breakthrough as seen from Victoria. He says: "Actually interest was whetted on Saturday evening when a number of weak unidentifiable signals appeared. These were heard by most active VK3 stations, and during a post-mortem late that evening VK3RR said that he was certain that he heard ZL prefixes. We decided to make an early start on Sunday (December 21) and the first station on the band was probably VK3HT who switched on his receiver at 8 a.m. During the first half-hour he heard two ZL's and commenced calling them, but without success. I started listening about 9 a.m., and was just in time to hear Owen (VK2OC) make what we take to be the first VK/ZL 50 mC/s contact. At this time ZL's 1CD, 1HY and 1AO were R5 S5/7 here. Immediately following VK2OC's contact, VK7AB and ZL-1HY made contact, followed by VK2HT. (In Sydney at the same time VK2NP contacted ZL3LB.—D.B.K.) As time moved on, the ZL's built up in strength until steady S9 was reached and, of course, the word went around that the DX was 'on,' and VK3's began to hop in for their share. The condition lasted until approximately 10 a.m. Up to that time I had heard ZL's 1CD, 1HY, 1AO, 1GG, VK2OC and VK4ES. Now we come to the afternoon when things really happened. A little after 3 p.m. the ZL's again made their appearance, followed by VK7's and VK2's. At one period between 1635 and 1700 hrs the band sounded like 20 metres . . . or, should I say, part of the band—more about that anon—as ZL's, VK7's, VK2's and VK4's were all romping through with S9 peaks. The section of the band 50-50.3 mC/s sounded like the 20-metre Yank phone section. The VK2's and VK4's appeared only for two brief periods during the afternoon and I could hear VK7's working VK2's whenever the 7's became audible here . . . about every 30 minutes. They would appear suddenly at S9 and fade completely after 15 minutes.

"It would appear that VK7 had the best say so far as VK is concerned, as they worked all States excepting, of course, the elusive VK6. VK3 managed VK2, 4, 7 and ZL1, 2 and 3. I believe a ZL4 was heard here but have no information if worked or not. Judging by the calls of the ZL stations I'm doubtful if a ZL/VK4 contact eventuated, but this may have happened when the ZL's were not audible here in VK3. The day was a real kick for the VK3 country enthusiasts as we could hear ZL's working with such stations as 3AGB, 3UI, 3FF and 3KX, who cannot do much good with metropolitan signals. In fact, I think that every active VK3 station excepting myself got its share of the ZL's. The ZL stations were audible here from 1500 to 2130 hours. From 1500 until 1900 hours signals were very steady with the major-

A WORD TO THE WINDOM

From Mart Chaffer, VK3MH, Ballarat, Vic.: "I noticed an article in A.R.W. for November on the Windom aerial by VS1AA, and forwarded by VK2CM. Let me tell you I have used the Windom system (or SWF) since 1928, and swear by it. I actually put it up at the time the American Fleet visited Melbourne, around 1928, and have used it ever since. In fact, I am using the original piece of wire I put up at that time! I would not use any other system as it is useful on 80, 40, 20 and 10 metres. What I like about this aerial is that one erects the 67½ feet to best advantage in the location, irrespective of where the shack is. Then all one does is to bring in the feeder to where the Rig is, whether in the lounge or—! There is no worry about feeder length. The outfit here is 89 tritet from 3.5 mC/s crystal, 807 buffer-doubler or quadrupler, driving a Taylor T40. The receiver is 17 years old and is a 4-tube TRF type. The only difference between now and 17 years ago is a new dial, plus a 956 in place of the original 78 RF valve. The detector is still the same old 78 . . ."

These observations from OT Mart (once 3XF of Moonee Ponds) prompt the question: How many active stations are today making use of early type equipment? If you are operating your station with TBO/46's or DET1's, write and tell us about it.

MICROPHONE

(Continued)

be observed in finishing off the block and that is to be sure that the face is perfectly true and flat. This is of vital importance as the mica diaphragm which covers the cavity will buckle if there is the slightest unevenness.

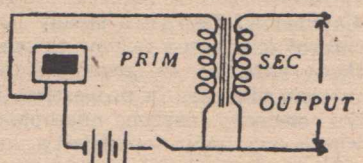
The diaphragm should be split off a sheet of mica until an even thickness of approximately 0.002in. is obtained. The size should be sufficient to overlap by at least a quarter of an inch all round, and it can be then fixed into position. Thin shellac varnish is suitable for this as the mica can be gently smoothed into position as it forces any excess from beneath it. Quick setting glues should not be used as they may quickly form into lumps underneath the diaphragm before it can be pressed into position, thus causing the warping mentioned before.

A cover to protect the diaphragm can be made by sandwiching a square of gauze wire between a bakelite frame and another frame of exactly the same size made of thin cardboard. These can then be screwed down around the overlapping edges of the diaphragm; the width of the frame should be sufficient to allow the screws to clear the edge of the mica, otherwise the latter will tend to buckle as the screws are driven through it. Before going this far, however, it will be necessary to mount a carbon rod at each end of the cavity. These can be obtained from an old dry-cell, but care should be taken to be sure that they are perfectly clean. Polishing with fine sandpaper will ensure this. The metal tops can be left in position, as they form a simple means of soldering a wire connection which can be brought out through a hole to the back of the block for terminals.

