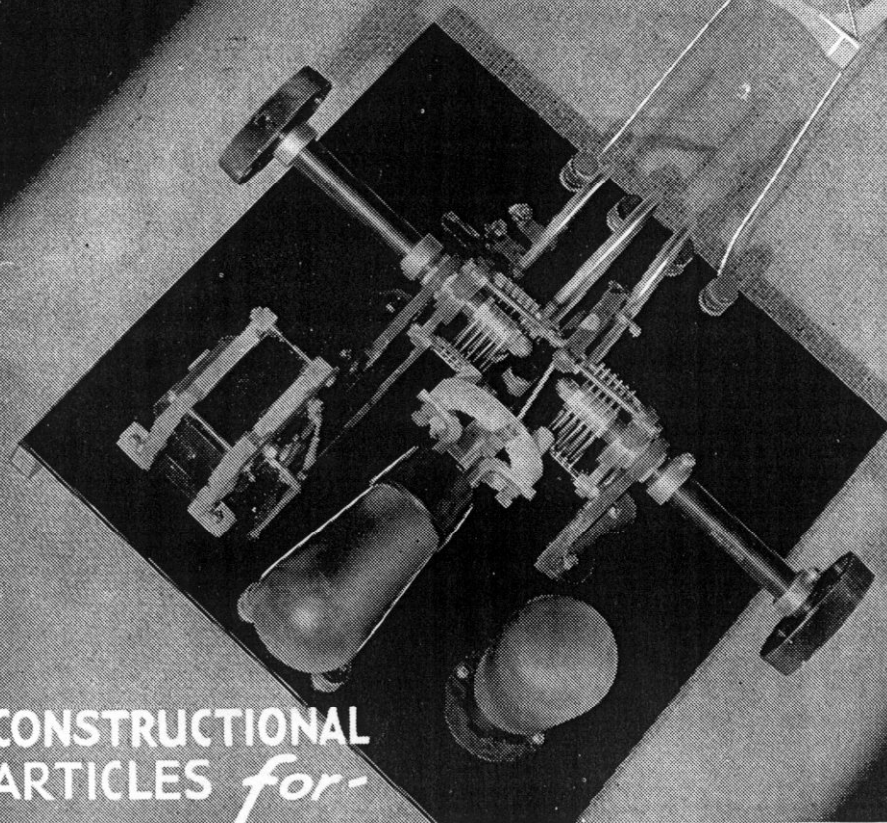


# EDDYSTONE

## *Short Wave*

### MANUAL



6<sup>D</sup>

CONSTRUCTIONAL  
ARTICLES *for*

SHORT WAVE RECEIVERS AND APPARATUS

THE broadcast side of wireless on the medium and long waves, under existing circumstances has lost much of its early appeal to the real radio enthusiast. Factory built sets cater for all general requirements and a known quantity exists as far as range and quality are concerned.

Short wave radio, on the other hand, offers the world as a field for reception with that unknown factor, the ether, to add to the thrill of the game. Further, on the ultra short waves, which are coming into greater prominence and use, there exists a whole field for genuine experiment at present comparatively unexplored.

We hope that this second number of the Eddystone Short Wave Manual will prove of help and interest to those who wish to join the ranks of radio enthusiasts who find this the most interesting side of wireless.

Stratton & Co. Ltd.,  
Eddystone Works,  
Bromsgrove Street,  
BIRMINGHAM 5.

