THE AUSTRALASIAN

Radio World

1/6

Vol. 14 . . . No. 12 JULY 15, 1950

Registered in Australia for transmission by post as a periodical.

1950 PRICE LIST

INTERMEDIATE TRANSFORMERS

STANDARD 455 Kc/s ROUND CAN DIMENSIONS 2½" x 1 3-8"

IF170 1st Stage Permatune Iron Core	13 9
IF171 2nd Stage Permatune Iron Core	13 9
IF172 1st Stage Permatune Iron Core	13 9
IF173 2nd Stage Permatune Iron Core	13 9
IF174 Low Gain Permatune Iron Core	15 0

STANDARD 460 Kc/s SQUARE CAN DIMENSIONS 3" x 1 3-8"

IF162 1st Stage Permatune Iron Core	13 9
IF163 2nd Stage Permatune Iron Core	13 9
IF164 Low Gain Permatune Iron Core	13 9

MAGNASONIC 455 Kc/s ROUND CAN DIMENSIONS 2" x 1"

IF168 1st Stage Permatune Iron Core	12 6
IF169 2nd Stage Permatune Iron Core	12 6

STANDARD 175 Kc/s SQUARE CAN DIMENSIONS 3" x 1 3-8"

IE74 1st Stage Permatune Iron Core	13 9
IE75 2nd Stage Permatune Iron Core	13 9

F.M. TYPE

IF180 10.7 Meg Iron Core Permatune	13 9
IF181 Ratio Detector Iron Core Permatune	17 6

COILS

STANDARD SUPERHET BROADCAST ROUND CAN DIMENSIONS 2" x 1 3-8"

E355 Iron Core Permatune Aerial	8 6
E357 Iron Core Permatune R.F	8 6
E358 Iron Core Permatune Oscillator	8 6

STANDARD SUPERHET BROADCAST SQUARE CAN DIMENSIONS 2 3-8" x 1 3-8"

E342 Air Core, Aerial	6 6
E343 Air Core, R.F.	6 6
E344 Air Core, Oscillator	6 6
E345 Iron Core Permatune Aerial	8 6
E346 Iron Core Permatune, R.F.	8 6
E347 Iron Core Permatune, Oscillator	8 6

MIDGET MAGNASONIC BROADCAST ROUND CAN DIMENSIONS 1" x 1"

E352 Iron Core Permatune, Aerial	6 6
E354 Iron Core Permatune, Oscillator	6 6
E353 Iron Core Permatune, R.F.	6 6

F.M. COILS

E362 Aerial	2 6
E363 Aerial Coupling	2 6
E364 Oscillator	2 6

T.R.F. COILS

T81 Air Core Reinartz	6 6
T82 Air Core Reinartz in Can	7 6
T87 Air Core R.F. with Reaction	6 6
T88 Air Core, Aerial	6 6
T89 Air Core, R.F.	6 6

SHORT WAVE COILS

H121 Iron Core Permatune, Aerial	5 0
H122 Iron Core Permatune R.F.	5 0
H123 Iron Core Permatune Oscillator	5 0

LOOP AERIAL COILS

F125 Standard 6" Diameter	7 6
F126 Midget 4" Diameter	7 6

5 BAND SHORT WAVE AND BROADCAST

H124 10 Metre Aerial	5 6
H125 10 Metre R.F.	5 6
H126 10 Metre Oscillator	5 6
H127 20 Metre Aerial	5 6
H128 20 Metre R.F.	5 6
H129 20 Metre Oscillator	5 6
H130 40 Metre Aerial	5 6
H131 40 Metre R.F.	5 6
H132 40 Metre Oscillator	5 6
H133 80 Metre Aerial	5 6
H134 80 Metre R.F	5 6
H135 80 Metre Oscillator	5 6
H136 Broadcast Aerial	6 6
H137 Broadcast R.F.	6 6
H138 Broadcast Oscillator	6 6

COIL KITS

K116 Standard Personal Coil Kit	£2 2 0
K117 Standard 4/5 Dual Wave Kit (complete with intermediates)	£3 6 0
K118 Midget Personal Coil Kit	£1 19 6
K119 Midget B/C Coil Kit	£1 18 0
K120 5 Band Coil Kit	£4 5 0
K121 4/5 B/C Coil Kit	£2 3 6
K122 5/6 B/C Coil Kit	£2 11 6

DUAL WAVE UNITS

DW29 Standard 4/5 Dual Wave Unit	£2 0 0
DW37 Standard 5/6 Unit with R.F Stage	£6 10 0

RADIO FREQUENCY CHOKES

RF81 Silk Honeycomb	1 9
RF82 3 Pie 1.7 M/H	4 6
RF83 4 Pie 2.5 M/H	4 6
RF84 5 Pie 4.0 M/H	4 6
RF85 6 Pie 7.0 M/H	4 6
RF86 Cotton Honeycomb	1 6
RF106 Low Tension Vibrator	4 3

LINE FILTERS

LF20 Line Filters ¾ Amp	£1 10 0
LF24 Line Filters 2 Amps	£1 18 6

LINE FILTER COIL

RF15 Line Filter Coil ¾ Amp	12 0

SWITCHES

SW17 5 Band Switch	£3 0 0

COIL LACQUER

KH34 Low Loss Coil Lacquer	2 6

COIL FORMERS

1.24 6 Pin Plug in 1¼" Diam.	3 9
1.25 6 Pin Plug in 1½" Diam.	4 0

DIAL DRIVE DRUMS

MO8 Dial Drive Drum. Complete with Screws, Spring and Cord	3 6

FILTER CHOKES

TC60 100 M/A 30 Henries 250 Ohms D.C. Res.	13 6
TC65 50 M/A 30 Henries 400 Ohms D.C. Res.	13 6
TC80 150 M/A 30 Henries	£1 5 0
TC81 200 M/A 30 Henries	£1 10 0

AUDIO CHOKES

TA4 100 Henries 1000 Ohm D.C. Res. .25 M/A	18 6

VIBRATOR CHOKES

TC58 Low Tension 3 Amps, 50 M/H .5 Ohms D.C. Res	15 0
TC70 High Tension 50 Henries 450 Ohms D.C. Res. 75 M/A	15 0

FILAMENT TRANSFORMERS

TP1 2.5 volts 2 Amps 7 Watt	12 6
TP2 4 volts 1 Amp 7 Watt	12 6
TP3 6.3 volts .3 Amp 7 Watt	12 6
TP55 6.3 volts 3 Amps 15 Watt	16 6

AUDIO TRANSFORMERS

TB42 A Class Single Ratio 3 to 1	£1 1 0
TB43 A Class Push Pull Ratio 3 to 1	£1 2 6
TB44 B Class Push Pull Ratio 1½ to 1	£1 1 0

AUTO TRANSFORMERS

TP80 6.3 volt 4 volt and 2.5 volt	12 6

SPEAKER TRANSFORMERS

TS23 Single Low Imp. Triode	10 0
TS24 Single High Imp. Triode	10 0
TS25 Push Pull Low Imp. Triode	10 6
TS26 Push Pull High Imp. Triode	10 6
TS27 Single Low Imp. Pentode	10 0
TS28 Single High Imp. Pentode	10 0
TS29 Push Pull Low Imp. Pentode	10 6
TS30 Push Pull High Imp Pentode	10 6

VIBRATOR TRANSFORMERS

TP81 135 volts 6 volts	£1 2 6

SPEAKER TRANSFORMER REPLACEMENT COILS

F132 Single Low Impedance Triode	5 0
F133 Single High Impedance Triode	5 0
F134 Push Pull Low Impedance Triode	5 6
F135 Push Pull High Impedance Triode	5 6
F136 Single Low Impedance Pentode	5 0
F137 Single High Impedance Pentode	5 0
F138 Push Pull Low Impedance Pentode	5 6
F139 Push Pull High Impedance Pentode	5 6

VOLTAGE DIVIDERS

VD25 15,000 Ohms 2 Variable Clips	5 6
VD27 25,000 Ohms 2 Variable Clips	5 6

TRIMMING CONDENSERS

CG15 2 Plate	1 0
CG16 2 Plate	1 0

FIVE IN ONE TRIMMER

CG27 Four 2 Plate and one 3 Plate	4 6

DIALS

DA7 D/W Portable Kit Dial	11 0

POTENTIOMETERS AND RHEOSTATS

Type	Ohms	M/A	Price
PT40	6	250	7 6
PT33	10	250	7 6
PT30	20	250	7 6
PT34	30	250	7 6
PT42	100	100	7 6
PT46	400	50	7 6
PT47	1000	35	7 6
PT48	1500	35	7 6
PT49	2500	30	7 6
PT51	5000	30	7 6
PT52	10,000	20	7 6

PADDING CONDENSERS

P21 455 K.C.	2 6
P22 262 K.C.	3 0
P23 175 K.C.	3 6

AERIAL FILTERS

AF21 Aerial Filter	—

MIDGET VARIABLE CONDENSERS

Star Type with Face support.

Type	mmfd	Plates	
CV34	10	2	4 3
CV35	15	3	4 6
CV36	25	4	4 9
CV37	35	5	5 0
CV38	50	7	5 9
CV39	70	9	6 4
CV40	100	14	7 0

M.C. Type with Face and Back Support.

Type	mmfd	Plates	
CV41	10	2	7 6
CV42	15	3	8 0
CV43	25	4	8 7
CV44	35	5	9 3
CV45	50	7	9 9
CV46	70	9	10 3
CV47	100	14	11 3

WIRE WOUND RESISTORS

0 Ohms to 1500 ohms 100 M/A	1 0
1500 Ohms to 2500 Ohms 50 M/A	1 2
2500 Ohms to 10,000 Ohms 25 M/A	1 2

CENTRE TAPPED RESISTORS

10, 20, 30, 75, 100 & 200 Ohms	1 2

THE AUSTRALASIAN

RADIO WORLD

DEVOTED ENTIRELY TO TECHNICAL RADIO

and incorporating

ALL-WAVE ALL-WORLD DX NEWS

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THIS month's front cover continues our series of photographs taken in the modern factory of the Rola Company, situate on the Boulevarde, Richmond, alongside Melbourne's famous Yarra River. Many highly-skilled girls assist in the production of Rola Loudspeakers.

CONTENTS

Personal

As announced on page 5 of this issue, I have made arrangements for a get-together of those interested in the subject of quality reproduction.

When it comes to the subject of sound reproduction, the laboratory of the Rola Company is probably the best-equipped in the Commonwealth. I have often visited there to hear the latest in speakers, to play around with the latest of imported gramophone outfits. These visits have always been of great interest and I have often said to myself that I would like all my readers to be able to share such pleasures.

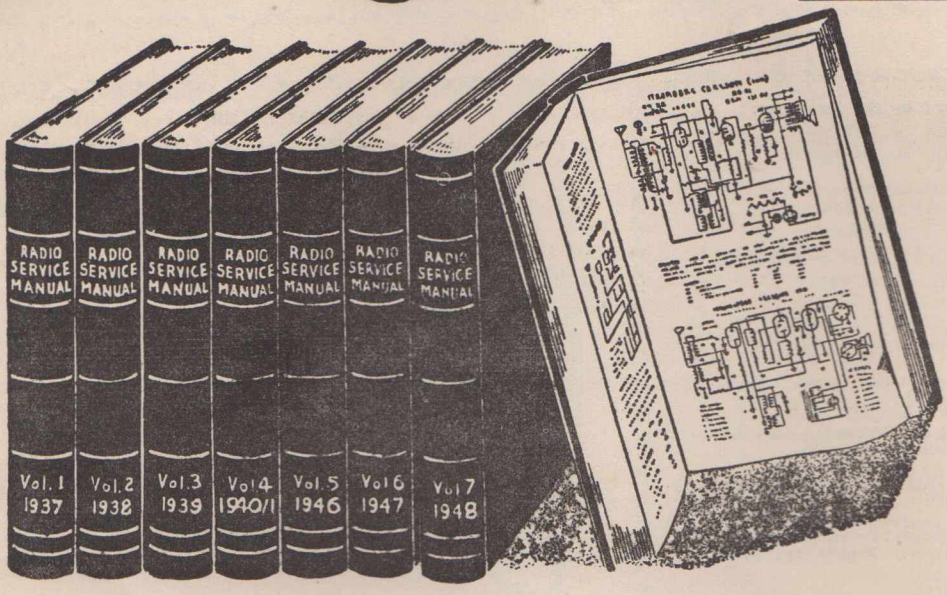
Now, through the co-operation of the Rola Company, it has become possible for me to extend to you an invitation to be present at a really fine demonstration which has been arranged for 3rd August.

At this party I hope that it will be possible to get down to tin tacks on the subject of what is worth hearing and what is not. Reproduction of the highest fidelity, equal to anything yet done in any part of the world, will be demonstrated, as well as filtered effects to show what is lost in realism when the frequency response is restricted.

A. G. HULL.

Just Out!

Containing the Circuits of All Commercial Receivers Manufactured during 1949.



Australia's Official Radio Service Manual

Vol. 8 (1949 Receivers)

Volume 8 of the Service Manual is now rolling and should be ready for delivery about the time you see this notice.

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HI-FI PARTY FOR READERS

FOR the many readers who are interested in the subject of quality reproduction, "Australasian Radio World" is to collaborate with the engineers of The Rola Company to hold a Hi-fi Party at 7.30 p.m. on Thursday, 3rd August.

All interested are invited to make written application for reservations immediately, and at the latest not later than 27th July.

At the party it is planned to give demonstrations of wide-range sound, as well as various types of restricted reproduction. For the widest range a specially-recorded programme from Verdon Williams and the 3DB Symphony, with Allan Eddy, will be reproduced by means of the latest E.M.I. tape recorder. The tape recorder will also give comparisons of reproduction of orchestral instruments.

Other demonstrations will be given of the capabilities of frequency modulation transmissions as well as ordinary broadcasting, and various types of recordings.

A feature of the evening will be the display of the new Rola twin-cone high-fidelity speaker, to be known as model 12-OX.

There is only room for a limited audience, so it is necessary to write immediately for reservations. There is no limit to the number of seats available to each reader, but please do not make reservations for seats unless you are quite sure that they will be occupied.

The Rola Company has the facilities for the deepest research into the finer points of quality reproduction, and the demonstration has been made possible only as the result of many months of work by Rola engineers. It will be held at the Rola factory, located in the Boulevard, Richmond, just a few steps down from the tram in Bridge Road.

Master of Ceremonies will be Mr. A. K. Box, well-known radio journalist, who was technical editor of the "Listener-In" for many years.

Also present will be your Editor, who looks forward to meeting you in person. It is hoped that an important announcement regarding the future development of our publication will be made at the Party.

As it is quite impossible for us to cater for an unknown number of guests, we must insist that only those with reservations will be admitted. So write now for your reservation. There is no charge; no restrictions.

IN A NUTSHELL:

The Event: A Hi-fi Party, at which all forms of reproduction will be demonstrated.

The Date: Thursday, 3rd August, at 7.30 p.m.

The Place: At the Rola factory, Boulevard, Richmond, not far from the Bridge Rd. tram.

RESERVATION ESSENTIAL

To A. G. Hull,
Box 13, Mornington, Victoria.

Please reserve me .... seats for the Hi-Fi Party.

Name.....

Address.....

.....

No need to use this coupon if you don't want to deface your issue. Just write, but do it NOW.

POSITIVELY NO ADMISSION WITHOUT RESERVATION

FOR TALKIE WORK

A Novel Sound System

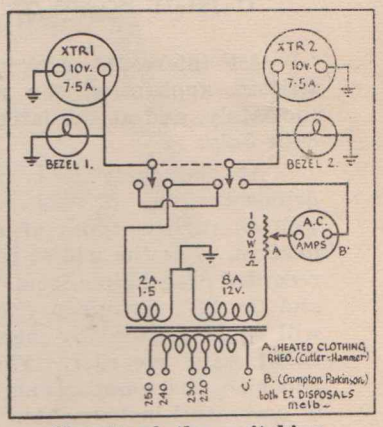
Designed by Ray Brown

FROM time to time, we have the pleasure of receiving articles from the pen of Ray Brown, of the Harvey Ivers organization at Taree, N.S.W.