Alternative Method

Instead of using a block for the body of the microphone, another method is to use two sheets of bakelite or similar material. The centre is cut out of one of these sheets to the size you wish to make the cavity. It is then laid flat on the other sheet and sealed or screwed down. Care should be taken to ensure that the joint is made air tight to exclude any moisture from reaching the carbon granules. This is shown in the order of its assembly in Fig. 1. The carbons can also be seen in place. These should be a tight fit and can be held in position by cement such as "Tarzan Grip" applied at the bottom and back; a matchstick cemented at the side will also help. Brass or copper strips or rods can be used instead of carbon but it will be necessary to have them gold plated to avoid corrosion. If these are used, a threaded brass rod can be tapped into the back of each one at the centre; this rod can then be passed through holes to the back of the block, thus forming an excellent method of bolting the contact rods in position and at the same time acting as terminals.

FIG 2.



Microphone connections.

Before final assembly, a small hole should be drilled in the top through which to pour the carbon granules. This can best be done by using a paper funnel for the purpose. The granules should only be allowed to trickle in to avoid jamming in the hole; at the same time, the block should be tapped down on something solid to ensure that they completely fill all the space to within approximately 1/16in. of the top. The hole should then be plugged and sealed off. On no account should the fine polished granules be handled, otherwise they will be inclined to stick together later on, thus marring the microphone's performance. Although carbon granules may be obtained from an old P.M.G. microphone or similar type, it is far better to use a much finer grade, otherwise the quality may not come up to expectations.

Connecting to Amplifier

The method of connecting the microphone to the amplifier is shown in Fig. 2. A 4½-volt battery should supply sufficient excitation, but up to nine volts can be used if you are unable to get sufficient output. However, the lower voltage with extra amplification will give the best results. As with all carbon microphones a transformer with a low impedance primary will be required to provide the coupling to the high impedance grid circuit. This usually means a step-up ratio of from 30-1 to 75-1 dependent on the actual impedance. However, if you are unable to procure one suitable, it is possible to make one by carefully removing the primary winding from an old L.F. transformer and replacing this winding by another consisting of 200 turns of wire with tappings brought out at each fiftieth turn. These tappings will enable you to obtain the best match possible. This is not a very difficult procedure as there is usually a fairly thick insulative layer between the primary and secondary windings, so you need have no fear of spoiling the latter provided you take reasonable care. The main thing to watch is that you do not break the input and output leads to this secondary winding, particularly the former, as it would be impossible to pick this up again.

Harry C. Hickin, chemical engineer of Sydney, Australia, visited New York recently and learned to his surprise that there was a Keller Hickin in the same profession. Harry introduced himself to Keller, whereupon they found a common English ancestry, Harry's forbears moving to Australia in 1800, while Keller's came to America in 1880. Thinking to be funny, Harry said, "I suppose you are also a ham." In the dead silence that followed, W2OUT exchanged a card with Harry, second op at VK2ACX. Taking note of this, a bystander exclaimed, "I'll bet your wives have the same names!" To this the two hams answered in chorus—"Marjorie." Being in the RCA Building, there was only one thing to do: the boys adjourned to the Down-Under Bar, where skeds were arranged over a "Sydney Sling."—"Q.S.T."

HAM NOTES

(Continued)

ity at S8. From 1900 until 2130 hours signals were affected to a greater extent by fading and, excepting for ZL1HY, were peaking at S6. ZL1HY was the outstanding signal, at times pegging the S meters. Here is a list of stations heard here during the day: ZL1AO, 1HY, 1ON, 1NL, 1CD, 1GG, 2RT, 2DS, 2PV and 3LB. VK7CW, 7XL, 7PW, 7NC and 7AB. VK2BZ, 2OC and 2ADT. KV4ES, 4AW and 4FB. I was not able to work any due to the fact that I am forced to use an indoor aerial at this location—people next door objected to a beam overlapping their property. About the activity at the low frequency end of the band . . . it was particularly noticeable that almost all the ZL's were crowded between 50 and 50.2 mC/s. The highest frequency I heard used was 50.6 mC/s. From observations here the ZL's invariably tune from the low frequency end of the band (we do also) and do not appear to tune above about 50.5 mC/s. VK3 stations within the limits of 50 to 50.5 mC/s had by far the best spin. I heard some of the VK3's who operate around 51-52 mC/s frantically calling, and invariably the station called either came back to someone at the low frequency end or with a CQ. A few VK3's could do no good until they moved, so adding to the QRM at the LF end. I had the same experience myself when the VK4's were rolling in last July. My normal frequency at that time was 51.88 mC/s and I called and called without result until I shifted to 50.3 mC/s, when I just couldn't miss. The same applies to other bands, particularly 10 metres, where the LF end is bedlam at times, and the middle and HF ends are barren of signals. Methinks this is a poor show in view of the fact that our official amateur organisations are struggling to hold present assignments. If we are going to utilise merely a narrow portion of the bands, and if the powers that be become fully aware of it, I can see a slice coming off both the 6 and 10 metre bands. On Sunday, December 21, for example, out of approximately 50 stations audible on the band here, only one was higher than 52 mC/s, three between 51 and 52 mC/s, and the remainder crammed in between 50 and 51 mC/s."