# EDDYSTONE

## SHORT WAVE MANUAL

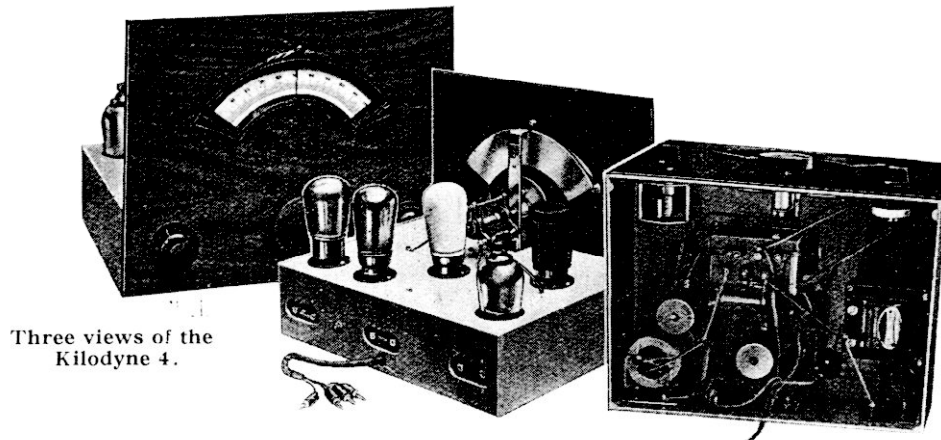
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# THE 1935 KILODYNE FOUR

A POWERFUL 4 VALVE SHORT WAVE RECEIVER  
WITH BROADCAST BANDS ADAPTION  
BATTERY MODEL, 13-2000 METRES



Three views of the  
Kilodyne 4.

The 1933/34 Kilodyne has proved so successful that the 1935 model incorporates most of its features. There are, however, a number of improvements which have been added and have still further added to its capabilities. The screened grid valve has now been replaced by one of the new vari-mu pentodes and a variable potentiometer giving variable bias to this valve is fitted, so that an effective selectivity control is available. The high frequency chokes have been replaced with a new screened type and a Ferranti transformer replaces the one previously used.

The set gives loud speaker results from all the main short wave stations in the world and is extremely simple to operate. Reaction is smooth and there is no trace of hand capacity effects. Tuning is by one dial only with open vision scale and slow motion ratio. From the theoretical diagram, it will be seen that the aerial stage consists of a high frequency choke in the grid circuit of the high frequency valve. Full advantage of the characteristics of the high frequency valve is, however, obtained by means of the high frequency transformer with tuned secondary winding which couples this valve to the detector. The transformer incorporates a reaction winding which is fed from the detector plate by the Reinartz method. The detector valve is of the metallised type with leaky grid detection and is coupled to the first L.F. valve by means of a resistance coupling stage. The values of this stage are so arranged that maximum use of the amplification factor of the valve is obtained. The

first L.F. valve is of the high amplification type and is followed by a Ferranti AF4 transformer, which feeds the final output valve. This last valve is a high amplification pentode. It should be appreciated that the Kilodyne has been primarily designed for short wave reception and although the selectivity on the broadcast band is good, it is not equal to a receiver employing many tuned circuits.

## CONSTRUCTION.

The lay-out and general construction of the receiver are simplified due to the one-piece diecast chassis which contributes to a strong and workmanlike looking job in the finished receiver. The components on the underside, including the back terminal strips, should first be screwed into place and it is of advantage to leave the potentiometer, reaction condenser and tuning dial until last, when the panel is fitted. It should be noted that in many cases soldered joints are employed. This method has been adopted because it gives greater efficiency, particularly in the cases where several connections are made to one point. The actual wiring details are clearly shown in the wiring plan, which should be used in conjunction with the theoretical diagram and the point to point wiring instructions. The following points are, however, mentioned for greater clearness.

Leads Nos. 5, 17, 25, 36, 48 and 53 are connections made to the metal chassis, via fixing screws, and it should be seen that the fixing screws make good metallic contact

## 1935 KILODYNE FOUR—continued

with the chassis, the paint being scraped off. The condenser block also makes connection with the chassis from its underside and good metallic contact should exist here. The potentiometer connections are more clearly shown in the small sketch in the wiring plan. Lead No. 37 is actually made by connecting the tag of the .006 mfd. coupling condenser direct to the terminal of the high frequency choke. Leads 30 and 32 are shown broken for greater clearness. The position of the resistors, which are situated at different heights, may perhaps be difficult to follow from the diagram, and are as follows: The 100,000 ohm resistor runs at the narrow side of the block condenser, about  $1\frac{1}{2}$ " from the chassis base. The 50,000 ohm resistor is practically level with the top of the condenser block, as is also the 40,000 ohm unit, while the 30,000 ohm resistor is just above the top of the condenser block. The 3 megohm leak is just above the grid condenser and is  $\frac{3}{4}$ " from the baseplate. Leads Nos. 44 and 52 go to the under terminals of the transformer.