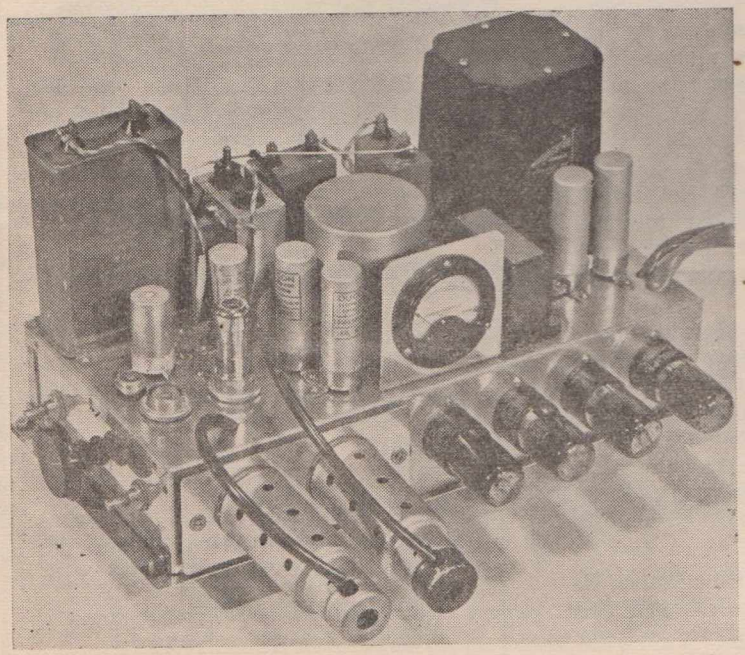
Ray Brown is a bright radio enthusiast of the keenest type and was successful in a circuit contest which we conducted many years ago.

A short time ago we had an article from Ray on the subject of a talkie installation which he designed and installed, being also associated with the local picture show in Taree. Being himself a keen follower of the cult of high-fidelity reproduction, you can imagine that Ray made a grand job of this talkie outfit.

Here are details of another sound system which Ray recently designed and built, and as you will see at first glance at the photographs, it is a most unusual design, especially as regards the layout of the valves. To describe it you might say that the front panel is the bottom cover of the chassis, that the valves come out the side of the chassis, yet are upright. In fact, you could spend a lot of time trying to describe the layout and still only cause confusion. The quickest way to understand it is to study the photographs. When you have worked it all out you must agree that everything is most unorthodox, but allows base dimensions about half those that would be required for a similar amplifier if built in the normal way.



Circuit of the switching of the exciters.



A general view of the chassis.

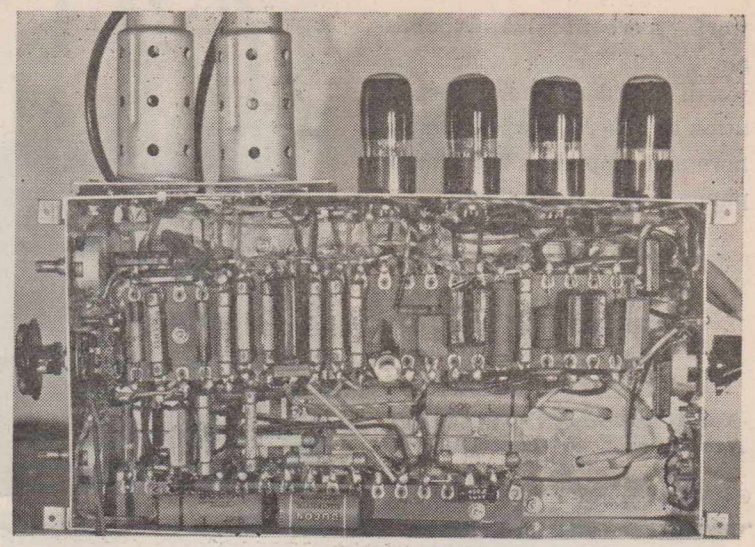
Another feature of the layout is that the job can be readily fitted as a panel in a rack and panel assembly, or it can stand up sturdily on its own bottom, with the panel in front, the valves in a vertical position and the whole steadied by the heavy components in the rear. Incidentally, the matter of heat dissipation has been well covered in this design, also maximum accessibility for testing, checking or servicing. As will be seen from the photograph of the wiring, the strip of resistors makes for ease of voltage checking.

According to Mr. Brown, hum and inherent noise are non-existent, yet the gain is greater than can be used with even the worst film he has encountered.

The quality of reproduction is limited only by the quality of the audio transformer used, and high-quality units to pass the widest limits of high fidelity are readily available these days. The step-up ratio of the transformer should be low. The transformer in the original amplifier having a ratio of 2 to 1. Mr. Brown recommends the "Red Line" brand.

Points to Watch

There are one or two points to be watched in the construction of this amplifier. In order to avoid hum troubles great care must be taken with the heater wiring, which should be carried out with heavy gauge twisted wires which are kept well clear of input leads, wires connecting to grids, etc.

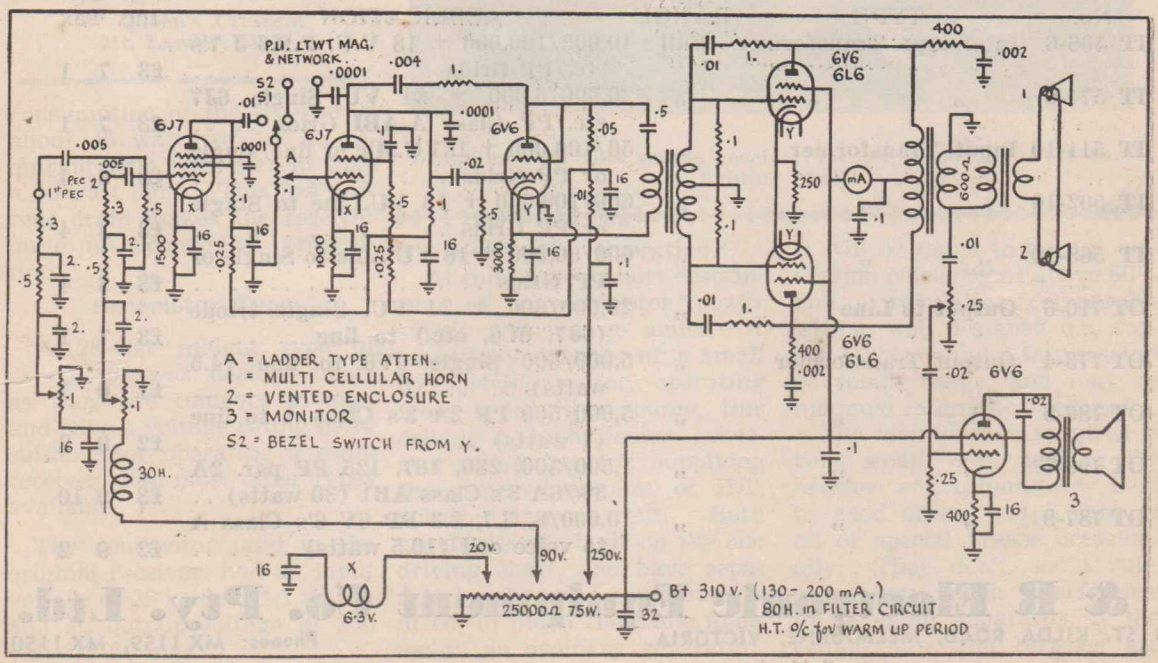


View of the neat panel wiring, with components mounted on the terminal strips.

It is recommended that the 12-volt exciter supply, together with ammeter, should be carried out exactly as was done in the original job. Voltage drop at this fairly heavy current can be considerable, even with reasonably short leads.

Although primarily designed as a sound system for talkie

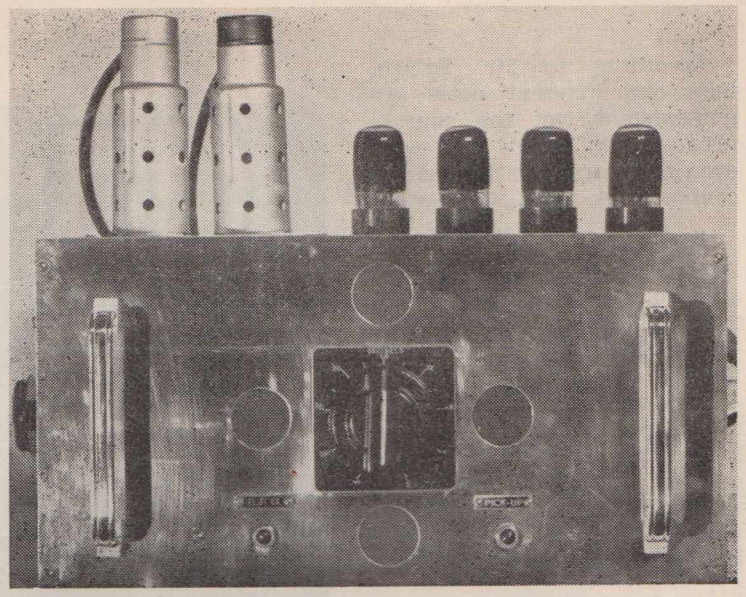
(Continued on next page).



SOUND SYSTEM

(Continued)

work, there are many points about this design which are worth considering for incorporation in general purpose amplifiers and amplifiers for gramophone record reproduction.



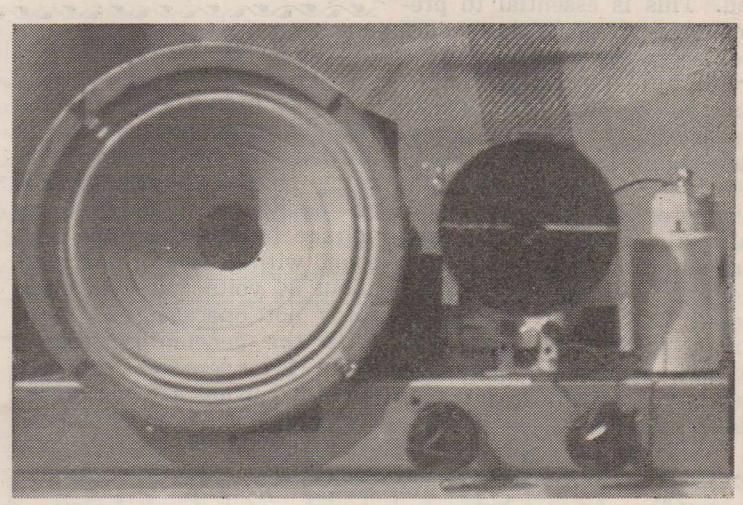
Another view of the completed unit.

"The Farmer's Four"

OWING to the numbers of first-class genemotors being available from disposal sources, and also the lack of any constructional articles on equipment using this type of power supply, the writer decided to try out a receiver using a genemotor power supply. The idea resulted in the "Farmer's Four" receiver, which uses a 28-volt genemotor, and operates direct from the 32-volt home-lighting plant.

IN featuring a small mantel receiver of this type, the aim was to bring to the rural man, who has his own lighting plant, the convenience of a small second set. This set can be moved from room to room, without the nuisance value of having to cope with an external power supply. The current consumption of the receiver is about 45 watts or 1.4 a., requiring little more current than a 40-watt lamp. This low current drain makes the receiver quite an economical proposition.

By
A. J. GARDNER
Assoc. I.R.E.
22 Queen's Crescent
Mt. Lawley, W.A.



Front view of this simple receiver for use from a 32-volt home lighting plant.

Genemotor Type

A 28-volt midget type of genemotor was decided upon, as they are compact in size, and have a voltage rating more suitable for operating a radio receiver than most other types available.

The genemotor used in the original receiver, had an input voltage of 28 volts at 1.1 amps., and an output voltage of 250 volts at 60 mas.

Genemotor Operation

At this stage a short description of a genemotor power supply will not go amiss. It essentially consists of a small d.c. driving motor, operating from a low d.c. source, this driving a high-tension generator armature, for supplying the required amount of H.T. voltage and current. Both armatures are built on the one driving shaft, and have separate brushes and commutators fitted, in much the same manner as an ordinary generator. It will be found to have a conversion efficiency of above 60% and a regulation comparable with a well designed a.c. supply. They stand a fair amount of rough usage, and may be mounted in any position.

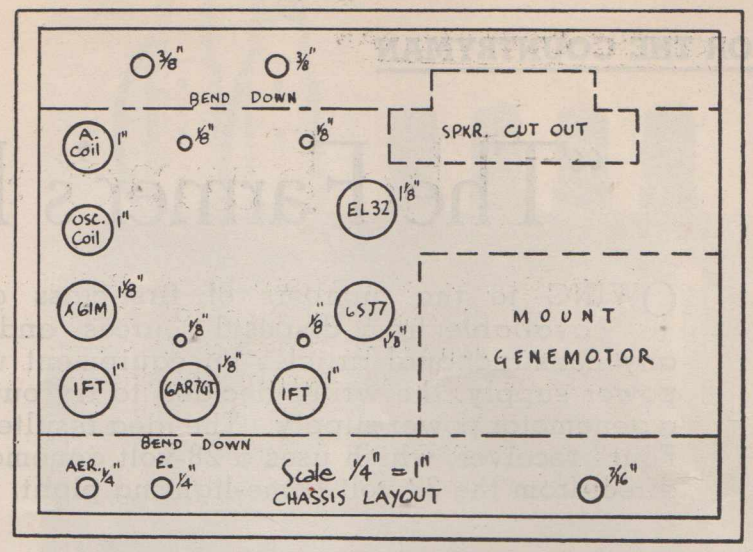
The maintenance required is very small, only needing the brushes and commutator kept in good order, and a spot of oil or special grease occasionally. They don't, as a rule, cause very much interference to receiving apparatus, if the commutator and brushes are

"FARMER'S 4"
(Continued)

operating correctly. Successful operation also implies mechanical isolation to reduce vibration, and thorough R.F. and commutator ripple filtration.

Precautions

Of course, commutator ripple is not quite so troublesome, with indirectly-heated valves. But still certain precautions are necessary, as can be seen from the schematic diagram of the receiver, needing a low tension air-cored choke L2, in the genemotor L.T. positive lead. This is essential to prevent commutator ripple, feeding back from the genemotor L.T. circuit into the heater circuit. Also to operate the 28-volt genemotor off a 32-volt supply, makes it necessary to fit a resistor between L2, and the genemotor 28v. positive lead. This supply voltage to the genemotor is rather critical, and must not on any account exceed 28 volts. Otherwise, damage to the armature winding may be caused, and also premature brush wear may take place.