The Sydney Picture

It was at 6 p.m. on Saturday evening, December 20 last, when an S9 phone signal from ZL3AR appeared on 50.1 mC/s calling "CQ Six Metres . . . ZL3AR of Ashburton, New Zealand." The rush by Sydney VK2's, also the northern men, was memorable . . . everybody called him and everybody was puzzled for thirty minutes or more when ZL3AR replied to nobody, but just went on calling CQ. Gradually it dawned on one or two that something was amiss with ZL3AR's receiver, a fact that he admitted after a while . . . saying, "I'm not sure if I've found the band on this converter." No other ZL's being in evidence on Six . . . VK2OC of Wyong and VK2NO of Sydney both thought of the same thing at almost the same time and adopted the expedient of calling New Zealand on Six for replies on Ten . . . a ruse that brought immediate results. ZL4BN in Dunedin came back to both stations and reported S9 reception; in fact it was possible to use duplex. Thus did the first Six metre/Ten metre cross-band QSO's occur between Australia and New Zealand. Nothing further happened with ZL that night . . . but on the Sunday morning some VK2s were on the job bright and early. It is a matter for time checking as to who actually made the first two-way VK/ZL on Six metres, but it was thought to be a toss between VK2OC of Wyong and VK2NP of Sydney. The latter worked ZL3LB on CW at 0815 hrs, December 21, 1947. Next station to tie up with a ZL appeared to be VK2WJ, around 0830 hours, followed by VK2ZH. By 0900 hours the band was in full swing with VK2's working ZL1, 2 and 3 districts and ZL's could be heard working with country VK2's. As the morning progressed, ZL's could be heard in communication with VK3's, 5's and 7's, but not with VK4's. Throughout the day and evening, up to 2100 hours Sydney time, the strongest ZL in the Sydney region appeared to be ZL3AR, who by this time had got over the receiving problem, but ZL3LB ran him very close. A most interesting station with a consistently strong phone signal on 51.6 mC/s was ZL2MF of Wanganui, who had only 6 watts in a folded dipole aerial, fed with Tru-Rip cable (similar to Nylex). Moreover, Barry was modulating an 807 doubler as the output stage, yet his signal was quite equal to several of the ZL 100-watters. The idea that only the LF end of the band was workable certainly did not work out in his case, for ZL2MF lacked no VK callers and contacts.

As the day wore on, ZL signals appeared to follow an hourly pattern, reaching good strength and then fading to zero, repeating this effect continuously. To add to the excitement the interstate VK's put in an appearance and 5's and 7's in particular added to the general hubbub.

Consensus of opinion in the Sydney area is that stations on the coastline have much better conditions for ZL than those farther inland, even in the Western Suburbs. There, such stations as VK-

RADIOMAC NAME PLATES

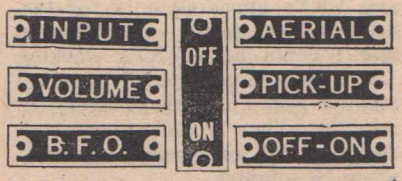


Plate size 1¼" x ¼". Brass lettering on black. The following titles are available:—

A BATTERY	LOW	RECEIVE
B BATTERY	MICROPHONE	RECTIFIER
C BATTERY	SPEAKER	REGENERATION
AERIAL	MILLIAMPS	SHORT WAVE
ATTENUATOR	MIXER	SELECTIVITY
BAND SET	MONITOR	SELECTOR
BAND SPREAD	MODULATOR	SWEEP
B.F.O.	NEUTRALISER	SYNC
BROADCAST	OFF-ON	TONE
CRYSTAL	OHMS	TUNER
BUFFER	OSCILLATOR	TRANSMIT
CURRENT	OUTPUT	VOLTS
C.W.	PRE AMP	VERNIER
DOUBLER	PHONE	VOLUME
EARTH	PHONES	WAVE
FILAMENT	PICK-UP	CHANGE
FOCUS	PLATE	X SHIFT
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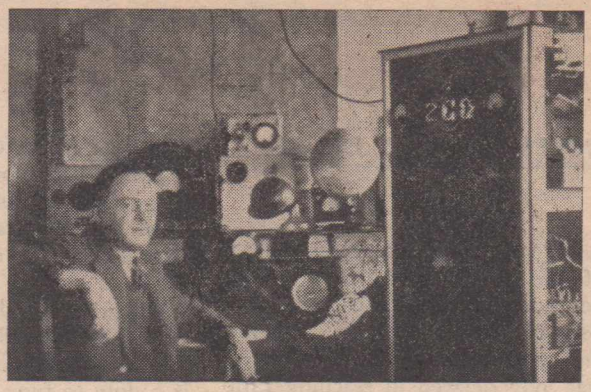
2NP and 2MQ, equipped with the best of gear and rotary horizontal beams, had the utmost difficulty in securing ZL contacts. Yet up in Wahroonga, VK2ZH, with a "Telcon" Folded Dipole totted up a nice score. In Pymble, VK2RA, using CW and a horizontal 8JK beam, had no luck at all that first day. Monday was a dead day for ZL's but at 1800 hours on Tuesday, December 23, ZL3AR was back again with an even stronger signal, if that be possible. He held until 2100 hours.

On Sunday, December 28, ZL's were heard again in Sydney for fleeting glimpses, this time the first district only. VK2NO listened to ZL1HP and 1SG duplexing for 45 minutes, and at last managed to raise ZL1SG before fading. ZL1SG was using an 80-metre zepp and was very surprised to hear a VK calling him. When log books are consulted, it will be found that some VK2's have a formidable list of New Zealand contacts on 50 mC/s . . . outstanding are VK2OC with 28, VK2BZ with 36 and VK2NO with 14. By the time these words reach print, those figures are likely to be considerably increased.

Observations From Queensland

Lloyd Williams, VK4OW, writes from Mackay, Qld.: "After several weeks of 50 mC/s listening, here is a report on results. Switched on at 1123 hours on 27/12/47 and heard VK3QR in communication with VK4HF, both at about S4. VK2AHF and VK3HT were heard at S5 and then VK2JU at S7. Later, this station was heard in contact with VK5BF and 5GL but neither of the South Australians could be heard here. An unidentified signal was observed to say on 51.1 mC/s that he was 'using a 3-element beam.' At 1225 hours VK2JU disappeared and then VK-2OC was heard with MCW and at 1230 the band appeared to close up. The receiver is a Kingsley Converter with an AWA type HRO and the aerial a 7 mC/s folded dipole. I expect to be active soon on 50 mC/s."