## VALVES.

The set has been designed for maximum efficiency round the valves which are specified and it is important to adhere to this choice, otherwise we cannot guarantee satisfactory operation.

First Valve	.....	Osram VP21.
Detector Valve		Mazda HL2 metallised or Osram HL2K metallised.
First L.F. Valve		Mazda HL210.
Pentode	.....	Mullard PM22.

## BATTERIES.

A 2 volt low tension accumulator is needed and the high tension supply should be 135/150 volts. No grid bias battery is needed, as grid bias is obtained automatically from the high tension supply and adjusts itself if the high tension voltage varies.

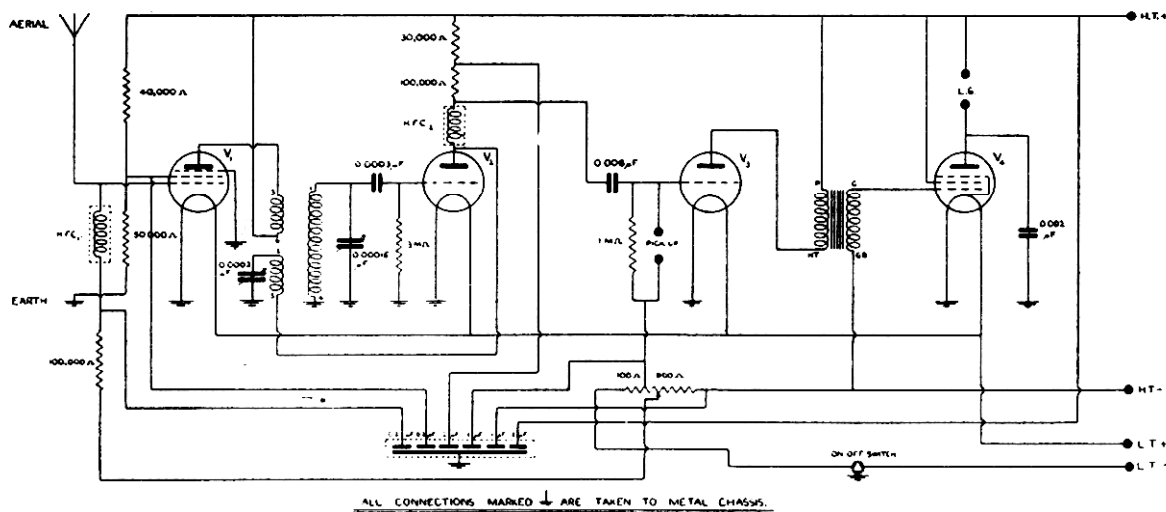
## CONNECTING UP.

There are only two connections to the L.T. battery and two to the H.T. battery, which are provided by means of the set of leads. There remains to attach the aerial, earth and loud speaker connections and the set is ready for use.

## OPERATING THE SET.

Insert a suitable coil and then starting with both tuning condenser dial and the reaction condenser at minimum, switch the receiver on. Turn the potentiometer control full on so that volume is at maximum. Increase the reaction control slowly by means of the vernier knob until at a certain point the set will begin to oscillate; this will be noticeable immediately since a low rushing sound will be heard. Throughout the whole tuning operations, this reaction control should be so adjusted that the set is always only just in this oscillating condition. The reaction control should never be turned any more than is necessary for the first reaction sound to be heard. Now commence turning the tuning dial slowly, increasing the reaction control gently if necessary to keep the set in the oscillating condition. Probably the first

THE 1935 KILODYNE FOUR.