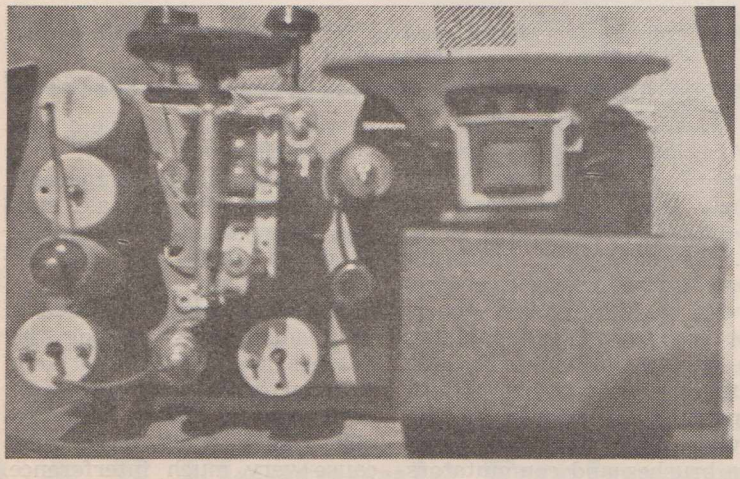


Plant Voltages

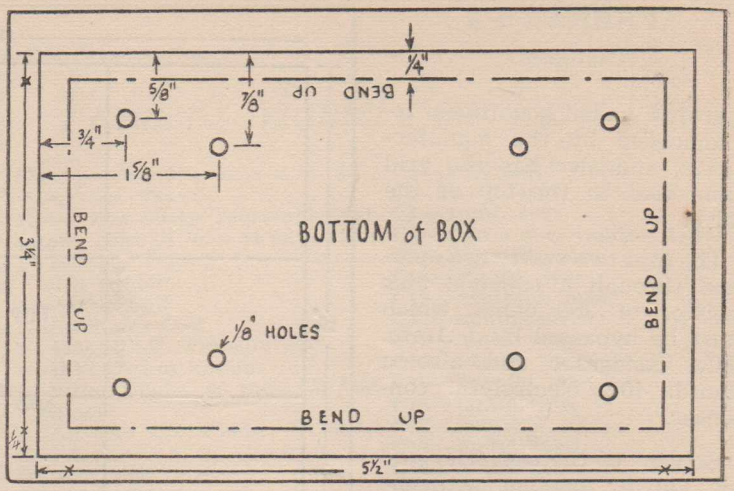
It has been found that 32-volt lighting plants can be divided into two groups. One using sixteen 2-volt batteries or equivalent. The supply voltage in this case, has been found with generator charging, about 34 volts and with generator not operating 32 volts. With the genemotor drawing about 1 ampere on the input side, and using a 6-ohm resistor in the genemotor 28v. positive lead, the voltage can be maintained between 28 volts and 26 volts.

The other type of plant makes use of eighteen 2-volt batteries or equivalent. Supply voltage being with generator charging anything up to 40 volts, and with same not charging about 36 volts. By using a 12-ohm resistor in series with the supply to the genemotor, the voltage remains between 28 to 24 volts. In the receiver being described, a 15-ohm 20-watt adjustable type of resistor has been used in this position, which allows the receiver to be adjusted for either supply voltage. The polarity of the supply voltage to the genemotor must be strictly observed. This can be overcome by using a regular 3-pin 240v. a.c. type of plug. First checking the polarity of the 32v. supply with a voltmeter.

A switch has not been provided in the receiver for turning same on and off. The one controlling the power point, on the lighting plant, being sufficient for operating the receiver.

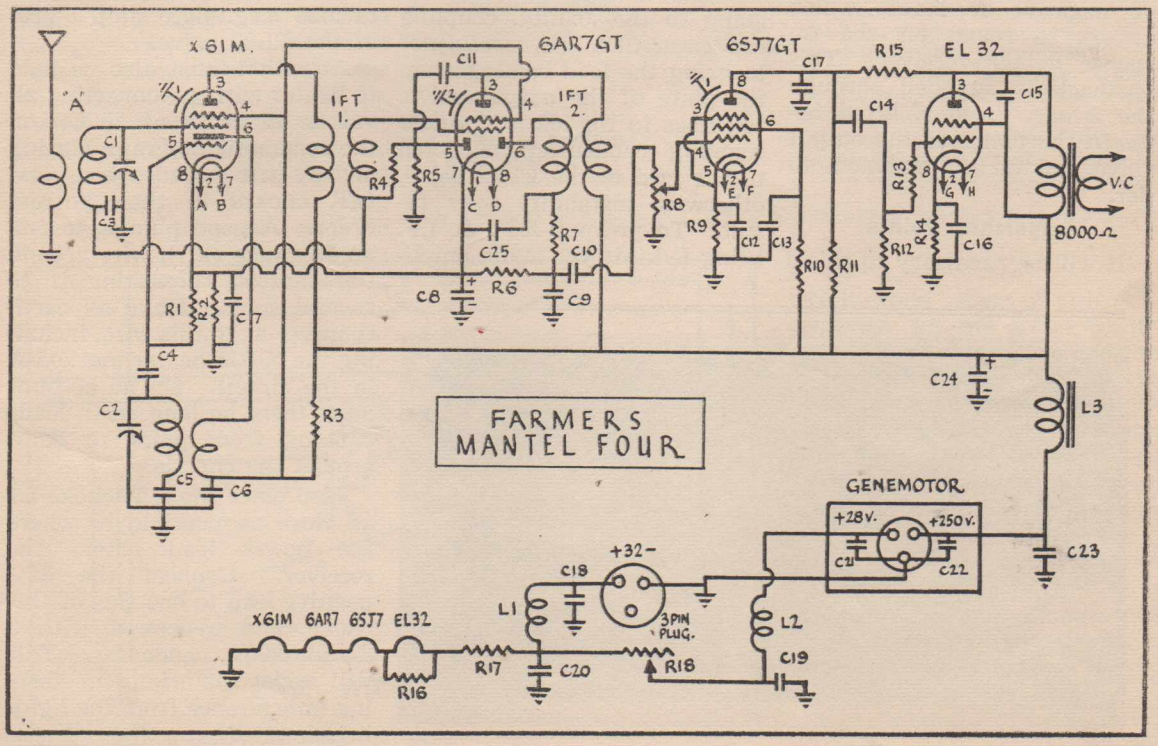


To prevent interference to the receiver from the plant, it will be necessary to fit a .5mfd. condenser from the generator output to frame. Also make sure the generator frame is effectively earthed, and that the commutator and brushes are in good order.



Circuit Details

As the genemotor has an output of 250v. at 60 ma's., the design of the receiver can be featured along conventional a.c. lines. On checking the schematic diagram it can be seen the receiver consists essentially of a X61M valve operating as a converter under usual conditions. This valve is similar to the 6J8G, but features much higher conversion gain. In the I.F. stage is the new Australian type, the 6AR7GT duo-diode-pentode, which has a variable-mu characteristic, and at minus 2 volts, it has a gm. of 2500 micromhos. Also it has external shielding in addition to the usual internal shielding. This new valve has a much better performance in the I.F. amplifier than the usual 6G8G valve without any instability troubles. The 6AR7GT valve also supplies detection and A.V.C., and the output is fed to a 6SJ valve, first audio voltage amplifier, operating with usual values of components. In the output stage is featured an EL32 valve, which was chosen because of its lower heater current. This valve is



"FARMER'S 4"

(Continued)

operated under conditions recommended by the manufacturers, and also has the grid connection to the top of the valve.

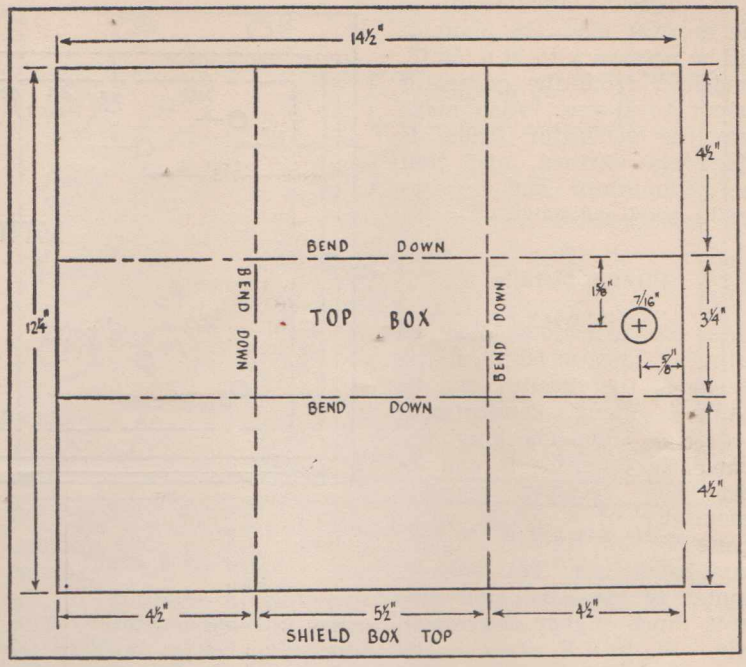
The first two valves are operated through a common bias resistor of 250 ohms, which must be bypassed by a .1mfd. 200v. condenser and also a 25mfd. 40v. electrolytic condenser.

Screens of the converter and I.F. valves, together with the oscillator plate of the X61M, are supplied through a common dropping resistor of 17,500 ohms. This resistor must have a two-watt rating, and it may be necessary to use two 35,000-ohm 1-watt resistors in parallel, to obtain this value.

A six-inch speaker has been provided, and a small measure of negative feedbock, which assists to round off the response of the receiver. This feedback is supplied through the 2-meg. resistor, fitted between the plates of the output valve, and the first audio omplifier.

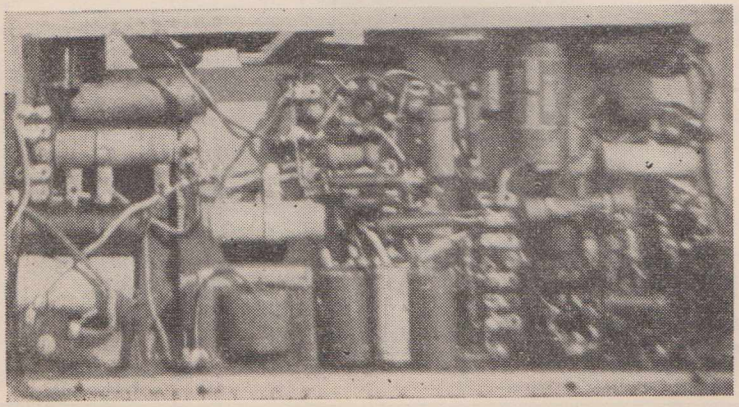
Important Points

It will be necessary to shield the lead coming from the moving arm of the volume control and going to the grid of the 6SJ valve, and also the one going to the .02mfd. coupling condenser C10. Be careful not to bring the lead coming from the plate of the output valve, too close to the .02 mfd. audio coupling condenser connected to the grid of the EL32 valve, otherwise instability may result. To prevent R.F. at I.F. being fed into the audio amplifier it was found necessary to use a .1 meg. resistor in the diode load of the 6AR7GT valve, and also a grid stopper of .025 meg. right at the grid of the EL32 valve.



Attention must also be paid to heater wiring, connecting all valves in series as shown on the schematic diagram, placing all by-pass condensers, and L.T. chokes in their correct order. A good plan is to run an 18-gauge earth wire around the chassis, connecting it to several spots. Make all earth connections to this wire, including the X61M heater marked A in the circuit. On no account must there be long earth leads running from point to point around the chassis.

Also place the L.T. choke L1 as close as possible to where the power lead enters the receiver. Connect the 32v. positive lead to one side of this choke, and bypass it with a .5mfd. 200v. condenser. This will assist materially in keeping interference from the lighting plant affecting the receiver.



Heater Wiring

It will be noticed all valves are of the 6.3v. type, and for operation off 32 volts the heaters are wired in series. All valves except the EL32 draw .3a. heater current, which requires .2a., making it necessary to wire a 63-ohm 1-watt resistor in parallel with the EL32 heater, to carry the extra .1a. of current. Two 125-ohm resistors in parallel will be near enough for this resistor. To complete the circuit a further 25-ohm 10-watt resistor is required in series with the EL32 valve, and the 32-volt positive lead.

If your particular lighting plant comes under the 36-volt type increase the size of this resistor to 30 ohms 10 watt, to ensure a margin of safety for the valve heaters.

Receiver Construction

The receiver has been constructed on a chassis, size 12½ in. x 6 in. x 1½ in., details of main dimensions and cut-outs being shown in the diagrams here. All components used are full size, and there will be found sufficient room without cramping. The lay-out of the components from the front of the chassis, we find the gang condenser mounted on the right-hand side, with the speaker on the left. On the right-hand side of the gang the aerial and oscillator coils, the X61M value, followed by the first I.F. transformer. Along the back edge of the chassis the 6AR7GT value, the second I.F. transformer, and coming across the centre of the chassis, the first audio valve, and the EL32. The power unit in its metal box being mounted behind the speaker in the extreme left-hand corner of the chassis. You will find the lay-out is

Farmer's Mantel Four Parts List

Chassis—Size 12½ in. x 6 in. x 1½ in. (See Text)
Metal Box—with removable bottom. Size 5½ in. x 3¼ in. x 4½ in.
1—H-type, 2-gang Condenser — with trimers
1—Aerial Coil
1—Oscillator Coil
2—455kcs. I.F. Transformers
1—DA7 Dial or Similar
1—Filter Choke, 60 ma's L3 (400 ohms)
2—Air-core L.T. Chokes L1 & L2

Resistors—
R1—.05 meg. ½ w.
R2—250 ohm 1w.
R3—17,500 ohms 2 w.
R4—2 meg. ½ w.
R5—1 meg. ½ w.
R6—.5 meg. ½ w.
R7—.1 meg. ½ w.
R8—.5 meg. potentiometer
R9—2,000 ohms 1 w.
R10—1.5 meg. 1 w.
R11—.25 meg. ½ w.
R12—.5 meg. ½ w.
R13—.025 ½ w.
R14—500 ohms 3 w. m.m.
R15—2 meg. 1 w.
R16—63 ohm 1 w. or 2—125 ohm 1 w. in parallel
R17—25 ohm. 10 w.
R18—15 ohm 20 w. adjustable type

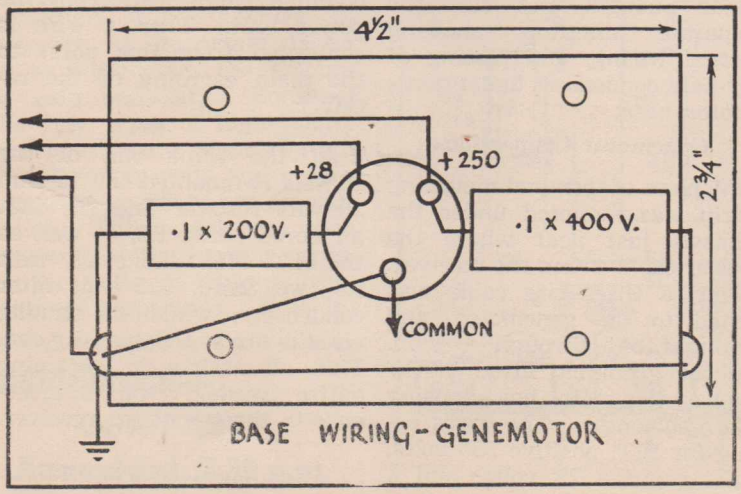
Condensers—
C1—Gang Section
C2—Gang Section
C3—.05mfd. 200v.
C4—.0005mfd. mica
C5—.000425mfd. mica
C6—.1mfd. 400v.
C7—.1mfd. 200v.
C8—25mfd. 40v. (midget type)
C9—.0001mfd. mica
C10—.02mfd. 400v.
C11—.0001mfd. mica
C12—25mfd. 40v.
C13—.1mfd. 400v.
C14—.02mfd. 600v.
C15—.001mfd. 600v.
C16—25mfd. 40v.
C17—.0001mfd. mica
C18—.5mfd. 200v.
C19—.1mfd. 200v.
C20—.25mfd. 200v.
C21—.1mfd. 200v.
C22—.1mfd. 400v.
C23—8mfd. 525v.
C24—8mfd. 525v.
C25—.0001 mica

Valves—
X61M, 6AR7GT, 6SJ7GT, EL32

Speaker—6-in. Perm. Mag.-Type, with 8,000r. matching

Genemotor—28 volt, 1.1 amp. input, 250 volt 60 ma. output

Sundries—
4—Octal valve sockets
2—Terminals
1—⅜-in. rubber grommet
8—¼-in. rubber grommets
1—3-pin plug (240v. a.c. type)
4—Bolts and Nuts, 1¾ in. x ⅛ in.
3 yds. power flex
Sponge rubber, solder lugs, terminal strips, bolts and nuts, tin copper wire, hook-up wire.