One of Sydney's most active 20 metre phone men is Ted Barlow, VK-2GQ, shown here with his neat rack and panel transmitter. Because Ted uses phone almost exclusively doesn't infer that he cannot handle a key bright and lively. CW men should try him some time.

He was, during the late war, Major E. C. Barlow, Commanding Aera Signals in N.S.W. L. of C.

Conclusions

During the closing days and nights of the old year, the 50 mC/s band has been wide open most of the time in Eastern Australia and conditions have been such that interstate contacts are the rule rather than the exception. In Sydney a few of the hitherto higher frequency end-of-the-band men have migrated to spots between 50 and 51 mC/s with the result that congestion is even fiercer. One VK2 station conspicuously introduced "20-metre DX tactics" by spotting his VFO on to a distant station and breaking in with a request for the next contact. Point is that the station already in communication hadn't finished, and thereby interference was occasioned by the intruding station. Nobody has any monopoly on contacts or band position but interjectory antics will not make for harmony. The correct procedure is simple: merely to wait until a QSO is definitely finished before starting up on the same frequency. VFO users should consider also the handicap of the crystal man . . . he is fixed in that spot and, upon completing a QSO with a man the VFO user wants, is likely to start up with another station. The result is needless QRM because the VFO man has settled on the same spot. The remedy is for VFO men to get in between . . . in the clear spots between crystal stations . . . and there are plenty of those spots. VK3BD has emphasised the need for utilisation of the entire band. This is more than a need . . . it is of great importance. Established stations can do much to alleviate the situation by indicating after each CQ call that they **will tune from the high frequency end of the band first.** Get that habit and help to spread stations out across the range from 54 to 50 mC/s. Otherwise narrow band congestion is inevitable, and bedlam will be the result during DX periods.

INDUCTIVE DIPOLE COUPLING

That inductive dipole coupling scheme of VK3KU's that VK2NO touched upon in "ARW" for November, 1947 . . . the American publication "CQ" featured an interesting scheme in their issue for September last. It is called the "Shortened Beam" and incorporates the basic "inductive coupling" method, but with a tuned radiator. The coil in the centre of the radiator is split in two and a 100 mmfd. variable condenser placed in series. A link coil swings in between the split radiator coil and provides coupling to the feedline as before. The overall length of the radiator is, of course, considerably less to hit resonance, and the result is that a beam can be constructed for the 14 mC/s band with only 24 feet overall spread. Another advantage is that by making a parasitic element on exactly the same lines as the radiator, this may be used as either a reflector or director, depending upon whether the variable condenser is set to a high or a low capacity value. Naturally it is essential to enclose the variable condenser in a weatherproof box.

Shortwave Review

CONDUCTED BY
L. J. KEAST

NOTES FROM MY DIARY

London Calling

My copy of this overseas journal of the British Broadcasting Corporation, No. 426, and dated London, November 20, 1947, reached me on January 28. But whilst it was long delayed in reaching Ermington, it nevertheless did not seem backdated. I was particularly interested in "A Good Moment to Take Stock," which was the text of Sir William Haley's speech on the occasion of the BBC's Silver Jubilee Year. It was on November 14, 1922—twenty-five years ago—that 2LO, London, sent out the first BBC programme. And from then till now the BBC has really set the standard for broadcasting, particularly that which we are interested in—short-wave transmissions and even at the risk of it being tiring to the old and regular readers of these pages I say again that the BBC is in my opinion the yardstick by which all S/W transmissions are measured.

I find on talking to many listeners, they, like myself, when they happen on a BBC programme, invariably listen and, whilst they may have been scanning the dial, they stop on the BBC programme, whereas, apart from satisfying themselves as to whom they are listening when they tune in a foreign station, they move on. And that reminds me when plenty of space was available and I printed long lists of stations in alphabetical order as regards countries, I was taken to task by the more venturesome listeners for giving so much space to the BBC frequencies. They said, "Anyone can tune the BBC." And is that not a great compliment to the BBC? The fact that they have perservered and found frequencies that will reach almost all parts of the world more or less all day and night must be very gratifying to their engineers.

And what about during the recent war? We listened to the news from the BBC and knew it was right—perfectly true; whereas we tuned to several countries and got a laugh out of their "news." No, don't pass the BBC by because they are easily tuned, but rather consider it a duty to tune to them regularly as a silent token for what they have done for shortwave broadcasting.

Exclusive Verie

The well-known South Australian Dx-er, Rex Gillett, has added another to this staff at Prospect. This time it is a fine bouncing baby boy. Rex already has a little girl, so, as he says, "with one of each, both he and his wife are quite satisfied." He has verified 94 countries, so let's hope the local listening-in will not prevent him from making his century soon. Congratulations, Rex.

Wedding Bells

Dx listeners, particularly those who tuned to the overseas broadcast band, will remember Roy Hallett who conducted the pages devoted to that type of listening for one of our contemporaries. Well, Roy has been and got married. I wondered why he had been so quiet and it was only through a letter from him that I learnt recently about the event. Congrats, Roy.

Greetings From N.Z.

And just to make this a really chummy page this issue, I quote a portion of a letter received from Rom R. Akersten, shortwave editor, Auckland Branch, New Zealand DX Radio Association Inc: "Greetings to you across the Tasman. At long last I have had a break in my correspondence, to be able to say 'Hullo' and compliment you on your good work in 'Shortwave Review.' I have read your S/W notes for some time now, and have found them informative and stimulating for this grand hobby of Dx-ing.