## 1935 KILODYNE FOUR—continued

signals to be heard will be C.W. morse transmissions, a series of dots and dashes of a high pitched musical note. With the set in the slightly oscillating condition referred to, telephony signals will also be first heard as a high pitched whistle similar to a continuous C.W. morse signal with the difference, however, that as the tuning is varied, the note will appear to consist of a double peak signal with a silent point in the centre. To receive the telephony signal clearly, leave the set tuned to the silent point, slack off the reaction control very slightly until the set is just out of oscillation, retune a trifle if necessary, and the speech or music should be quite clearly heard. It simplifies the operation of the receiver when searching for stations, to keep it in the oscillating condition, but it should be borne in mind that clear telephony can never be received with the receiver oscillating.

The operation of the volume control is also of great importance in obtaining selectivity. The station should first of all be received with the control near maximum and then if the control is reduced until the signal is about half strength, volume should be brought up again by increase of reaction and retuning the set.

## POINT TO POINT CONNECTIONS.

- 1—Aerial Socket to Grid Terminal of Valveholder V1.
- 2—Grid Terminal of V1 to H.F. Choke 1.
- 3—End of 100,000 ohms Resistance to H.F. Choke 1.
- 4—Same End of this Resistance to 0.2 mfd. Section of Condenser Block.
- 5—Suppressor Grid Terminal of V1 to Soldering Tag E.
- 6—Filament Terminal to Suppressor Grid Terminal.
- 7—Suppressor Grid Terminal to Metallising Terminal.
- 8—Bottom Terminal of On-Off Switch to Soldering Tag E, the latter is fixed under screw holding the paxolin terminal strip to the chassis.
- 9—End of 50,000 ohms Resistance to Wire No. 8.
- 10—Other End of this Resistance to Screen Grid Terminal of V1.
- 11—Same End of 50,000 ohms Resistance to 0.2 mfd. Section of Condenser Block.
- 12—One End of 40,000 ohms Resistance to 0.2 mfd. Section.
- 13—Other End of this Resistance to 2.0 mfd. Section.
- 14—Filament Terminal of V1 to Filament Terminal of Valveholder V3.
- 15—Filament Terminal of V3 to Filament Terminal of Valveholder V4.
- 16—Filament Terminal of V3 to Filament Terminal of V2.
- 17—Earth Socket to Soldering Tag E.
- 18—Flexible Lead from No. 3 Terminal of Coil Holder, through hole a in the Chassis, to Anode of H.F. Pentode.
- 19—No. 6 Terminal of Coil Holder to 2.0 mfd. Section of Condenser Block.
- 20—2.0 mfd. Section to Plate Terminal of L.F. Transformer.
- 21—One End of 30,000 ohms Resistance to 2.0 mfd. Section.
- 22—Other End of this Resistance to other 2.0 mfd. Section of Condenser Block.
- 23—One End of 100,000 ohms Resistance to 2.0 mfd. Section of Condenser Block.
- 24—Other End of above Resistance to H.F. Choke 2.
- 25—No. 4 Terminal of Coil Holder to Soldering Tag E.
- 26—No. 1 Terminal of Coil Holder to One End of .0003 mfd. Grid Condenser.
- 27—Other End of Grid Condenser to Grid Terminal of V2.
- 28—One End of 3 megohm Grid Leak to One Side of Grid Condenser.
- 29—Other End of Grid Leak to Other Side of Grid Condenser.
- 30—End of Grid Condenser, through hole b in chassis, to Fixed Plates of Tuning Condenser.
- 31—No. 2 Terminal of Coil Holder to Reaction Condenser.
- 32—No. 5 Terminal of Coil Holder to Anode Terminal of V2.
- 33—Anode of V2 to H.F. Choke 2.
- 34—One End of .0001 mfd. Anode Condenser to Anode of V2.
- 35—Other End of this Condenser to Earthed Screw E.
- 36—Filament Terminal of V2 to Soldering Tag E.
- 37—One End of .006 mfd. Coupling Condenser to H.F. Choke 2.
- 38—Other End of this Coupling Condenser to Grid Terminal of V3.
- 39—Grid Terminal of V3 to Pickup Socket.
- 40—One End of 1 megohm Grid Leak to Grid of V3.
- 41—Other End of Grid Leak to Pickup Socket.
- 42—Latter End of Grid Leak to 1 mfd. Section of Condenser Block.
- 43—1 mfd. Section to "d" Connection on Volume Control.
- 44—"a" Connection of Volume Control to G.B. Terminal of L.F. Transformer.
- 45—"a" Connection of Volume Control to 1 mfd. Section of Condenser Block.
- 46—"b" Connection of Volume Control to 100,000 ohms Resistance.
- 47—Connection marked "c" on Volume Control to On-Off Switch.
- 48—Filament Terminal of V3 to Soldering Tag E.
- 49—Anode Terminal of V3 to H.T.+ Terminal of L.F. Transformer.
- 50—Plate Terminal of L.F. Transformer to L.S.+ Socket.
- 51—L.S.+ Socket to Centre Pin of Valveholder V4.
- 52—Grid Terminal of V4 to Grid Terminal of L.F. Transformer.
- 53—Filament Terminal of V4 to Soldering Tag E at end of .002 mfd. Condenser.
- 54—End of latter Condenser to L.S.—Socket.
- 55—L.S.—Socket to Anode Terminal of V4.
- 56—End of .002 mfd. Condenser to Valveholder Fixing Screw.
- 57—Moving Plates of Tuning Condenser to Screw E holding .0001 mfd. Condenser to Chassis. This connection is made on the top of the chassis.