"FARMER'S 4"

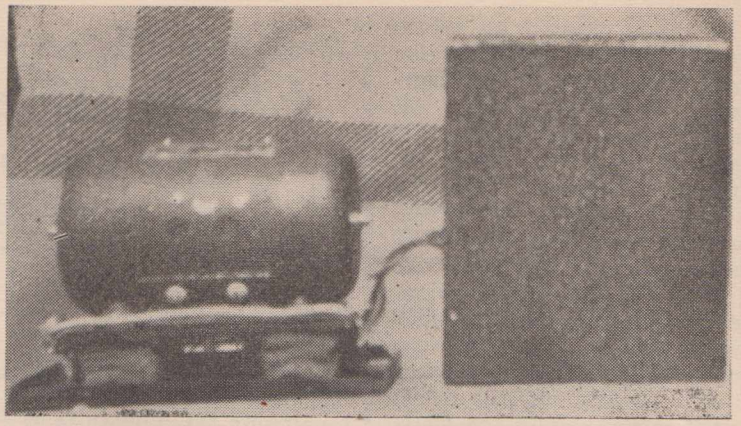
(Continued)

quite systematic, and allows for short grid and plate leads.

Genemotor Mounting

A considerable amount of thought had to be given to the mounting of the genemotor, as there is a fair amount of mechanical noise in connection with this type of power supply. After experimenting with several ways of mounting the genemotor, it was found that placing four pieces of sponge rubber, one under each corner mounting bolt, and fitting the genemotor in a metal box, gave the best results.

A metal box size 5½ in. x 3¼ in. x 4½ in. will now be required, with a removable bottom, and four bolts size 1¾ in. x ⅛ in. Through four holes drilled in each corner of the removable base bolts are passed through and locked in position with a nut and lockwasher. From a piece of ¾ in. sponge rubber, cut eight small blocks and place two each on the four mounting bolts. You will now find the weight of the genemotor will cause the rubber to press down to about one inch in thickness. This will give the required room between the bottom of the genemotor and the base of the metal box for mounting the two commutator ripple condensers. The particular genemotor used, had suitable holes for this purpose. To prevent the genemotor coming off the bolts, it will be necessary to fit a ⅛ in. rubber grommet and a nut to each bolt. Do not over tighten the genemotor on the mounting bolts, otherwise the cushion effect of the rubber mounting will be spoilt. The power unit is then mounted on the receiver chassis in the extreme left-hand corner, being held by four



bolts. To further minimise vibration, four ⅛ in. rubber grommets are fitted to the chassis to receive the above bolts. This procedure insulates the power unit entirely from the receiver chassis.

It is important to bring the earth points of the two ripple condensers, and the common earth from the genemotor to the one point in the power unit case.

With the genemotor mounted in the above manner, the mechanical noise is practically nil.

The photographs of the power unit construction should make the above description clear enough, and also the separate diagram showing actual wiring, and placing of by-pass condensers under genemotor base.

Genemotor Connections

A piece of terminal mounting strip was mounted under the chassis just near where the power cable enters the receiver. Next, a three-wire cable was fitted to the genemotor, and brought out through a ⅜ in. rubber grommet, fitted in the end of the metal box, housing the genemotor. The wires being for H.T. positive 250 volts, L.T. positive 28 volts, and a common lead for B negative, A negative, and the frame of the genemotor.

The above three connections are made to the three pin socket, which is attached to the bottom of the genemotor, as used in the orginal receiver. Connections as shown in the schematic diagram are in correct order for this particular type, but may vary with different makes. The three wires are now connected to the terminal mounting strip. Also connect the earth returns of condensers C18, C19, C20, and the incoming 32-volt negative power lead, to the same terminal tag as you connect the common earth lead from the power unit. Then a wire is connected from this point to the main earthing of the receiver.

At the same end of the chassis is mounted the 15-ohm 20-watt resistor and the L.T. air cored choke L2, as well as the H.T. filter choke L3, with its two 8mfd. 525 volt filter condensers, while the tuning circuits are at the opposite end. This all assists in obtaining entire freedom from interference in the completed receiver.

(Continued on Page 18)

"HAMLET Jnr."

THERE is considerable difference of opinion on the subject of tonal quality. Reproduction which may suit one person on account of its brilliance will seem shrill and harsh to someone else.

By A. G. HULL.

THERE is a tendency among theorists to aim at getting the widest possible frequency response. The practical aspects indicate that wide frequency response means the fullest reproduction of scratch and any inherent faults in the recording.

To suit all tastes, it seems that the best plan is to have an amplifier with the flattest and widest possible frequency response, ample power to move the cone of the speaker when full reproduction of the drum is desired, and the best speaker that you can afford. Compensation to suit your taste can then be carried out in the pick-up, pre-amplifier or bass compensation stages. There is, however, an important factor to be considered, the amount of gain necessary. Some of the finer types of high-fidelity pick-ups have a signal output of only micro-volts and need a couple of stages of pre-amplification. Other pick-ups, such as some of the crystal types, deliver volts of output from ordinary recordings. It is inefficient and undesirable to feed then into a high-gain amplifier. Most popular amplifiers, such as the famous "Williamson" circuit, have far too much gain for use with ordinary crystal pick-ups.

Now, in my particular circle of acquaintances, the popular choice of pick-ups is one of the old-style high-voltage crystal types. I have several pick-ups mounted up on the turntable ready for use, but my son and daughter and their many teenage friends seem to have a unanimous favour for a crystal pick-up which has a frequency response far from "flat". It delivers volts of output at 50 to 200 cycles, flattens out a bit towards 1,000 c.p.s. and cuts off fairly sharply at about 7,000 cycles. From these figures you might not expect it to be capable of reproducing the finer overtones of high-pitched instruments, yet in practice it gives reproduction which is considered ideal by many.

Similar style of reproduction is possible with most modern crystal pick-ups if the loading across the pick-up is kept at 1 megohm or more, as against the half megohm which is nor-

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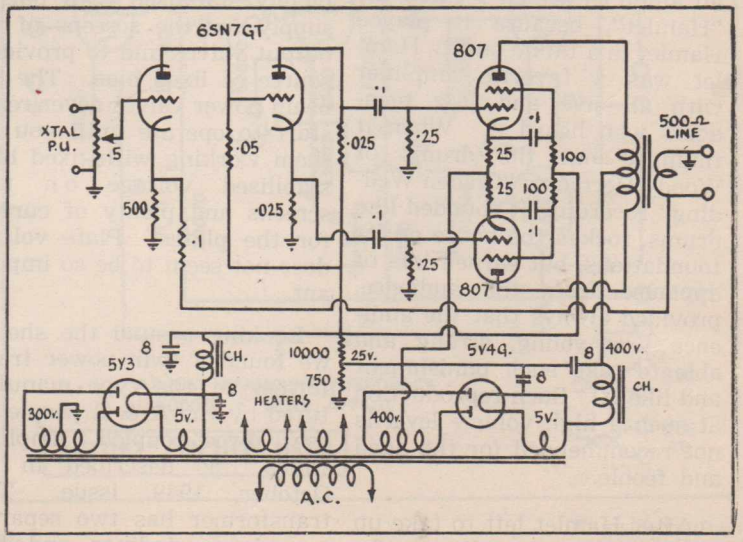

REMEMBER—

OUR PARTY

August 3rd, 7.30 p.m.

mal. In practice this means that a 1 megohm volume control must be used, without any grid-leak or other resistor across it. It also means that you must not use long leads from the pick-up with braided shielding, as this can also affect the loading. The old pick-up which is favourite around our house is about fifteen years old and gives the terrific lows, and sharp high cut, with a half-meg. loading. Most new pick-ups need a 1 meg. load to get the same result. Quite an effective tone control can be made for any crystal pick-up by fitting a 1-megohm potentiometer across the input terminals, wired in rheostat manner, so that the effective load on the crystal can be adjusted from about half a megohm down to a hundred thousand ohms. As the load is lowered so the low note response is evened out and the highs extended.

The Circuit

Readers will recall that the issue for February, 1949, contained details and circuit of an amplifier which I titled the "Hamlet", because it played Hamlet in a talkie outfit. Hamlet was a favorite amplifier with all jive and jazz teenagers who heard it. When it thumped out the drums of Woody Herman's "Golden Wedding" recording it sounded like drums, rocked the house on its foundations, but earned lots of applause from the audience, provided always that the audience was young, strong and able to take such punishment and like it! Such reproduction at such a high volume level is not recommended for the aged and feeble.

After Hamlet left to take up its hard life in a talkie outfit, there were repeated demands for Dad to build another of those beaut. big amplifiers, "like the one that blew the cone right out of the speaker".

To stop the incessant demand along these lines, I ran together another amplifier of similar design, but using lower voltages, no pre-amplifiers and using only components which were handy.

The Power Supply

One of the essentials of the design is to have twin power supply to provide high tension for the final plates with good regulation, as well as a completely stabilised high tension supply for the screens of the output valves and to provide a source of fixed bias. The 807 beam power valves never really start to operate until you get them working with fixed bias, stabilised voltage on the screens and plenty of current for the plates. Plate voltage does not seem to be so important.

Looking around the shelves we found a twin power transformer of the type manufactured by the A & R people for the direct-coupled amplifier which was described in the October, 1949, issue. This transformer has two separate secondary windings and filament windings for the two rectifiers as well as the usual valves. The two secondaries have voltage ratings of 250 and 385 volts, but under light loading will give about 300 volts and 400. So we used this A & R transformer and found it did the job to perfection. The original Hamlet used the Red Line transformer with about 330 volts for the screens and 600 for the plates. With the high voltages the amplifier gave a solid 40 watts of undistorted output. With Hamlet Jnr. the power output is only about 15 watts, but is quite sufficient to get some heavy sound out of a single twelve-inch speaker on a suitable baffle.

An important feature of the circuit design is the use of the same direct-coupled phase changer which was used in the "Williamson" amplifier in order to avoid phase-displacement troubles when feed-back is applied. With only a single stage in the main amplifier there is even less phase-displacement and less scope for distortion. Output from the 807's is fed into an output transformer stepping down to a 500 ohm load. Feedback is taken from one side of the 500

(Continued on Page 20)

A Switched Amplifier

HERE is an interesting novelty, in the form of an amplifier circuit which allows immediate switching from resistance coupling to direct coupling, so that the merits of the direct-coupled phase changer can be checked by ear.

FOR the past twenty years, the ranks of enthusiasts have been torn by the conflict between those who claim that direct-coupled amplifiers are superior to other types. Amplifier contests have been arranged from time to time and on such battlegrounds the direct-coupled jobs seemed to prove their superiority. During last year there was considerable revival of interest in this controversy by the introduction of some rather unusual direct-coupled arrangements using twin power supplies.

With a view to settling the argument once and for all, one of our keen readers, and a competitor in one of our early amplifier championships, Mr. Alban E. Hughes, of 224 Glebe Road, Glebe, built up an amplifier incorporating switching, so that at a single flick of the wrist it is possible to have either direct-coupled or resistance-coupled circuits.

Here is the tale of the experiment, as told by Mr. Hughes in a recent letter:—

"I am sending you some details of an experiment carried out recently.

"Object: to find out if there was any noticeable difference between a direct-coupled phase splitter and a resistance-coupled phase splitter.

"First, I wired a two-position two-bank switch to an amplifier and adjusted the amplifier very **carefully** in the direct coupled circuit and when switched to the resistance-coupled circuit the same adjustment worked well. I played different types of records in both positions and could not tell by ear **any** difference at all.

"I then took the amplifier to a very critical friend of mine and, before telling him what the switch was for, he also played several types of records with a new Decca pick-up and a Goodman's "Axiom 12" in a vented enclosure.

"He could not tell any difference and I then decided to let you know for the following reasons:

"First, because of the many circuits appearing in A.R.W.

"Secondly, I am interested in any idea that will help sell more copies of your A.R.W. and this circuit will allow your readers to find out themselves and feel that they have done

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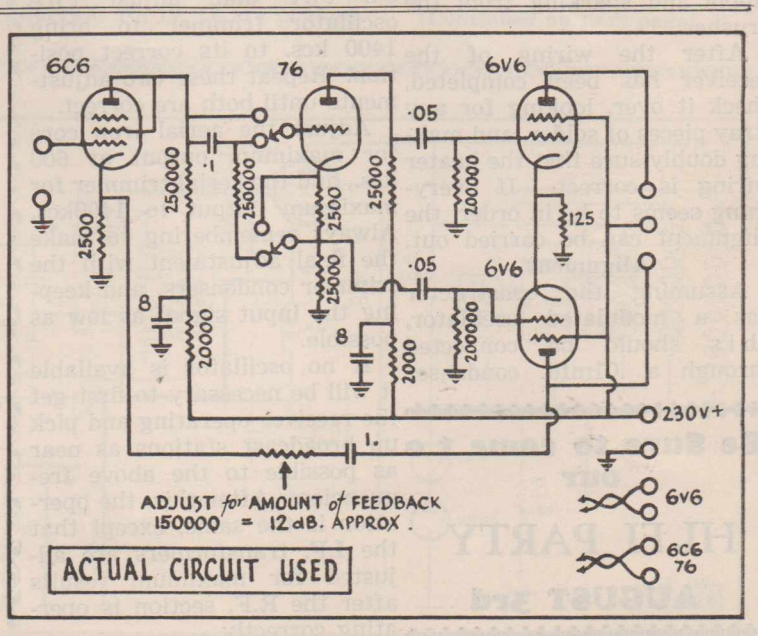

SWITCHED

(Continued)

something about the D.C. versus R.C. coupling argument.

"I do not claim that this idea is better than a complete direct-coupled amplifier but I do claim that there is no noticeable difference when used for a phase-splitter and, in fact, because of the ease of getting a resistance job going and there being no effect from one valve to the other, it is the best circuit to use.

"In my amplifier I used a 6C6 as a triode and a 76 as the phase- splitter because they were on the old base that I use for circuit testing but they could be replaced with any triodes, 6SN7, etc.

"I used feedback on the amplifier and there was no difference in volume either.

"I think your idea of letting some young chap off with a lower sub. was good, and you (if you like the idea) may print part or whole of this experiment at no cost to you.

"I hope that your A.R.W. will continue well, and wish you luck in the future.

Yours truly,

Alban E. Hughes"

I feel sure that everyone will agree with Mr. Hughes has carried out a most interesting experiment and it was a very bright idea. I would not be so brave, however, as to fully endorse the conclusions reached.

It takes all sorts to make up a world, and there are plenty of tone-deaf people around, even those who rate themselves as having critical ears. For example, I have been playing around a bit with those new frequency records which go right up to 20,000 cycles. I have found some bright young fellows who can, without doubt, hear such highs. On the other hand, quite a few cannot hear anything over 10,000 cycles per second.

That there can be less phase displacement in a direct-coupled phase splitter than in a normal one can be proved fairly conclusively by building up an amplifier of the "Williamson" type and fitting feedback over a number of stages. This shows up the phase displacement in no uncertain manner. Which does not, of course, prove that such phase displacement is going to make such a difference in the output of an amplifier that it will be detected with the normal ear.

—A.G.H.

NOTICE TO SUBSCRIBERS

As we were unable to get a printer to do the job, we were unable to bring out the issues for April and May last. All subscriptions have been corrected to advance the expiry date by two months.

"FARMER'S 4"

(Continued from Page 14)

Ripple Condensers

It is essential to bypass the L.T. positive 28 volt lead from the genemotor, right at the genemotor base, with its .1mfd. 200v. condenser, and also the H.T. positive 250v. lead, with its associated .1mfd. 400v. condenser.

These two condensers are required to prevent commutator ripple and sparking from the brushes.