"Well, L.J.K., a word or two about my rig here. I am using two receivers, a commercial 7-tube superhet and a super-regene comm. receiver, range 9.4 to 100 metres, both fed from a rotary beam antenna and a V doublet inverted. Both have performed 100 per cent. in as much that I won the S/W Trophy for 1947 here in our Auckland Branch of the N.Z. DX Radio Association. About 250 loggings were made in the 1947 DX season, some eighty-odd verifying to date of writing."

New Stations

KZBU, Cebu City, 6.10mc, 49.15m: This new Philippine station operated by Philippine Broadcasting Corp. on both 1250kc and 6.10mc is on the air from 7 p.m. till 2.05 a.m. Signals are only fair to good, particularly late at night. This report comes from Rex Gillett.

JKAO, Korea, 9.43mc, 31.81m: Radio Australia reports this station as being logged from 8.30 p.m. till 11.30 p.m. From 9.45 till 10 o'clock the 'Voice of America' is relayed. No programme in English has been heard but they announce, "This is the Korean Broadcasting Service."

SAYS WHO?

WGEX, New York, 9.67mc, 31.02m, gives news and sports news at 6.45 a.m. Times and frequency details given and address for reports—641 Washington St., New York 14 N.Y.—Miss Sanderson. (Latest sked to hand is: 6.30-8 a.m.—L.J.K.)

Conditions have only been fair lately, the best listening times being between 5 a.m. and 8.30 a.m., when there is quite a lot to be heard with fair ease. But after that the noise level is very high and it is quite impossible to hear anything with any degree of comfort.—Miss Sanderson.

Schedules for Tabriz are given as 7 p.m.-9.30 p.m. on 11.96mc and 12.30 a.m.-4.30 a.m. on 6.09 mc on week days. On Fridays the schedule is 4.30 p.m.-9 p.m. and 12.30 a.m.-4.30 a.m. News in English is scheduled for 4 a.m.—L.J.K.

Polskie Radio, Warsaw, has been heard for past few weeks on 6.215 mc. This is apparently to dodge interference from the Voice of U.S.A. on 6.10mc. English is broadcast as usual from 6.50 a.m.-7.10 a.m.—Rex Gillett.

XGOY is now using 6.142mc in the service to North America. A two-hour broadcast in English is commenced at 12.30 a.m. Very fine signals.—Gillett.

Singapore heard at 8 p.m. on 21.720mc and at 8.15 VUD-8 21.510mc; EPB, 15.10mc, at 9 o'clock. At 10 p.m. I heard Luxembourg on 15.35mc.—Akersten.

BBC General Overseas Service is on wavelengths considered suitable to Australia from 4 till 10 p.m., whilst of course a special regional programme is provided from 4-5.45 p.m. During February they will be found in 19, 25 and 31 metre bands during the afternoon, whilst in the evening the 13 and 16 metre bands are added. It is considered these bands will hold out until end of April.—L.J.K.

And here are some of the loggings made by Miss Dorothy Sanderson:

Canada

CHOL, 25.60, 11.72, 6.30 a.m.: Service to Europe in French.

CKCS, 19.58, 15.32, 7 a.m.: News to Europe.

CHIS, 31.22, 9.61, 7 p.m.: Canadian Chronicle.

CKLO, 31.15, 9.63, 7 a.m.: Christmas service in song and story.

CBLX, 19.88, 15.09, 10 p.m.: News in English and music.

CKCX, 19.75, 15.19, 9.30 a.m.: News in English; music and sports news.

Philippines

KZRC, 48.94, 6.13, 9 p.m.; News in English; QRM from VIR2.

KZPI, 31.58, 9.50, 9.15 p.m.: Good musical programme.

KZFM, 25.21, 11.90, 8.15 p.m.: People's Station, news and music.

KZRH, 31.12, 9.64, 8.45 p.m.: Music and news.

KZOK, 30.95, 9.692, 10 p.m.: Announced in English, but news in Philippino, and music.

India, Malaya, Ceylon, French Indo-China, Batavia, Java

VUD8, 13.98, 21.51, 9.30 p.m.: News in English for Africa and East Asia.

VUD9, 25.27, 11.87, 9.45 p.m.: News and music.

VUD11, 31.06, 9.66, 10.15 p.m.: News and music.

Singapore, 19.61, 15.30, 8.30 p.m.: News in French and music.

Singapore, 25.56, 11.73, 8.45 p.m.: News in Dutch and music.

Ceylon, 19.83, 15.12, 8 p.m.: News and music; Forces service.

Saigon, 25.47, 11.78, 8.15 p.m.: News in English and music.

Hanoi, 25.19, 11.91, 9.45 p.m.: News in French and Chinese; music.

Radio Francois, 49.75, 6.03, 9.30 p.m.: News in French.

YDD3, 31.41, 9.55, 7.45 p.m.: News in Dutch and English; music.

YDC, 19.81, 15.14, 7.30 p.m.: News in Dutch and English; music.

YCN3, 37.45, 8.09, 10.15 p.m.: Western music and news in Dutch and dialect.

YDB4, 30.99, 9.68, 10 p.m.: News in Dutch and English; Radio Batavia.

YFA4, 32.24, 9.25, 9.30 p.m.: Musical programme and news.

Ceylon, 16.84, 17.81, 10.45 a.m.: BBC relay and music.

SHORTS

Vatican Radio was heard the other Thursday at 1 a.m. with news in English on 31.06m . . . think they were also on 19 metre band; possibly a daily service. Also on, I understand, at 4.15 a.m. on 31 and 50 met. bands.—Hallett.