## BATTERY LEADS.

- L.T.+ (Red) to Filament Terminal of V3.  
 L.T.— (Blue) to On-Off Switch.  
 H.T.+ (Grey) to Plate Terminal of L.F. Transformer.  
 H.T.— (Slate) to 1 mfd. Section of Condenser Block.

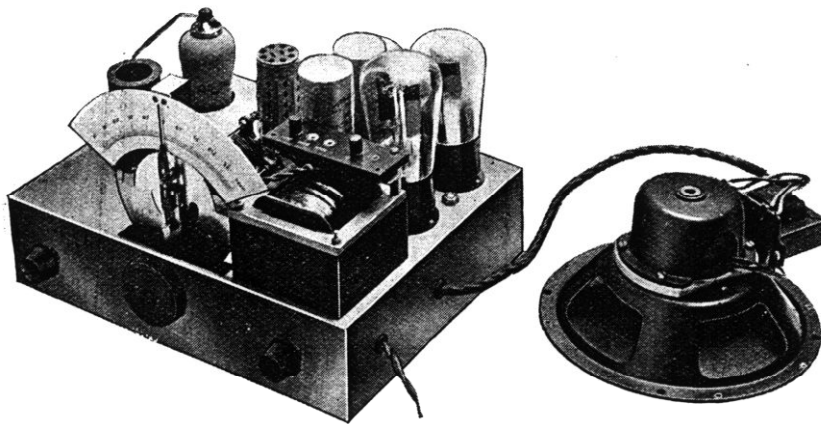
For List of Parts, see page 14



# 1935 ALL ELECTRIC KILODYNE

An All Electric Short Wave Receiver for A.C. mains operation  
with moving coil loud speaker.

13.5 — 2,000 METRES.