After the wiring of the receiver has been completed, check it over, looking for any stray pieces of solder, and making doubly sure that the heater wiring is correct. If everything seems to be in order, the alignment can be carried out.

Alignment

Assuming the constructor has a modulated oscillator, this should be connected through a .01mfd. condenser to the grids of the valves, and using as low an input level as possible, adjust the iron cores in I.F. transformers accurately to 455kcs. Starting with the secondary of I.F.T. two, and working back to the primary of I.F.T. one. After the I.F. amplifier is operating properly, the R.F. section can be aligned. Connect the oscillator through a .0001mfd. condenser to the aerial terminal and adjust the oscillator iron core to bring 600kcs. to its correct position on the dial, adjust the oscillator trimmer to bring 1400 kcs. to its correct position. Repeat these two adjustments until both are correct.

Adjust the aerial iron core for maximum output at 600 kcs., and the aerial trimmer for maximum output to 1400kcs. Always remembering to make the final adjustment with the trimmer condensers, and keeping the input signal as low as possible.

If no oscillator is available it will be necessary to first get the receiver operating and pick up broadcast stations as near as possible to the above frequencies. After this, the operation is the same, except that the I.F. transformers are adjusted for maximum results after the R.F. section is operating correctly.

V.F.O. with POWER

USED in the proper manner, a variable frequency oscillator can be of great assistance for the ham who is finding the bands crowded. From New Zealand comes a design for a v.f.o. which has several attractive features.

I WANTED a clapp oscillator which would deliver sufficient drive without doublers, buffers or "isolation" stages, to kick an 807 as a driver to an HF 100 on all bands. A series of tubes were tried including 807, 6L6, 6V6, 801, and while all would oscillate on the lower frequencies, efficiency was low and drift bad, and only the 6AG7 and 6AC7 would deliver a stable signal on high frequencies, but output was still too low.

By
J. B. CORMACK, ZL2CP
from "Break-In"—N.Z.

Finally a Phillips QV04-7 was tried and at reduced ratings still gave more than enough drive for an 807, even on 6 meters. Parts are the cheapest I could find, but the oscillator shows no drift after a 2 minute warm up and does not chirp on keying except on 6 meters.

Incidentally the QVO 4-7 can be run at its full ratings of 300v plate and 250v screen without any troubles, such as creep or chirp, and giving much greater output if required.

Note all leads from grid cathode circuit are extra heavy (10 gauge wire).

C4 and 5 are Erie 50mmfd. ceramicon paralleled to make up capacity. C6, 7, 8, 9 are Solar .001 gold spot ex ZC1 ant. tuning unit. C10 and 14 are ceramicon. C 16, 17, 18 are Phillips trimmers (receiver type). S1 and S2 are wafer switches ex ZC1, S1 being a two pole (back to back) 3 position 3 wafer unit.

VR tubes are not necessary with a separate well regulated supply but were available.

Note that oscillator grid coil fundamental is 3.5 to 4mc and 14 to 27mc. will full bandspread on 80 and 20 meters. Padders C 16, 17, 18 are peaked at 14,400kc, 29000kc and 51mc. R2 is not really necessary but does broaden tuning. R3 is not necessary with correct voltage on plates of QVO 4-7 if from separate 250 volt supply.

It is an advantage to make C14 variable but does alter calibration when varied.

Note also that grid resistor returns to ground, not cathode. All circuits on output side should be shielded from tube base and grid circuits.

Other types of tubes can be used, but it would appear that they must be well shielded internally, of low internal capac-

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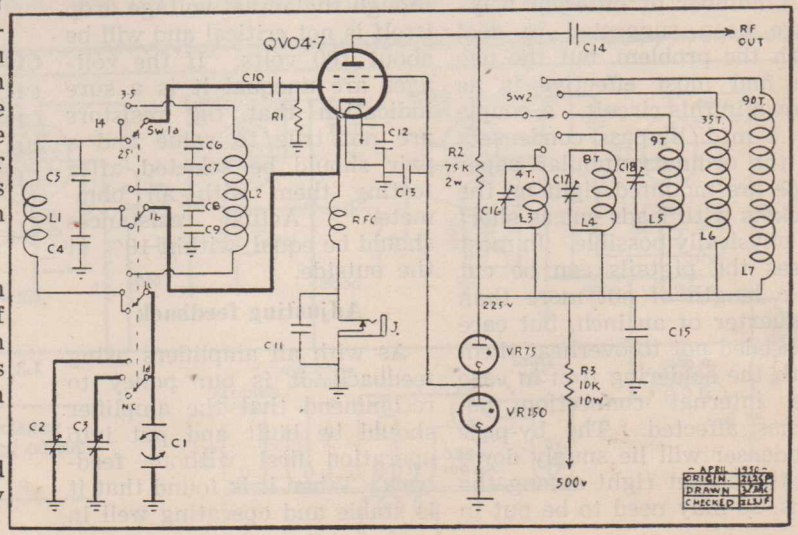


"HAMLET JNR"

(Continued from Page 16).

ohm line, back to the cathode of the input section of the 6SN7GT twin triode. It flattens out the response of the amplifier so that frequency discrimination and distortion are both of a nature too small to be detected by the equipment available to us.

The use of the 500 ohm line with a good output transformer such as the "Red Line" or "A & R" brands, seems to give a certain amount of advantage over the straight output - plates - to - voice - coil type. Speaker used by us consists of a twin-cone Goodman's "Axiom" on a four-foot square of seven-ply. This is still preferred to anything we have managed to make up in the way of reflex and box baffles.

Parasitics

A vital point about any amplifier with push-pull beam power valves is to ensure absolute freedom from parasitics. Spurious oscillation at frequencies outside the audio range will spoil the amplifier of its power and quality in a most insidious way.

A number of different ways have been suggested to deal with the problem, but the one we find most effective is as shown in this circuit. A couple of .1 mfd. by-pass condensers of the ordinary tubular paper type are mounted right on the sockets with leads cut as short as physically possible. In most cases the pigtails con be cut to a length of not more than a quarter of an inch, but care is needed not to overheat them with the soldering iron in case the internal connection becomes affected. The by-pass condenser will lie snugly down on the socket right among the pins, so may need to be put in position after the other soldering has been completed. The screens are then isolated by means of a couple of 100 ohm 1-watt carbon type resistors. Again these need to be located as close to the socket pin as possible, so cut the pigtail on the socket end to a quarter of an inch or shorter. Similar stoppers, but of 25 ohms are fitted close in on the cathode pin terminals. All of this sounds a ticklish job and does need a bit of care, but it seems to ensure a stable amplifier which will allow you to fiddle around with feedback and plate loadings without running into trouble.

Voltage Checking

There is seldom any need for voltage checking with amplifiers such as this one, but if the equipment is on hand it may be as well to run over the voltages. Most critical of the voltages is the bias on the output valves, so make sure that there is 25 to 27 volts between cathodes and earth. Screen voltage of the output valves should be between 285 and 325 volts. Voltage drop across the two loading resistors of the second section of the 6SN7GT (in the cathode and plate circuits) should be equal, although the actual voltage drop itself is not critical and will be about 100 volts. If the voltages are unequal it is a sure indication that the resistors are not true to value and a pair should be selected after testing them with an ohmmeter. Actual resistances should be equal, within 10% at the outside.

Adjusting feedback

As with all amplifiers using feedback, it is our policy to recommend that the amplifier should be built and put into operation first without feedback. When it is found that it is stable and operating well in every way, then the feedback can be added to flatten out response. With this particular amplifier it is possible to use a half-meg. potentiometer as a variable resistor in the feedback circuit. It is most interesting to play around with the feedback in this way, noting how too much feedback will affect performance. Normally the application of the correct amount of feedback will cut back the gain so that the volume control is fully advanced to give the maximum power output required.

V.F.O.

(Continued from previous Page)

ities, and preferably beam type h.f. oscillators.

The circuitry, layout and especially coils, can be considerably improved, but my idea was cheapness and stability, plus output.

R1—100,000 ohm

C1—35-35mmfd split stator.

C2, C3—100mmfd midget variable.

C4, C5—Each 5-50 mmfd. ceramicon in parallel making 250 mmfd.

C6, 7, 8, 9—Each .001 Solar gold spot ex ZC1 antenna tuning unit.

C10—100mmfd ceramicon.

C11, 13, 15—.01 paper.

C12—500mmfd mica.

C14—100mmfd ceramicon.

C16, 17, 18—3-30 Phillips trimmers.

L1—13 turns—14 enamel double spaced on ⅜in. former of shellac cardboard.

L2 — 42 turns — 16 enamel close wound on 1¼in. former of shellac cardboard.

L3, 4, 5, 6, 7 — Self resonant approx. for 6, 10, 20, 40, 80 meter bands on 1in. former.

6 meter ¼ diam. self supporting—18 enamel.

80 and 40 30 gauge D.S.C.

20 and 10 20 gauge DCC.

Interesting T.R.F. Circuit

AS promised in last month's issue, here are some details of a rather unusual type of receiver, designed and built by one of our popular contributors with no other idea in mind except to get realistic tone from the local stations. It is a t.r.f. type of set, with infinite impedance detector and a cathode-loaded output stage.

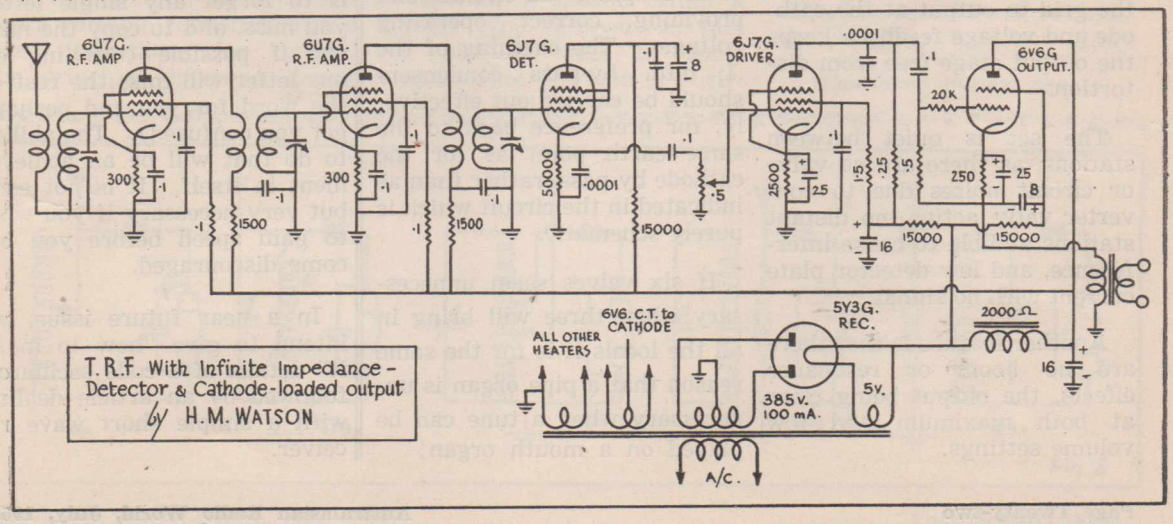
By
H. M. WATSON
89 Botting Street
Albert Park, S.A.

TWO stages of R.F. amplification are used ahead of an infinite impedance detector. This type of detector seems to be a good proposition as it combines the best features of all other types, such as high signal handling capability, low distortion due to good linearity, and cathode follower action. It does not load the tuned circuit and the grid cannot be driven positive. In addition, if two signals of unequal amplitudes reach the detector simultaneously, the weaker of the two is not rectified, as it is swamped in the modulation envelope of the larger, which the detector output follows. As the modulation envelope contains no component of the weaker signal, greater selectivity results.

Against these many advantages the only disadvantage is that it does not readily lend itself to A.V.C. rectification. This, however, is no disadvantage in the present case, as we are only concerned with local station reception. So we skip the A.V.C.

Having paid some attention to the detector, we now turn to the other usual source of distortion, that originating in the output circuit. If these two weak links are overcome we will have something worth listening to.

Output is single-ended and, again, use is made of the cathode follower. There is ample room volume with a bit to spare with this single-ended job, whilst the cathode follower adds the advantage of low



Ham Notes

(By E. K. RIDGWAY.)

While listening on the Ham bands, one occasionally hears yet another voice from the past.

Perhaps the latest to reappear is that of Alan Hutchings, VK3HL, of Callawadda, who is renewing a lot of old friendships which could never have been made except for ham radio.

The old-timers find things different in some respects now; and one who dates back to the early '20s was heard "confessing" he would have to do some swatting to catch up on all the "dee bees over S nine" and the Roger's and VFO technique, etc.

But the greatest blow is that anyone who is still crystal controlled, or "rockbound" in VFO parlance, is just tolerated by the "modern" operators.

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To those who wish to become hams, we would like to assure you that amateur radio need not be an expensive hobby, some old-timers taking pride in having built everything but the valves in their equipment.

Morse code is one of the snags for many beginners, and failure to build up sufficient confidence to sit for the exam has caused many a potential ham to wilt and give it away.

One thing seems important above all else. Do NOT visualise the letters as combinations of dots and dashes on paper, but memorise them as sounds —dits and dahs. Then write down the letters represented by the sounds from a buzzer or oscillator, with someone sending for you, or from a receiver tuned to a suitable station.

Where to Listen?

We suggest the eighty-metre amateur band, where special slow morse is sent on several nights of the weeks from various states. A Melbourne station can be heard (on 3504 kcs.) on Sunday nights at 8.30 or 2030 E.A.S.T. as it is usually given on the air.

Tasmania's night is Friday at the same time, and the procedure on the night of 26th May took the form of a contact between two stations. A preliminary call-in on voice, enabling beginners to identify the transmissions, was followed with greetings and encouragement to those who were trying hard to increase their copying speed.

Another suggestion we offer is to forget any single letter you miss, and to copy the next one if possible (dwelling on one letter will miss the rest of the word for you and perhaps get you confused). The ability to do that will be an achievement in itself. It is not easy but very necessary if you wish to gain speed before you become discouraged.

★

In a near future issue, we intend to give "how to make it" details of a code oscillator, followed by an article dealing with a simple short wave receiver.

T.R.F.

(Continued from previous Page)

output impedance, the power output across the output transformer remaining constant with change of frequency and impedance of the primary, all frequencies being reproduced at the same level. There is no phase reversal from input at the grid to output at the cathode and voltage feedback keeps the output stage free from distortion.

The set is quiet between stations, as there are no valve or circuit noises due to converter valve action, no distant stations audible to cause interference, and low detector plate current with no signal.

Another feature is that there are no boom or resonance effects, the output being clear at both maximum and low volume settings.

As will be seen from the circuit, the valve types selected are just the usual run of popular valves. Types 6U7G are used in the r.f. stages. These have quite high gain, so in order to ensure stability it is desirable to isolate the plate and screen sections with resistors of 1500 ohms and .1 megohms, as shown. These resistors serve the double purpose of de-coupling the circuits and providing correct operating voltages. The earthing of the .1 mfd. by-pass condensers should be carried out effectively, for preference back to the same earth point as for the cathode by-pass, rather than as indicated in the circuit which is purely schematic.

If six valves seem unnecessary when three will bring in all the locals it is for the same reason that a pipe organ is unnecessary when a tune can be played on a mouth organ!

Receiver Circuit Designs

IN this part it is intended to discuss a few of the simpler radio receivers and, as power supplies were covered in part X, they will in general be omitted from the diagrams.

THE simplest receiver is, of course, the crystal set, consisting of a station selector, a crystal detector, and phones.

Fig. 1a shows the circuit of the slider tuned type, the equivalent circuit of which is shown in fig. 1b. The capacity C is the capacity of the aerial and, with the variable inductance of the coil, makes a tuned circuit of the rejector type. The crystal, which will conduct effectively in one direction only, passes an unidirectional current to the phones, the magnitude of this current being dependent on the peak value of the r.f. signal. As this varies with the modulation, so will the phone current, giving rise to audible sounds of the same form as the original modulating sound.