Radio Luxembourg gives its schedules as: 9-11 p.m. on 15.35 mc, and 2.30-9 a.m. on 6.09mc—Gillett.

The "Voice of America" signs off on 6.17mc at 5 a.m. with "Star-Spangled Banner." It opens on 6.10mc a little later.—Gillett.

Paris can be heard at 3.30 p.m. with news in French and musical programme on 11.845mc, 25.33m, and at 3.45 with news in French on 9.56mc, 31.37m, whilst at 6.30 a.m. on 7.28mc, 41.21m.—Miss Sanderson.

Luxembourg is being heard as late as 10.45 p.m. on 15.35 m.c.—Akersten.

HCJB heard closing at 4 p.m. on Thursday, January 15, in English on 24 metre band. They announced they were also on 19 and 30 metre bands.—Hallett.

SUX on 7.865mc, 38.15m, is giving usual Arabic programme at 6 a.m.—Miss Sanderson.

EPB, "Radio Teheran," amended schedule is from 8.30-10.30 p.m. with English from 10.15-10.30.—L.J.K.

CBRX is a station I have not heard for a year or two on 6.15mc. I have logged them again at 2.15 a.m. announcing as CBR, Vancouver.—Gillett.

XGOYv is now using 6.142mc in the service to North America. A two-hour broadcast in English is commenced at 12.30 a.m. Very fine signals.—Gillett.

WLKS, Kure, is back on 6.105 mc from 7.30-11.30 a.m., apparently having dropped the 2.46 channel.

Radio WEIN, Vienna, has moved from 7.17mc to 7.24mc.—DXNZ.

Damascus, Syria, is reported as on 7.55mc as well as 6.00 and 11.985mc. Schedule is 3-4 p.m.; 9-10 p.m. and 2-7 a.m.—URDX. (I believe Damascus is also on 12.00mc in early mornings in Arabic but morse is prevalent.—L.J.K.)

Radio France, Hanoi, French Indo-China, 9.485mc. Address is 56 Rue Richaud.

Radio Tananarive, Madagascar, broadcasts regularly on shortwave over three transmitters in parallel on 6.063, 9.669 and 10.615mc. The broadcast hours are: 1.45-3.30 p.m.; 6.20-8.45 p.m. and 12.20 a.m.-3.40 a.m. All reports should be sent to: Radio Tananarive, Office of the French High Commissioner, Tananarivo, Madagascar. —"Shortwave Listener."

OLR2A, Prague, is putting in a good signal at 4.45 a.m., when news in English is broadcast.—The N.Z. DX-TRA.

Latest QRA for reports to Radio Italiana is: Presidenza del Consiglio dei Ministri, Servizio Radiodiffusioni per L'Estero, Via Vento 56, Rome, Italy.—"Radio News."

HHYM, Haiti, 6.00mc, 50m. Port-au-Prince is relatively new station signing off at noon.—"Radio News."

Syria. Damascus verifies from Republique Syrienne, Direction Generale des Postes, Telegraphes et Telephones, Damas (Damascus), Syria.—Ken Boord.

Cape Verde Islands

Here is one for those fortunate Dx-ers in a quiet district. I here-with quote "Shortwave Listener": "W. J. Pye mentions a new one, but offers no times; he says, 'Once or twice recently Praia, Cape Verde Isles, has been putting in a good signal for its microscopic power on 6.405mc.' Our information is that CR5AA, Praia, Cape Verde Islands, operates on 6400kc. 46.88m exactly, with a power of 30 watts, on the following brief daily schedule: 6.30-8 a.m."

New Zealand S.W. Transmitters

The following are the frequencies allotted to the N.Z.B.S. shortwave transmitters: ZL1, 6.08 mc; ZL2, 9.54mc; ZL3, 11.78mc; ZL4, 15.28mc; ZL5, 17.77mc; ZL6, 25.80mc.

The above have a power of 7.5 kilowatts. Tests are apparently concluded but no advice has been received as to when they will take the air on full time.

Data on Greenland

The following comes by airmail from "Radio News," Chicago:

"Greenland. 'World Handbook for Listeners,' published by O. Lund-Johansen, 1 Lindorffsalle, Copenhagen Hellerup, Denmark, lists this data re radio in Greenland: Normal clock time is GMT *minus* 3 hours; QRA, Radiostation Godthaab, Greenland. Frequency 5.942mc (50.49m). Power 1 kW. Daily programme at 7.45-8.45 a.m. weather report 7.45; news in Danish 8 o'clock; ships' positions 8.15: news in Eskimo 8.30. Announcement in Danish is. 'God Aften; her Gronlands Radio." Interval signal is chimes and first movement of six bars—played

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twice—of the Funeral March by Norman Andersen which was composed for Kjell Abel's play, 'Silkebourg'."

THE CROSLEY CORPORATION, CINCINATTI

Shortwave frequency schedule, Eastern Standard Time, January, 1947:

WLWK: 3 a.m.-8 a.m., 15250 kc, 19.7m, Europe; 11 a.m.-1 p.m., 17800kc, 16.8m, W. South America.

WLWO: 3 a.m.-6.15 a.m., 17800kc, 16.8m, Europe; 6.30 a.m.-8 a.m., 9590kc, 31.3m, Europe; 11 a.m.-1 p.m., 11790kc, 25.4m, E. South America.

WLWL: 2 a.m.-8 a.m., 21690kc, 13.8m, Europe.

WLWR: 4 a.m.-8 a.m., 15350 kc, 19.5m, Europe; 15350kc, 19.5 m, North Africa; 9 a.m.-3 p.m.*, 11710kc, 25.6m: W. South America; 15250kc, 19.7m, W. South America.