The 1935 all electric Kilodyne resembles the battery model in circuit design as far as the receiving portion is concerned. It incorporates, however, additional provision for supplying high and low tension to the A.C. valves. This entails quite a considerable number of additional components and care in the general design is essential if really first class short wave results are to be obtained. Much time has been expended on the present design and the result is a set which is free from hum, which works efficiently over all wavebands and gives smooth reaction. The layout of the components is critical and the design shown should be carefully followed. The whole of the receiver is built on a diecast aluminium chassis which gives strength and rigidity to the finished assembly. The mains transformer is a particularly well designed and massive component, so that good regulation without over-heating is assured. Good regulation is very important as far as valve life is concerned. The high tension winding of the transformer gives 350-0-350v. output. The speaker field is used as a smoothing choke, this has a resistance of 2,750 ohms and gives 110v. drop so that the voltage to the set is 250v. The speaker field is connected in the negative lead, so that the potential difference between the coils and frame of the speaker is only 110v. The frame of the speaker should be earthed.

## CIRCUIT.

The high frequency valve is one of the new vari-mu pentodes and is high frequency transformer coupled to the triode detector.

There are two L.F. stages, both being resistance coupled, which is responsible for the excellent tonal quality of the receiver. The output valve is a super-power pentode. Full wave rectification is employed. The total power consumption of the set is 45 watts.

## VALVES.

H.F. Valve	..	Mullard VP4
Detector Valve	..	Osram MH4
First L.F. Valve	..	Mullard 354V
Output Valve	..	Mullard PM24M
Rectifier	..	Mullard DW3

## CONSTRUCTION.

The set is rather more complicated than the battery model and the wiring plan may at first sight make it appear that the construction is difficult. Actually, however, when the component parts are placed in position and the wiring is carried out from the wiring plan and the point to point connections, it will be found that the whole can be wired up and put together more easily than would be expected. On the wiring plan, of course, the components are all shown on the same level and it has been difficult for our draughtsman to clearly indicate the connections due to resistances and other small components being placed above the valveholders which are at baseboard level. However, the plan does show everything quite clearly.

The first procedure is to sort out the various components and those which have to be mounted on the chassis should be placed in position. It is convenient to mount the valveholders and terminal strips first. The switch, reaction condenser and tuning dial may be





## 1935 ALL ELECTRIC KILODYNE—continued

## LIST OF PARTS.

	Price
1 Diecast Aluminium Chassis, drilled all necessary holes, finished inside and out battleship grey celluloid varnish, complete with three terminal panels .. .. .	27/6
1 Panel drilled and gapped for escutcheon .. .. .	3/6
1 Eddystone Scientific Variable Condenser, 160 m.mfd. .. .	7/6
1 Eddystone S.M. Reaction Condenser, .0002 mfd., with dial .. .	6/-
2 Eddystone Screened All Wave H.F. Chokes, Cat. No. 982 .. each	5/-
1 Eddystone Open Vision Disc Drive, Cat. No. 970 .. .. .	10/6
3 Eddystone 5-pin Valveholders, Cat. No. 954 .. .. . each	1/-
1 Eddystone 4-pin Valveholder, Cat. No. 953 .. .. .	10d.
1 Eddystone 7-pin Valveholder, Cat. No. 985 .. .. .	1/4
1 Eddystone 6.4 mfd. Condenser Block, Cat. No. 993 .. .. .	11/6
1 Eddystone 6-pin Base, Cat. No. 964 .. .. .	1/6
1 Eddystone 6-pin Coil, type 6LB, 12/26 metres .. .. .	4/6
1 Eddystone 6-pin Coil, type 6Y, 22/47 metres .. .. .	4/6
1 Eddystone 6-pin Coil, type 6R, 41/94 metres .. .. .	5/-
1 Eddystone 6-pin Coil, type 6G, 260/520 metres .. .. .	6/-
1 Eddystone Mains Transformer (100v. or 200v. range, 40, 100 cycles) .. .. .	39/6
1 Eddystone 3,000 ohm Potentiometer with knob .. .. .	6/-
1 Eddystone 625 ohm Bias Resistor .. .. .	1/9
1 Eddystone 1,500 ohm Bias Resistor .. .. .	2/3
1 Eddystone 5-way Connection Strip with brass mounting pillars .. .. .	2/-
2 Eddystone .1 mfd. Tubular Condensers, Cat. No. 987 .. each	2/-
1 Eddystone Special Moving Coil Loud Speaker Unit .. .. .	40/-
3 Rubber Bushes .. .. .	2d.
1 B.A.T. 2 pt. On-Off Rotary Switch with knob .. .. .	2/-
1 Humdinger .. .. .	2/6
2 8 mfd Dry Electrolytic Condensers, 500v. working .. .. each	6/-
1 20 mfd. Ditto, 50v. working .. .. .	4/-
2 T.C.C. "M" type Condensers, .0003 mfd. .. .. . each	8d.
1 T.C.C. "M" type Condenser, .0001 mfd. .. .. .	8d.
3 T.C.C. "M" type Condensers, .002 mfd. .. .. . each	1/-
4 T.C.C. "M" type Condensers, .006 mfd. .. .. . each	1/6
12 Resistors, comprising—Two 30,000, Three 40,000, One 10,000, One 5,000, One 250,000, Two 100,000 ohms, One 1 megohm and One 3 megohm .. .. . each	1/-
1 4-way Loud Speaker Cable .. .. .	2/9
6 Plugs and Sockets .. .. .	each 3d.
Screws, Nuts, Washers, Wire, etc. .. .. .	2/6
1 length mains flex .. .. .	1/-