Fig. 1c, 1d and 1e show different circuits, all of which use a variable condenser and a fixed inductance for tuning, the principal difference being the method of coupling the aerial to the tuned circuit and crystal. Fig. 1e has two tuned circuits, a series tuned one in the aerial and a parallel tuned circuit coupled to it.

Several different types of crystal detector are used in practice:

(i) A crystal of galena or similar material with a fine contact wire (called a cats-whisker).

(ii) Two crystals of different materials pressed together by a spring.

(iii) A carborundum crystal and a steel point or plate held together by a strong spring.

(iv) A germanium diode such as the IN34.

When a powerful radio station is very close it is possible to operate a speaker from a crystal type receiver, in fact the monitor unit in some broadcasting stations is a circuit like 1c but using an ordinary power rectifier in place of the crystal.

In general, the maximum useful range of a crystal type receiver is about 20 miles.

The useful range of reception may be increased by the use of a valve detector as this gives some amplification to the signal.

The simplest one valve receiver is shown diagrammatically in fig. IIa. The aerial is coupled to the tuned circuit consisting of a coil and variable condenser. The upper, or grid, end of this coil is connected to the valve grid by means of a grid condenser and grid leak (typical values .0002 mfd. and 2 megohms).

The operation of the grid leak detector was briefly explained in part VI and is basically a diode detector direct

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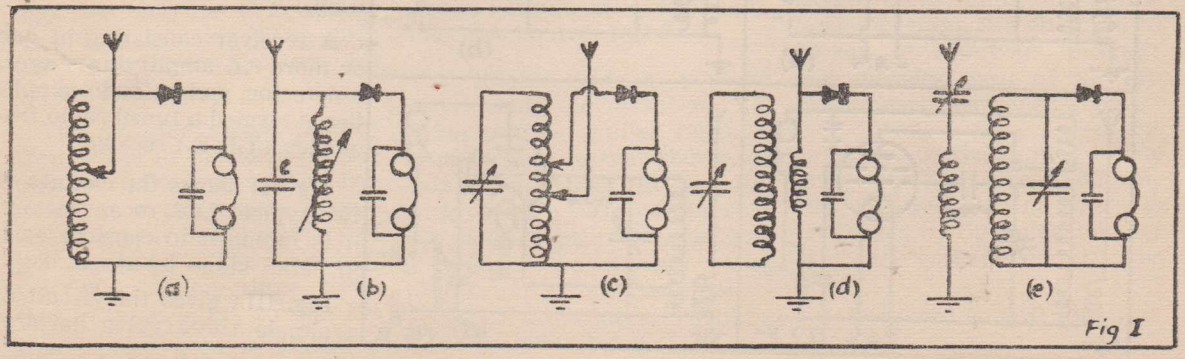


Fig 1

THEORY

(Continued)

coupled to a triode amplifier, the valve grid acting as the diode plate as well as the amplifier grid.

Three different aerial connections are shown, any of which may be used.

The Reinartz Receiver

Receivers having a single valve as above have only a relatively mediocre performance, principally due to the losses in the coils, the loading of the coil by the detector and the aerial and various other factors. There will, after detection, be a certain amount of r.f. signal present at the plate of the valve and it is found that if some of this r.f. is fed back into the grid circuit in the correct phase it will make up for these losses. In fact, if too much is returned to the grid the losses will be more than made up and the valve will break into self oscillation at the tuned frequency. It cannot normally be used for reception in this condition but, by fitting a control in the feedback or regeneration circuit it is possible to adjust the conditions so that the losses are almost exactly made up. This has the effect of greatly increasing the efficiency of the input circuit so that much greater sensitivity and selectivity can be obtained (but at the tuned frequency only). This makes the regenerative circuit much superior to the simple valve set above. There are several different versions of the regenerative receiver, the best known being the Reinartz circuit as shown in fig. IIb. The r.f. in the plate circuit is stopped by the r.f. choke and passes via the plate or tickler coil to earth through the small variable condenser shown. As the capacity of this condenser is increased the amount of feedback increases so that this condenser acts as a regeneration control.

If a regenerative receiver is operated in an oscillating condition it will radiate signals which may interfere with the reception of nearby receivers.

Fig. IIc shows a different method of regeneration control, in this case applied to a screen grid valve. The plate coil and condenser are both fixed and the regeneration is controlled by varying the screen voltage.

Fig. IId is a type of regenerative circuit applicable to indirectly heated valves. The feed-back coil, instead of being in the plate circuit is in the cathode lead, and is a tapping on the main grid coil instead of a separate coil. Screen voltage control is used again.

Radio Frequency Amplifiers

A considerable improvement in performance may be obtained by the use of a stage of amplification before the detector. If this amplifier stage as well as the detector is tuned, there will be an even more important improvement — the selectivity will be much better. A triode valve could be used as an r.f. amplifier but it could not be used as a tuned stage without neutralization and would only give a small amplification at best. A screen grid valve or a pentode would give a much higher gain and would not require any special precautions except effective shielding of the grid circuit from the plate coil and detector valve.

The gain of the stage may be controlled by either of two methods:

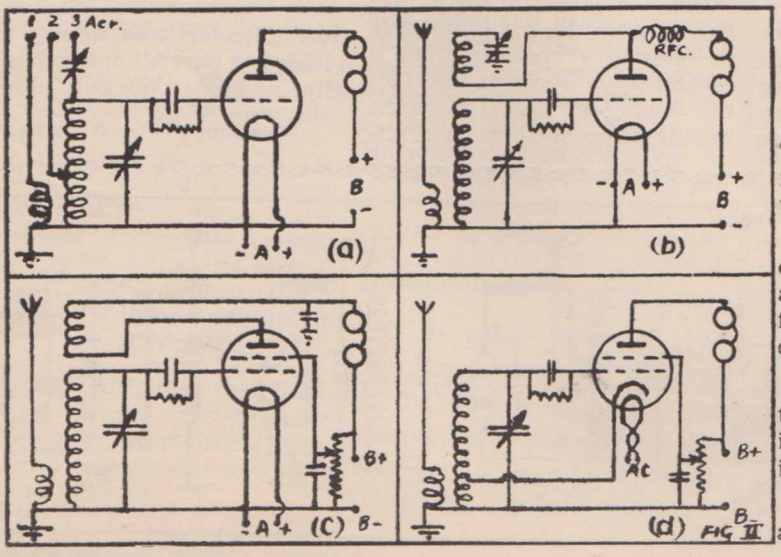
(i) by variation of the screen voltage. This can be used with either sharp or remote cut-off valves.

(ii) by variation of grid bias. This is recommended where a remote cut-off type of valve is used.

A receiver consisting of one or more r.f. amplifying stages, a detector, and an audio amplifier is termed a tuned radio frequency (T.R.F.) receiver.

Fig. III shows the circuits of two typical t.r.f. receivers, and it is intended to consider each in detail stage by stage.

Fig. IIIa gives the circuit of a simple three valve battery-



operated receiver and we will deal with this case first.

VI is a screen grid valve of the sharp cut-off type (32, 1E5) and has its grid circuit tuned by the aerial coil L1 and the variable condenser C1. The condenser C4 is fitted to ensure that any impedance in the bias battery will not have any effect on the tuned circuit. The condenser should be at least .05 mfd. The plate circuit of the valve is conventional, being the primary of the r.f. coil L2. The screen voltage for V1 is obtained from a potentiometer R1, the screen being by-passed to the filament by the condenser C3 (about .1 mfd.). Variation of screen voltage is used as a gain control, the gain increasing with rise of screen voltage, the resistance R2 limiting the maximum value to the rating of the valve.

The grid winding of L2 is tuned by the variable condenser C2, which may be ganged to C1 if the coils L1 and L2 are properly matched. V2 is a triode which operates as a grid leak detector, C5 and R3 being the grid condenser and grid leak. Regeneration is provided by the coil L3 and the small variable condenser C6, usually a 100 mmfd. variable. The coil L4 is an r.f. choke and is placed in the plate circuit as shown to prevent any r.f. in the plate circuit passing to earth or B+ through the capacity of the transformer windings. A fairly low H.T. voltage should be used for V2 to limit the no signal current, no bias being used.

The detected signal (audio) from V2 is in the form of current variations at audio frequency and this causes a voltage to appear in the primary of transformer T1. The secondary voltage is about three times that in the primary so that the transformer gain is added to

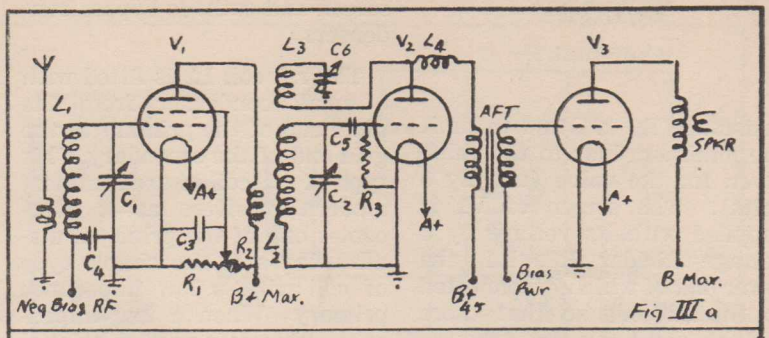


Fig III a

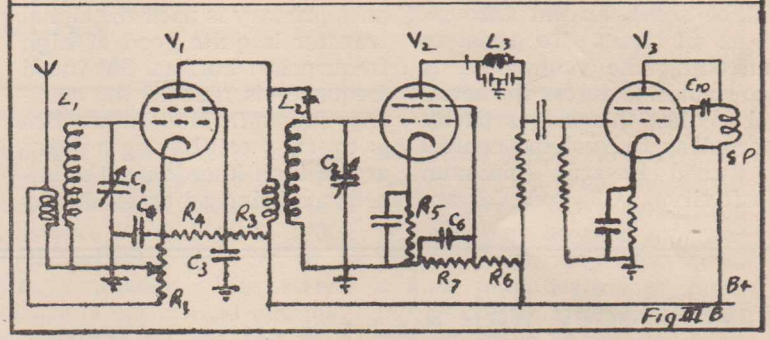


Fig III B

that of the valves. The secondary voltage is applied to the grid of V3, in this case a second triode. The negative bias required for this valve is obtained from a bias battery or other means and is applied to the secondary of the transformer. This valve is termed the power valve and is designed to operate the speaker, the impedance of which is arranged to suit the valve.

Notes: Some improvement may be made by using a variable-mu tetrode or pentode for V1. Screen voltage control could be retained or a fixed screen voltage used and variable bias control fitted

A screen grid or pentode valve could be used as V2, either with a similar regeneration system to that shown, or using the circuit in fig. IIc, with variable screen voltage. If a tetrode or pentode is used as a detector transformer coupling cannot be used and resistance or impedance coupling must be substituted.

V3 could be a pentode with some improvement in efficiency.

Owing to the fact that adjustment of the regeneration control usually has an effect on the tuning the ganging of the two tuned circuits will not be perfect but the tuned circuits will not be sufficiently selective for this to have an appreciable effect.

A Three-Valve Electric Receiver

Fig. IIIb shows a circuit for a three-valve electric radio, without power supply (this would be a unit to provide heater current and about 50 to 60 ma. at 250 volts, filtered) and includes most of the improvements mentioned above.

V1 is a variable-mu pentode or tetrode (58, 6U7, 6SK7, 35) the negative bias of which is controlled by the potentiometer R1 in the cathode circuit. The

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THEORY

(Continued)

resistance R2 is fitted to limit the minimum bias to the value given for the valve (usually 3 volts). The screen of V1 is supplied with its voltage by a voltage divider R3, R4, the lower end of which is connected to the cathode so that there will be some current through R1 at all times. To assist in controlling the volume R1 is also connected across the aerial coil so that this coil is partly shorted as the volume control is turned towards minimum sensitivity. C3 and C4 are screen and cathode bypass condensers.

The r.f. coil L2 is fitted with a small condenser from the plate end of the primary to the grid end of the secondary. This type of r.f. coil is used in most modern receivers as it overcomes one of the principal disadvantages of the simple type of coil with a low impedance primary When a low impedance primary is used the signal transfer is quite good at high frequencies, but, as the tuned frequency is reduced the efficiency falls off. Modern practice is to use a coil having a primary of high impedance, the impedance being adjusted during manufacture so that it will resonate with the valve plate capacity and the stray wiring capacity at some frequency just below the lowest to be received. The coupling between the two coils is adjusted to give a good signal transfer under these conditions, the high impedance due to the primary approaching resonance being an advantage because screen grid and pentode valves require a high impedance load.

At high frequencies the plate coil presents a high inductive reactance to the plate circuit so that a fairly high r.f. voltage will appear at its plate end. This is transferred to the grid end of the secondary by the small condenser, which presents a very low empedance at high frequencies. This condenser should be of low capacity (usually a single turn of wire wound alongside the last grid coil turn — the end left open). Modern pie wound coils may have a single capacity turn or, better, a small mica capacitor (5-10 mmfd.) as the h.f. coupling. The effect of this arrangement is to give a fairly even signal transfer over the whole band, effectively overcoming the falling efficiency which would occur with a simple primary. The coils must be so connected that the two effects aid each other at the mid-band frequencies.

While on the subject of r.f. coils it would be as well to make some mention of the use of litz wire and iron cores. The litz wire, by reducing the skin resistance of the wire, greatly reduces the r.f. resistance of the coil, thereby increasing the Q of the coil ($Q = L/CR$) and with it the selectivity and general efficiency. Iron cores serve two purposes, firstly by improving the magnetic circuit, they increase the inductance of

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a given coil, allowing less turns for a given inductance, further increasing the Q of the coil, and, in addition, they may be made adjustable, allowing a certain amount of latitude in the coil winding. With the old type solid wire solenoid coils the number of turns had to be exactly right, in fact, each coil had to be individually adjusted to the correct inductance using a beat oscillator or the like. As it would not be practicable to remove or add turns the coils were often wound with the last three or four turns at the grid end separated by a small distance from the rest. The inductance may be adjusted by moving these turns to or from the others, increasing or decreasing the length of the coil (a short coil has a higher inductance than a long one for a given number of turns and diameter). The necessity for this adjustment disappears with the use of adjustable iron cores as the cores may be adjusted after the receiver is built so that the inductances are the required value. The range of adjustment is comparatively small, however, too much may upset couplings or selectivity.

Returning to the receiver under discussion the r.f. coil L2 is tuned by the condenser C2 and is connected directly to the grid of the detector valve V2, which should, in this case be a sharp cut-off valve (57, 24A, 6C6, 6SJ7, etc.) as it is operated as a biassed detector. The bias is obtained from the bias resistance R5 of 5000 to 10000 ohms, bypassed by a .25 or .5 mfd. condenser. The screen voltage is not critical and may be obtained by the use of a voltage divider R6-R7. The value may be 50 to 100 volts, depending on R5 and must be bypassed to earth by the condenser C6 (.1 mfd.). Transformer coupling cannot be used with screen grid valves owing to the high load impedance required so resistance coupling is normally used. A plate resistance of 250,000 ohms is typical, coupled to a grid resistance of 500,000 ohms by a condenser of .01 to .05 mfd., the higher value giving a better low note response.

An r.f. choke L3, bypassed on each side by a condenser of 50 to 100 mmfd. effectively removes the r.f. from the signal to the power valve grid. This is important because a power pentode valve may have quite a good amplification at radio frequencies and these frequencies can easily be radiated from a speaker lead to a nearby aerial wire with consequent instability.

The power valve V3 may be any pentode or beam power valve (2A5, 42, 6V6, etc.) and is operated under cathode bias conditions. The cathode resistance, the value of which depends on the valve type, should be bypassed by a condenser of about 25 mfd. Failure to do this will cause a drop in low note response (capacity too small) or poor gain. The condenser C10 is provided to give some high note attenuation and to partly correct the tendency for a rise in gain on high notes which occurs with pentode valves and inductive loads. The usual values range from .004 to .01 mfd.