WLWS: 3 a.m.-6 a.m., 21650kc, 13.2m, Europe; 21650kc, 13.2m, North Africa; 6.15 a.m.-8 a.m., 11705kc, 25.6m, Europe; 11705kc, 25.6m, North Africa; 10 a.m.-3 p.m., 6080kc, 49.3m, W. South America; 9700kc, 30.9m, W. South America.

* 10 a.m.-3 p.m. Monday only.

Here is an interesting item from Rex Gillett: "The following is from VU7MC: Transmissions are three in number from 11.30 a.m.-1.40 p.m.; 6.30 p.m.-7.40 p.m.; and 10 p.m.-2.40 a.m. Frequencies in use are 968kc and 6.065mc during each transmission. Power employed is 300 watts on 6.065mc, whilst 30 watts is used on 968kc. Plans are under way for increased power to 10 k.w. on the B/C band, and 5 k.w. on S/W. It is hoped the transmitter will be installed this year. News in English is scheduled for 12.30 p.m. and 10.30 p.m. VU7MC belongs to the Government of Mysore. Address is Akash-Vani Broadcasting Station, Mysore, India."

VERIFICATIONS

Miss Sanderson of Malvern, Victoria, writes: "Verifications have been coming along very well, and I have now some more cards to add to my collection. A card and letter from Radio National Espana for 9.38mc, two cards from Singapore for 6.77 and 11.73mc; a card and letter from the Forces Broadcasting Service in Benghazi, North Africa, which attest transmission on November 8. The frequency on which they did their test was 11.850mc, and as they had to suspend the tests for the present they hope to resume shortly, according to their letter. Cards from Capetown, Johannesburg and Siam and a letter from EPB, Teheran, for a report sent in September last."

Rex Gillett of Adelaide reports: "A few very decent veries have been finding their way to my location, some of the best being: LKJ, LKV (first report from Australia): LLG (first report from Australia; CXA-19, Radio Luxembourg, 9.5275mc (first from Australia;; HI2T, 11.90; LRM; Omdurman, 9.70; VUTMC; ZPA-5; EQB; Radio Tabriz, 11.96 and 12.18; HJDE; CE1190; ZOY, 4.915; and XGOY on 11.913, 15.17 and 7.153; J'burg 4.373 and 6.095.

"Others of lesser merit are ZL2, ZL3, ZL4; COBL; Singapore on 11.74, 15.30, 9.68 and 6.77; VUD-7, 15.16; VUD-11, 15.29; VUD-8, 21.51; VUD-9, 9.67; CFRX, 6.07; PCJ on 17.77, 11.735 and 9.59; Radio Dakar, 11.715; CHOL, 11.715; and SEAC, 17.83 (but station quoted old frequency of 17.77mc).

"Countries verified total 94, latest additions being Dominican Republic, Iran and Colombia."

Rom R. Akersten, Auckland, N.Z., advises: "Among some of my 'firsts' reports I can count on are LRM, 'V. of A,' Manila, SBT and one or two N.A. low-powered M/W stations. Some of my recent veries came from: Singapore, 9.69 mc (second report from N.Z.), KZPI, 9.50mc; KZOK, 9.69mc; OAX4J (200 watts), 9.33mc; WXFG, Alaska, 12.25mc; XGOY, 11.913mc; YFA4, 9.265mc; CSX2, 11.0mc; CXA19, 11.835mc; HEU-6, 15.315mc; XEWW, 9.50mc; XEQQ, 9.68mc; Luxembourg, 6.09 mc; ZBW3, 9.515mc; CE615, 6.152mc; "F.B.S.," Jerusalem, and SDB2, 10.78mc."

DISPOSALS BARGAINS

Things must be much the same in England, according to the following paragraph by "Diallist" in the English Wireless World.

"It's very interesting to spend an hour or two in exploring the contents of the shops which make a feature of war surplus radio gear. There's a good deal of useful stuff to be picked up if you buy carefully; but there is also no small amount of elaborate apparatus, which, though it may be beautifully made and must originally have cost a tidy packet, is now of little practical use to the wireless man. There is always the temptation to buy this or that just because its present price is a mere fraction of what it cost to make. By spending a few pounds without much thought one might easily acquire a barrow load of gear of attractive appearance, for which it would eventually prove difficult to discover practical uses. Too often conversion which at first sight appears so simple turns out, when you come to tackle the job, to be an involved and expensive business. From our point of view the trouble with a great part of the war surplus radio material is that it was made for highly specialised purposes which don't fit in with our normal requirements. There are naturally lots of things—meters, for example, of various kinds—which are exactly what we long to possess, but as many others are filled with similar yearnings you don't often find the good ones offered at give-away prices."

Speedy Query Service

T.L. (Pymble) asks whether we can accept subscription orders for issues to be sent to friends in America.

A.—Yes, we will be pleased to accept subscription orders for copies to be posted to any address in the world. Quite a few are being received at present from fellows who are arranging "swaps" for overseas publications which are restricted on account of dollar shortages, and as gifts to pals who send "gifts" in return in the form of tubes and other components.

* * *

P.D. (North Adelaide) asks if we can help him to locate disposals communications receivers such as the AR7 at bargain prices.

A.—Sorry, but we haven't been able to find any of these bargains, although we have heard rumours about them. On enquiry it is always the other fellow who seems to have got the bargains.

* * *

S.D.S. (West Brunswick) has a 7-valve S.T.C. receiver, but is starting to take an interest in recorded music. Wants to know what type of pick-up head would suit this set, to be used with a mechanical motor from an old gramophone.