Plus Royalty of 7/6 if kit is purchased complete.

## POINT TO POINT CONNECTIONS.

- 1—Aerial Socket to Grid Terminal of Valveholder V1.
- 2—Grid Terminal of V1 to H.F. Choke 1.
- 3—H.F. Choke 1 to Centre Terminal of Volume Control.
- 4—Centre Terminal of Volume Control to Outer Connection of Volume Control.
- 5—H.F. Choke 1 to No. 4 Terminal of Coil Holder.
- 6—No. 4 Terminal to Soldering Tag E.
- 7—Metal Coating Terminal of V1 to Soldering Tag E under fixing screw of V1.
- 8—Metal Coating Terminal to Suppressor Grid Terminal of V1.
- 9—Screened Grid Terminal of V1 to 0.2 mfd. Tapping on Condenser Block.
- 10—0.2 mfd. Tapping to 30,000 ohms Resistance.
- 11—Other End of 30,000 ohms Resistance to 1 mfd. Tapping.
- 12—One End of 10,000 ohms Resistance to 1 mfd. Tapping on Condenser Block.
- 13—Other End of this Resistance to Terminal Block.
- 14—One End of 40,000 ohms Resistance to 0.2 mfd. Tapping.
- 15—Other End of this Resistance to other 0.2 mfd. Tapping.
- 16—1 mfd. Tapping to No. 6 Terminal on Coil Holder.
- 17—0.2 mfd. Tapping to Volume Control.
- 18—Volume Control to Cathode Terminal on V1.
- 19—Twisted Lead from Heater Terminal of V1 to Heater Terminal of Valveholder V3.
- 20—Twisted Lead from Heater Terminal of V3 to Heater Terminal of Valveholder V4.
- 21—Twisted Lead from Heater Terminal of V4 to Heater Terminal of Valveholder V3.
- 22—Twisted Lead from Heater Terminal of V3 to Heater Terminal of Valveholder V1.
- 23—Twisted Lead from Heater Terminal of V2 to Heater Terminal of Valveholder V3.
- 24—Twisted Lead from Heater Terminal of V2 to Heater Terminal of Valveholder V3.
- 25—Earth Socket to 6BA Screw E. This lead should be bent in the manner shown as it forms an earthed bus-bar to which several connections are made.
- 26—Soldering Tag E under Fixing Screw of V1 to Latter Connection.
- 27—No. 5 Terminal of Coil Holder to Anode Terminal of V2.
- 28—No. 2 Terminal to Reaction Condenser.
- 29—No. 1 Terminal to .0003 mfd. Grid Condenser.
- 30—Flexible Lead from No. 3 Terminal through hole z in Chassis to Anode of H.F. Pentode.
- 31—Grid Terminal of V3 to One Pickup Socket.