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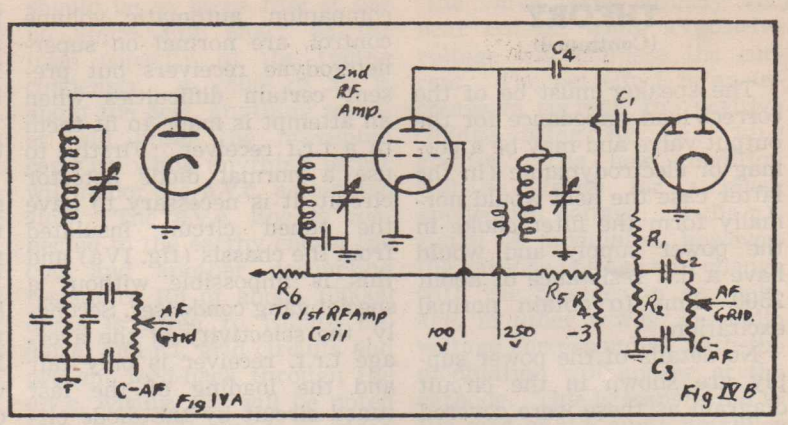

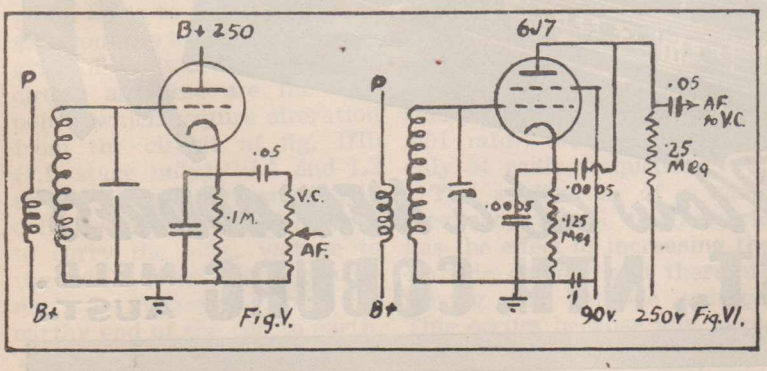

THEORY
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The speaker must be of the correct load impedance for the output valve and may be a permag or electrodynamic (in the latter case the field would normally form the filter choke in the power supply and would have a d.c. resistance of about 2500 ohms to obtain normal excitation).

No details of the power supply are shown in the circuit diagram as these were covered in the last part. The power supply should be capable of providing a.c. for the heaters and 50 or so ma. of filtered d.c. at about 250 volts.

Diode Detection

The diode detector, and its companion, automatic volume control, are normal on superheterodyne receivers but present certain difficulties when an attempt is made to fit them to a t.r.f receiver. Firstly, to use a normal diode detector circuit, it is necessary to have the tuned circuit insulated from the chassis (fig. IVa) and this is impossible without a special gang condenser. Secondly, the selectivity of the average t.r.f. receiver is only fair and the loading of the last tuned circuit by the diode circuit will tend to reduce it further so that it is impracticable to consider diode detection if there are less than three tuned stages (two r.f. stages and the detector). Another reason for the three tuned stages is the important point that a diode detector must be operated with a fairly high signal voltage for best results.

Fig. IVb shows an example of a t.r.f. detector using diodes.

The a.v.c. circuit is fairly straightforward, being similar to that used in any superhet. receiver for delayed a.v.c.

The audio detector system, however, is much different from the usual detector circuit. Firstly, the diode is supplied with the r.f. via a condenser C1 (.0001 mfd.) and the diode load resistor is tapped, the audio signal being taken from the tap. In operation the system works something like the grid leak detector, the diode voltage being such that the positive peaks of the r.f. signal

just make it conduct. This means that the average voltage across C1 is equal to the peak r.f. voltage and varies at modulation frequency. The current through R1 and R2 (50000 and 250000 ohms respectively) will also be proportional to this voltage so that the voltage of the tap point will be an a.f. voltage. This a.f. voltage is passed to the volume control R3 by the .01 mfd. condenser C2. The volume control should be as high a resistance as possible, preferably 1 megohm. The condenser C3 is necessary to provide a low impedance path at the zero end of the volume control, otherwise there would be an appreciable minimum volume. The section R1 of the diode load resistance is necessary to prevent the capacity of the volume control and its associate wiring affecting the tuned circuit.

To prevent, or at least reduce, the loading effect of the diode circuit the diode coupling condenser C1 is tapped into the tuned circuit part way down.

The a.v.c. circuit shown needs little explanation, being operated on the same principle, the condenser C4 being connected to the plate of the r.f. amplifier valve (last r.f. stage) or to the coil tap with the detector. The load resistances in this case are too high in value to have much effect on the tuned circuits (R4 and R5 1.5 to 2 megs. each). R4 acts as the diode load resistance while R5 is to filter any r.f. or a.f. from the a.v.c. voltage. The grid coils only are shown in the circuit as these are the only points which require alteration from the circuit of fig. IIIb (r.f. stage only). L1 and L2 are the aerial and first r.f. grid coils respectively and, in order to carry the a.v.c. voltage to the grid it is necessary to connect a condenser from the earthy end of the coil to earth. This condenser forms part of the tuned circuit capacity and should be so large that it has no appreciable effect on the total capacity of the tuning condenser. A value of .05 is about the best, anything smaller will upset the maximum capacity while anything larger will make the a.v.c. action too slow. The a.v.c. line is connected to the earthy end of the coil and another decoupling resistance R6 of about 100000 ohms is fitted to isolate the aerial and r.f. grid circuits and prevent feed-back through the a.v.c. wiring. It will be noted that no r.f. filtering is provided in the detector circuit but some should be fitted in the plate circuit of the first a.f. amplifier valve.

The diode detector, having no amplifying power, requires at least one audio amplifier between it and the power valve in most cases.

Infinite Impedance Detector

Some years ago a somewhat different type of biassed detector was introduced which overcame some of the disadvantages of the diode detector and had less distortion than the ordinary biassed detector.

The detector consists of a triode valve with a very high value of bias resistance, a typical value being 100000 ohms. This resistance is not bypassed for audio frequencies, the bypass condenser being .0005 to .001 mfd.

Fig. V shows a typical circuit, the valve being any medium-mu triode (6J5, 6J7 as triode, etc.), biassed by a high value of cathode resistance to a very low current. This cathode resistance (about 100000ohms) is bypassed by a small condenser only (.0005 to .001 mfd.) which is effective only at radio frequencies.

The application of a radio frequency signal to the grid has the effect of increasing the cathode current and therefore raising the cathode voltage. This occurs because any negative voltage applied to the grid will reduce the current to zero, the valve being already very near cut-off, while a positive voltage will increase the current. The net effect is an increase in current, the positive change being by far the greater. The new condition will be steady for a given applied r.f. voltage. If the r.f. signal be modulated, however, the cathode voltage will change with the changes in r.f. voltage, in other words, an audio voltage corresponding with the modulation will appear at the cathode. This is transferred to the grid of the audio amplifier by the condenser shown.

The advantages of this detector are:

1. High input impedance — virtually infinite — allowing most efficient use of last r.f. amplifier and tuned circuit. (The diode loads the last tuned circuit fairly heavily greatly reducing its efficiency.)

2. Lower distortion than the diode when modulation exceeds about 60% — which occurs frequently, and lower distortion than the normal biassed detector. (Max. distortion about 2% at 100% modulation.)

On the debit side there is the fact that this detector has to be supplied with a signal of about 10 volts r.f. and has a definite upward limit also, due to the possibility of grid current. This means that some form of automatic volume control is essential, for preference a separate channel or amplified volume control capable of holding the signal within close limits.

The tuned radio frequency receiver, in general, is only suitable for local reception, the selectivity being unsatisfactory for other than limited reception outside a small radius, but this poor selectivity has its advantages where high fidelity is desired. The wide reception band allows the full side-bands transmitted to reach the detector, permitting reception of all audio frequencies transmitted.

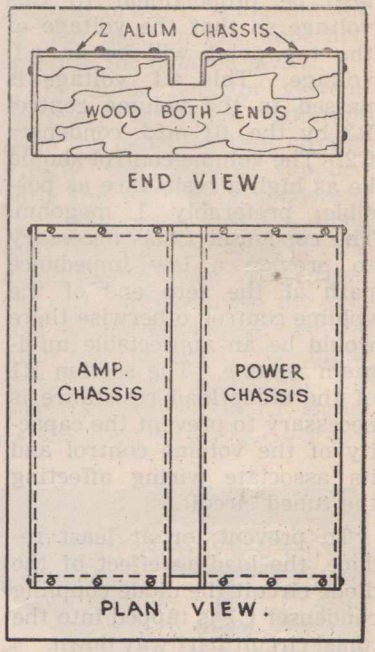
Neat Chassis Construction Idea

UP till now there have been two main ways of building radio sets and amplifiers, either one a single chassis base, or on two separate bases, one for the receiver or amplifier and the other for the power supply unit.

The single unit has the advantage of compactness, cheapness, simplicity of wiring and so on. On the other hand the separate power supply has the advantage of separating mechanical vibration of the power transformer and filter choke core laminations from the sometimes micro-phonic elements of the early amplifier stages. Two units mean a rather complicated coupling cable with plug and socket, but often helps to avoid hum troubles caused by magnetic induction from the powerful magnetic fields set up in the power supply units.

One of our keen readers, Mr. W. S. Ford, of 54 Oxford Street, Burwood, has thought up a novel amplifier chassis arrangement which embodies some of the best features of both designs. What is to the point is that Mr. Ford has been kind enough to send along details of his arrangement so that we can publish them for the benefit of all readers. It would be a great help to all concerned if more of our readers would do likewise; send along any bright ideas they happen to come across.

Basis of Mr. Ford's idea is to use two separate pieces of folded sheet metal for the two bases, but mount them together on a pair of single wooden ends. There is no metallic connection between the two bases, so no chance of stray fields. Mechanical vibration is absorbed and dampened out by the wood, which also gives structural rigidity. No plugs, sockets or connecting cables are required as the wiring can be carried out in the normal way, just as though a single unit chassis was employed.



The idea seems to be a fine one in every way and we cannot imagine any likely drawbacks to the scheme.

NEW ROLA SPEAKER

NO official announcement has yet been made by the Rola Company, but it is widely known throughout the trade that the Rola engineers have been working for some time past on a new high-fidelity speaker. This speaker, which will probably carry the type number of "120X", features twin cones, is capable of giving really wide-range reproduction of the highest order, yet is expected to be in the medium price range. It may be some months before this speaker becomes available, but, in the meantime, there has been a lot of interest aroused. A demonstration of the speaker's capabilities was given at the recent convention of the Institution of Radio Engineers at the Melbourne Town Hall.

QUERIES

(Continued)

J.T. (Moe) has a set which stops when hot. One valve, a type 80, goes out but lights up again after cooling for a while.

A.—Most likely there is a dry connection between one of the filament leads and the pin to which it is connected.

Melt the solder with a HOT iron, or over a gas jet, and shake it out until the end of the wire is free to move. Countersink the hole in the pin with a sharp drill (the wire will push in) and clean the wire as far down as possible with a pointed instrument. Then tin both the wire and the new surface of the pin, using a non-acid flux and a hot iron, applying enough solder to make a good joint.

Such faults do occur in many types of valves which are mass-produced, and can show up in a new valve occasionally.

Foreign Language Broadcasts

Compiled by L. J. KEAST

B.B.C. SERVICES TO EUROPE IN FOREIGN LANGUAGES
Shown in Wave-length (Metres)
Continued from June issue
(Albanian, Bulgarian, Czecho-slovakian Danish, Dutch, Finnish, Flemish, French, French for Belgium, German for Austria and German shown in June issue.)

GREEK:
3.00- 3.15 p.m. 41.32, 31.50, 25.30
10.15-10.30 p.m. 30.96, 25.30, 19.61
4.30- 5.00 a.m. 41.49, 31.50, 19.61

HUNGARIAN:
4.15- 4.30 p.m. 49.59, 41.21
2.15- 2.30 a.m. 41.49, 31.50
5.30- 6.00 a.m. 41.49, 31.50, 25.42

ITALIAN:
4.30- 4.45 p.m. 41.32, 31.50, 25.30
10.30-10.45 p.m. 30.96, 25.30, 19.61
2.30- 3.00 a.m. 30.96, 25.30
4.30- 5.00 a.m. 30.96, 25.42, 25.30
7.00- 7.45 a.m. 41.49, 30.96, 25.30

LUXEMBOURG PATIOS:
6.30- 6.45 p.m. (Sundays) 41.61, 31.88

NORWEGIAN:
9.00- 9.15 p.m. 49.67, 31.01, 25.68
3.30- 4.00 a.m. 49.67, 31.01, 25.68

POLISH:
3.30- 3.45 p.m. 49.59, 41.21
11.30-11.45 p.m. 40.98, 31.17, 25.15
2.15- 2.45 a.m. 40.98, 31.17, 25.15
4.30- 5.00 a.m. 49.59, 40.98, 31.17
7.30- 8.00 a.m. 49.59

PORTUGUESE:
11.30-11.45 p.m. 31.01, 25.68
5.45- 6.15 a.m. 31.01, 25.68

ROUMANIAN:
2.30- 2.45 p.m. 41.32, 31.50
2.00- 2.15 a.m. (Tues. and Thurs.) 41.49, 31.50
2.45- 5.00 a.m. 41.49, 31.50, 19.61
5.00- 5.30 a.m. 41.49, 31.50, 25.42, 19.61

RUSSIAN:
1.15- 1.45 p.m. 49, 41, 31, 25, 19, 13 Metre Bands
8.00- 8.15 p.m. (Sunday) 49, 41, 31, 25, 19, 13 Metre Bands
12.15-12.45 a.m. 49, 41, 31, 25, 19, 16, 13 Metre Bands
7.15- 7.45 a.m. 49, 41, 31, 25, 19, 16, 13 Metre Bands

SERBO-CROAT:
3.45- 4.00 p.m. 41.32, 31.50, 25.30
11.45-Midnight 30.96, 25.30, 19.61
2.15-2.30 a.m. (Tues. and Thurs.) 30.96, 25.30
3.15- 3.30 a.m. 41.49, 31.50, 25.42, 19.61
5.45- 5.15 a.m. 30.96, 25.30
7.45- 8.15 a.m. 41.49, 30.96

SLOVENE:
6.15- 6.30 a.m. 30.96, 25.30

SPANISH:
11.15-11.30 p.m. 31.01, 25.68
6.15- 7.00 a.m. 49.67, 31.01, 25.68
8.00- 8.30 a.m. 41.67, 31.01

SWEDISH:
4.30- 5.00 a.m. 49.67, 31.01, 25.68

TO LEARN ENGLISH BY RADIO
B.B.C. TRANSMISSIONS

English—
3.15- 3.30 p.m. 41.32, 31.50, 25.30
3.45- 4.00 p.m. 49.59, 41.21
4.00- 4.15 p.m. 48.54, 41.61
8.45- 9.00 p.m. 49.67, 31.01, 25.68
9.30- 9.45 p.m. 31.50, 25.30, 19.61
10.00-10.15 p.m. 41.61, 40.98, 31.88, 31.17
11.00-11.15 a.m. 31.01, 25.68
1.45- 2.00 a.m. 49.67, 31.01, 25.68
2.45- 3.00 a.m. 41.61, 31.88, 25.49
3.30- 3.45 a.m. 30.96, 25.42, 25.30, 19.61
5.30- 5.45 a.m. 30.96, 25.30
7.15- 7.30 a.m. 49.50
9.45-10.00 p.m. (Bulgarian)—
(Mon. and Wed.) 31.50, 25.30, 19.61
4.00- 4.15 p.m. (Czech.)—
(Tues. and Thurs.) 41.32, 25.30
2.00- 2.15 a.m. (Roumanian)
(Tues. and Thurs.) 41.49, 31.50
2.15- 2.30 a.m. (Serbo-Croat)—
49.59, 40.98, 31.17
(Tues. and Thurs.) 30.96, 25.30
2.00- 2.15 a.m. (French)—
41.61, 31.88, 25.49
(L'Anglais par la Radio)
6.00- 6.15 a.m. (French)—
48.54, 41.61
(L'Anglais par la Radio)
4.15- 4.30 a.m. (German)—
49.49, 40.98, 31.17
('Lernt Englisch im Londoner Rundfunk')

THE VOICE OF AMERICA

Call-Sign		Megacycles	Metres
WLWO	1	6.08	49.34
	2	17.80	16.85
	3	21.52	13.93
	5	11.71	25.62
		15.24	19.69
		15.25	19.68
		15.35	19.54
	6	15.33	19.57
	7	11.71	25.62
		17.80	16.85
		21.65	13.85
	8	9.70	30.93
KRCA	1	9.51	31.55
		21.46	13.97
	3	17.83	16.82
		15.25	19.68
WGEO	1	9.53	31.48
		15.33	19.57
	2	11.847.5	25.32
		15.33	19.57
		21.59	
	3	17.765	16.88
MANILA	1	11.89	25.28
		15.33	19.57
	2	15.25	19.68
		15.33	19.57
		21.57	13.90
	3	9.53	31.48
		17.78	16.87

Schedule Changes

*Change in Schedule

PROGRAMME FROM TANGIERS—

Note: Changes in Call Signs

		m.c.	met.	
Tangiers	2	15.25	19.68	2.00- 6.00 a.m.
	1	15.21	19.73	3.15- 7.45 a.m.
	*2	11.79	25.44	6.00- 8.15 a.m.
	1	7.214	41.61	11.00 p.m. - Midnight
	1	6.06	49.5	8.00- 8.30 a.m.