A.—Practically any of the ordinary magnetic or crystal type pick-ups would be suitable. The motor won't matter so long as it pulls the turntable around at exactly 78 revolutions per minute without dragging on the heavy passages. Possibly you are in a position to do a bit of mechanical work, in which case we suggest that you get a crystal cartridge only, and fit it to the arm of the old gramophone or on a swivel arrangement of some sort to allow it to track across the record. Some sets do not have the volume control connected across the pick-up terminals, in which case you will need to fit a volume control on the pick-up. If the set is a fairly recent model it may have the set's volume control still in circuit for the pick-up.

* * *

A.L. (Concord) has built a cathode ray oscilloscope, but fails to get a properly-shaped sine wave pattern for a signal from his home-made oscillator.

A.—The trouble could be in the oscillator, the amplifiers, or the c.r. tube. For a start we suggest you suspect the oscillator and feed the C.R.O. with some a.c. from a power transformer. If the shape is still wrong suspect the amplifiers and feed the a.c. directly into the tube ahead of the amplifier. From what you say we feel sure that the trouble is too bad to be simply a matter of incorrect bias on the amplifier; looks more like a major error in the wiring, open circuited grid or something like that. Incidentally, the power supply is 50 cycle, not 60 as in America.

* * *

R.L.S. (Broken Hill) asks whether there is any chance of getting a "ham" ticket without having to pass the morse code exam.

A.—Frankly, we don't think you've got the slightest chance of getting the authorities to overlook the regulations, but there is no harm in trying. Write and put the best case you can to the Chief Inspector of Wireless, G.P.O., Sydney.

* * *

N.B.S. (Bairnsdale) asks about an English circuit with tone corrector pre-amplifier for grao work and t.r.f. tuner for high-quality broadcast reception, with high-fidelity audio amplifier featuring 6L6's in the output with inverse feedback.

A.—This was the circuit by Hartley in the December 1944 issue and would be ideal for use with the new types of English high-fidelity pick-ups. You could use a single 6SN7GT instead of the two separate 6J5's, and 807's instead of the 6L6's. If you haven't this issue on file, we suggest you send for it right away as only a few dozen copies are left in stock.

* * *

C.S. (Sydney), who is in the radio trade, asks for details of the prices of certain pick-ups.

A.—The English "Connoisseur" pick-ups from Magrath's sold at a nett trade price of £5/12/6, plus tax, complete with input transformer and needles. That was the price of the first shipment, but there may be some variation in future shipments. For trade price of the Lexington we suggest you write John Bristoe of Denhams, Maryborough, Queensland. They are £19/2/6 retail in a Swanston Street (Melbourne) window.

* * *

G.H. (Caulfield) asks about the DX club.

A.—No, so far nothing has been done to revive the Club. One of the major problems would be to get stationery printed. Imagine trying to get envelopes in thousands at present! You've got to be pretty good to get the local newsagent to let you have four at a time, four envelopes, not packets.

BARGAIN CORNER

Advertisements for insertion in this column are accepted free of charge from readers who are direct subscribers or who have a regular order placed with a newsagent. Only one advertisement per issue is allowed to any subscriber. Maximum 16 words. When sending in your advertisement be sure to mention the name of the agent with whom you have your order placed, or your receipt number if you are a direct subscriber.

FOR SALE: Improved FS6 transceiver, with power pack, new condition, £10. D. G. Bradshaw, 46 Gould Street, Bondi.

FOR SALE: Palec VCTV, as new, also "Modern Radio Servicing" (Ghirardi), "Drakes' Cyclopaedia of Radio and Electronics." W. H. Kelly, 30 O'Connor Street, Horsham, Vic.

FOR SALE: Rotary transformer, new disposals, 12v. 6.26 amps. to 450 volts 50 milliamps, with filter unit, blower fan and switching relays. What offers? John Down, 3 Stewart Street, Parramatta, N.S.W.

WANTED: January 1945 issue of Australasian Radio World. D. G. Bradshaw, 46 Gould Street, Bondi.

WANTED TO SELL: Disposals AR14, receiver tunes 16,000 kC/s to 110 kC/s. Valves 1P5, 1D8GT, phones. No batteries. £5. J. R. Dempster, Elphinstone, Vic.

WANTED: January 1945 issue of Australasian Radio World, buy or swap. Have 2 doz. A.R.W., some pre-war, also other radio mags., some overseas. WX2213, 62 Shannon Street, Box Hill, Vic.

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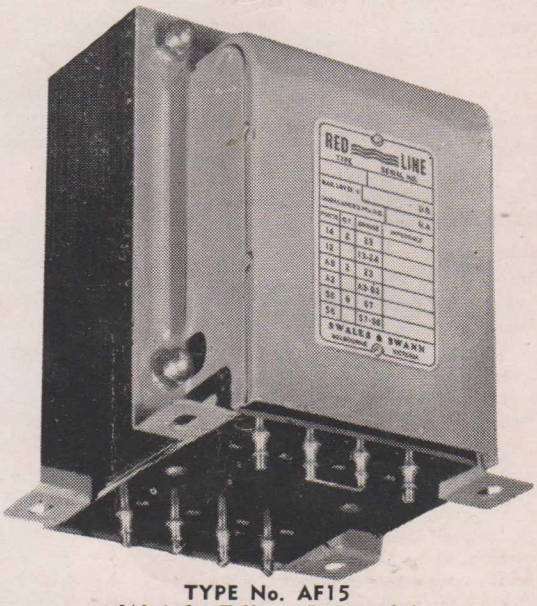

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