VOICE OF AMERICA FROM MUNICH—

		m.c.	met.	
Munich	1	15.28	19.64	2.00- 3.45 a.m.
	1	11.87	25.27	5.30- 8.30 a.m.
	*2	9.54	31.45	1.45- 8.15 a.m.
	*4	7.25	41.38	1.45- 8.15 a.m.
	3	6.08	49.34	1.45- 8.30 a.m.

Call-Sign		Megacycles	Metres
KWID	1	9.57	31.35
		11.90	25.21
		17.76	16.89
	2	9.57	31.35
		11.86	25.29
WRUL	1	11.79	25.44
		15.29	19.62
		15.35	19.54
	2	15.35	19.54
	3	15.31	19.60
	4	17.75	16.90
		9.57	31.35
		11.79	25.44
	5	17.75	16.90
KRCA	1	15.13	19.82
	2	15.13	19.82
		9.65	31.09
		9.70	30.93
WABC	1	9.65	31.09
		21.57	13.90
	2	15.27	19.66
	3	17.83	16.82
	6	21.50	13.95
KGEI	1	9.67	31.02
		15.105	19.86
	2	11.73	25.58
WRCA	1	15.21	19.73
	2	17.78	16.87
	3	21.61	13.88
	5	11.77	25.48
	6	9.67	31.02
		21.73	13.81
KCBR	1	15.13	19.82
	2	9.70	30.93
		21.74	13.81
		17.77	16.88
	3	15.21	19.73
		15.31	19.60
		17.77	16.88
HON	1	11.79	25.44
		17.80	16.85
		15.25	19.68
WBOS	1	15.285	19.63

WEST COAST STATIONS

(including Honolulu)

Note Change in Call Signs

	m.c.		
KCBR - 2	21.74	13.81	7.45- 8.00 a.m. 9.00-10.00 a.m.
KRCA - 1	21.46	13.97	Noon- 1.00 p.m.
KRCA - 3	17.83	16.82	7.00 p.m. - 12.15 a.m.
HON - 1	17.80	16.85	5.15- 6.45 p.m.
KCBR - 3	17.77	16.88	7.45- 8.00 a.m. 9.00-10.00 a.m.
KCBR - 2	17.77	16.88	11.15 a.m. - 6.30 p.m.
KWID - 1	17.76	16.89	10.00 a.m. - 1.00 p.m.
KCBR - 3	15.31	19.60	11.15 a.m. - 6.30 p.m.
KRCA - 3	15.25	19.68	3.30- 6.30 p.m.
HON - 2	15.25	19.68	7.00 p.m. - 12.15 a.m.
KCBR - 3	15.21	19.73	7.00 p.m. - 12.15 a.m.
KRCA - 2	15.13	19.82	10.00 a.m. - 1.00 p.m.
KRCA - 1	15.13	19.82	5.15- 6.45 p.m.
KCBR - 1	15.13	19.82	7.00 p.m. - 12.15 a.m.
KGEI - 1	15.105	19.86	3.30- 6.45 p.m.
KWID - 1	11.90	25.21	3.30- 9.30 p.m.
KWID - 2	11.86	25.29	6.30 p.m. - 12.15 a.m.
HON - 1	11.79	25.44	7.00 p.m. - 12.15 a.m.
KGEI - 2	11.73	25.58	3.30- 6.45 p.m. 7.00 p.m. - 12.15 a.m.
KRCA - 2	9.70	30.93	5.15- 6.45 p.m.
KCBR - 2	9.70	30.93	7.00 p.m. - 12.15 a.m.

HOLLAND

Special Programme to Australia daily

PCJ, HILVERSUM—

21.48 m.c. 13.96 met.)
17.775 m.c. 16.88 met.) 8.00 - 8.55 p.m.
15.22 m.c. 19.71 met.)
6.025 m.c. 49.79 met.)

THE VOICE OF CANADA

The Voice of Canada may be heard every Sunday by shortwave listeners in Australia, New Zealand and the South Pacific—

CHOL, SACKVILLE—
11.72 m.c. 25.60. met. 6.40-8.30 p.m.

CKLO, SACKVILLE—
9.63 m.c. 31.15 met. 6.40-8.30 p.m.

All programmes are produced by the Australian, New Zealand and South Pacific Unit of the C.B.C. International Service. They are designed to tell listeners about Canadian life and to present an up-to-the-minute picture of happenings in Canada.

RADIO SWEDEN

The International Service of the Swedish Broadcasting Corp.

Schedule of Shortwave Programmes

SDB - 2 STOCKHOLM—
10.78 m.c. 27.83 met. 10.00-11.30 a.m.
1.15- 8.00 a.m.
(Home Service) 1.30- 8.00 a.m.

SBT STOCKHOLM—
15.155 m.c. 19.80 met. 10.00-11.30 a.m.
3.15 p.m.-8.00 a.m.
(Home Service) 3.15- 5.15 p.m.
9.00-10.15 p.m.
1.30- 8.00 a.m.

SBQ STOCKHOLM—
6.065 m.c. 49.46 met. 3.15- 5.35 p.m.
(Home Service) 3.15- 5.15 p.m.

SBP STOCKHOLM—
11.705 m.c. 25.63 met. 5.35 p.m. -
1.15 a.m.
(Home Service) 9.00-10.15 p.m.

BELGIAN CONGO

Radio Congo Belgi, Leopoldville, is now on the air, as follows, in French, Flemish and Portuguese—

	m.c.	met.	
OTM - 1	6.295	47.66	3.00- 5.00 p.m. 8.00-10.00 p.m. 2.00- 6.00 a.m.
OTM - 2	9.38	31.98	3.00- 5.00 p.m. 2.00- 6.00 a.m.
OTM - 4	11.72	25.60	8.15-10.00 p.m.

In a special broadcast for Nature Listeners

	m.c.	met.	
OTH	9.21	32.57	3.30- 4.30 a.m.

Speedy Query Service

Conducted under the Personal Supervision of A. G. Hull.

D.J. (Kaniva) writes: Looking over and comparing old circuits with those of recent years, I am intrigued with the fact that the voltage divider, as a standard component, has virtually disappeared. Have I missed something?

A.—The answer here is perhaps more historical than theoretical. All of the first receivers were battery-operated, and tappings were available between cells for voltages lower than the maximum of the battery.

Next followed battery eliminators, and to allow these to be used with any set built for battery operation, the voltage divider with fixed or variable taps was the most satisfactory way of providing intermediate voltages.

When "electric" sets were first built, it was common practice to mount a ready-made battery eliminator on the chassis, these being similar to the type used with battery sets, except that they had heater or filament windings to operate the then new AC operated valves. These eliminators were then called power packs.

After manufacturers had mastered the preliminary production problems, they built their own power packs—on the same chassis with the set itself, but with all the original components, and they were still standard power packs suitable to use with almost any set then built.

But, with the types of valves now used, so many different voltages are required in a set that these are generally arranged separately for each valve, sometimes by voltage dividers, but generally through series dropping resistors which incidently were not available to the earlier manufacturers in their present form.

J.F.M. (Kilcunda) writes: Nearly everyone knows that only distilled water should be used in wet "A" batteries, but I have never seen in print, or heard the real reason for this. Is it only sales talk?

A.—A wet battery contains sulphuric acid diluted with distilled water, and the introduction of foreign matter could result in chemical processes which would upset the normal operation of the battery.

For instance, metallic oxides would be attacked by the sulphuric acid which would then be rendered useless to the normal chemical action within the battery—in other words the battery would not hold its charge.

Ordinary tap water generally contains some rust (iron oxide) from the pipes and thus is to be avoided. Of the mineral waters, some are safe; but any lime or magnesia content, both common, would tend to neutralise the acid, again reducing the capacity.

Rain water is generally safe, but can contain dust particles of unknown matter, and during a thunderstorm nitric acid is formed as a by-product of lightning discharges, and though in small percentage could add to the chemical "confusion" within the cells.

Summing up, the price of distilled water is good insurance for your battery. If unobtainable, catch rain water in a glass or earthenware vessel.

BARGAIN CORNER

WANTED TO BUY.—Old type Delco genemotor starter and generator, commutators opposite ends, overdrive unit for car, Dodge or similar. Write Box 13, Carwarp, Vic.

FOR SALE.—Set of two-volt valves, six month's use, but all O.K. 1C7G, 1M5G, two 1K7G, 1L5G. 5/- each, or offer. Write or call. A. M. Griffiths, 8 Holyrood Avenue, North Essendon, Vic.

WANTED TO SELL. — V-belt pulley, 20-in. diameter, "B" belt, 3¼ in. split bore, ideal to drive generator off slow speed engine. New. £6. Write Box 13, Carwarp, Vic.

FOR SALE. — Goodman's "Axiom 12" twin-cone speaker, as new. Guaranteed perfect. Delivered Melb. suburb or packed. £10. Write No. 101, c/o. Box 13, Mornington, Vic.

FOR SALE.—Car radio, built from Paul Stevens Carlectric kit, not quite finished but all complete, with valves. £12. Apply No. 102, c/o. Radio World, Box 13 Mornington.

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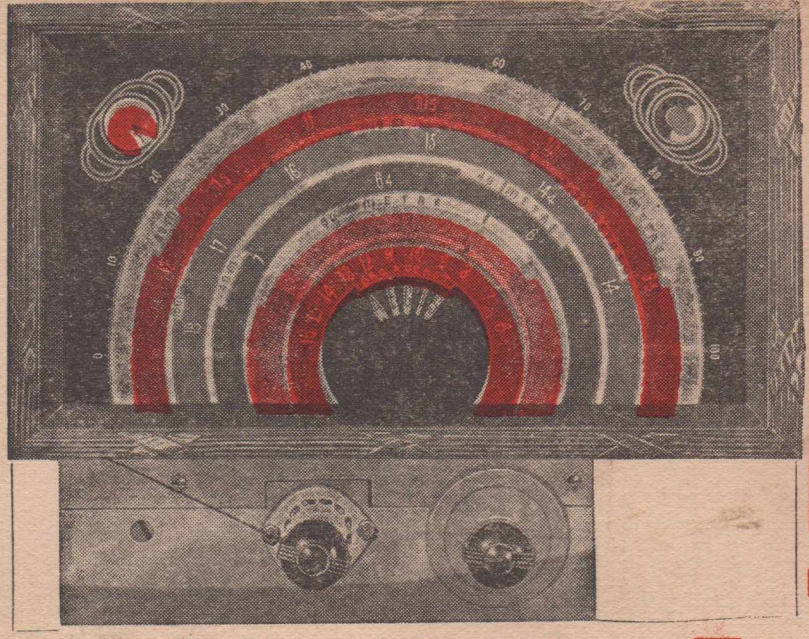

The LEADING 5 BAND

AEGIS KC.5

Electrical BANDSPREADING TUNING UNIT

Aegis does it again! This time it's a multi-band tuning unit, specially developed for the Custom built Console of the modern lounge! The unit is actually the entire "Front End" of a radio receiver, completely assembled and wired and accurately calibrated in megacycles and aligned. For those who are especially keen on listening to exciting Overseas Broadcasts direct from their origin, plus hundreds of amateur radio operators, talking to one another all over the world; small ships at sea, aircraft, police and standard broadcast interstate, we highly recommend the Aegis KC.5. Tuning on the Shortwave Bands is just as easy as tuning the Broadcast. Once a station is logged on this beautifully clear dial, you can rest assured it will appear at the same position next time.

SPECIAL FEATURES

Complete coverage of all popular bands obtained with FIVE SWITCH POSITIONS. (550-1630 Kc), (3.4-4.05 Mc), (5.8-7.5 Mc), (9.4-12.3 Mc), (13.9-18.2 Mc).

Bands indicated on dial include 16, 19, 20, 25, 31, 40, 49, 80 Metres, and Standard Broadcast.
Multi-coloured, full vision, illuminated dial. 12½" x 7¼".
Band change switch operates Automatic Band Indicator on dial face.
Fly wheel spin tuning shaft.
Provision for "Magic Eye" tuning indicator.
Positively no back lash on dial drive with 29:1 Ratio.
Special Perspex dial pointer prevents incorrect logging.

All coils possess high quality, adjustable, iron-dust cores.
Trimmers have high "Q" factor.
Best quality Moulded Mica, Ceramic and Paper Condensers incorporated in circuit.
I.R.C. Resistors used throughout.
Stabilised Voltage Control on Screens of both R.F. and Converter valves.
R.F. Stage on all wave bands.
Something New and Exclusive in Dial Escutcheons.
A.W.A. three-gang Tuning Condenser floated on Rubber.
Whole unit may be mounted on four rubber grommets when attached to chassis.

All associated resistors and by-pass condensers included, complete.
Any number of valves and control circuits can be built around this unit to give the desired results. (We recommend two I.F. stages using Aegis J20 and J21 I.F. Transformers).
Only five connections to make, to feed into any 455 Kc. I.F. channel.
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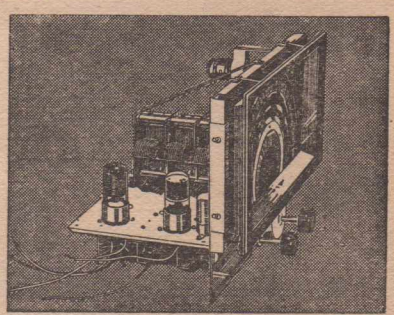

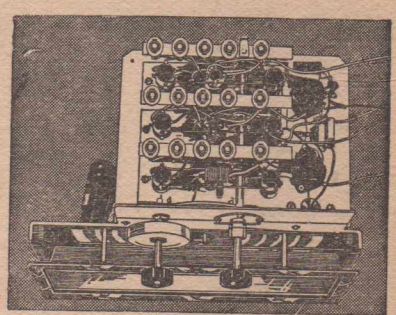

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