- 32—Other Pickup Socket to Soldering Tag E placed under screw fixing Paxolin Strip to Chassis.
- 33—End of .0003 mfd. Condenser to Grid Terminal of V2.
- 34—Fixed Plates of Tuning Condenser through hole y in chassis to End of Grid Condenser.
- 35—One End of 3 meg. Grid Leak to Grid of V2.
- 36—Other End of Grid Leak to Wire No. 25.
- 37—Bottom of .002 mfd. Condenser to Heater of V2.
- 38—Bottom of other .002 mfd. Heater Condenser to other Heater Terminal of V2.
- 39—Bottom Tag of .0001 mfd. Anode Condenser to Anode of V2.
- 40—Cathode of V2 to Wire No. 25.
- 41—Top Tag of One .002 mfd. Condenser to Wire No. 25.
- 42—Top of Other .002 mfd. Condenser to Wire No. 25.
- 43—Top of .0001 mfd. Anode Condenser to Wire No. 25.
- 44—Anode of V2 to H.F. Choke 2.
- 45—One End of .006 mfd. Condenser to H.F. Choke 2.
- 46—Other End of this Condenser to Grid of V3.
- 47—One End of 1 meg. Grid Leak to Grid of V3.
- 48—Other End of Grid Leak to Wire No. 25.
- 49—One End of 100,000 ohms Resistance to Anode of V2.
- 50—One End of 40,000 ohms Resistance to 2 mfd. Tapping on Condenser Block.
- 51—Other End of this Resistance to Terminal Block.
- 52—Other End of 100,000 ohms Resistance to Wire No. 50.
- 53—One End of 30,000 ohms Resistance to Wire No. 50.
- 54—Other End of this Resistance to Wire No. 25.
- 55—Bottom Tag of One .006 mfd. Heater Condenser to Heater of V3.
- 56—One End of .006 mfd. Grid Condenser to Anode of V3.
- 57—Bottom Tag of .0003 mfd. Anode Condenser to Anode of V3.
- 58—Bottom Tag of Remaining .006 Heater Condenser to Heater of V3.
- 59—One End of 40,000 ohms Resistance to Anode of V3.
- 60—Other End of this Resistance to Terminal Block.
- 61—Cathode of V3 to One End of 1,500 ohms Resistance.
- 62—Other End of Latter Resistance to Wire No. 25.
- 63—Moving Plates of Tuning Condenser, through hole x in chassis, to Wire No. 25.
- 64—Top Tag B of One Heater Condenser to Top Tag C of Other Heater Condenser.
- 65—Centre of Wire No. 64 to Top Tag A of .0003 mfd. Condenser.
- 66—Tag A of Latter Condenser to Wire No. 25.
- 67—End of .006 mfd. Condenser to Grid Terminal of V4.
- 68—One End of 250,000 ohms Grid Leak to Grid of V4.
- 69—Other End of this Grid Leak to Terminal Block.
- 70—One End of 100,000 ohms Resistance to Latter Terminal.
- 71—Other End of this Resistance to another Connection on the Terminal Block.
- 72—One End of 625 ohms Bias Resistance to Terminal Block.
- 73—Other End of Bias Resistance to Fixing Screw E of Mains Transformer.
- 74—One End of 5,000 ohms Resistance to Centre Terminal of Valveholder V4.
- 75—Other End of this Resistance to Terminal Block.
- 76—This Terminal of Block to Bottom Terminal of Block.
- 77—Centre Pin of V4 to 1 mfd. Tapping on Condenser Block.
- 78—Heater Terminal of V4 to One Side of Humdinger.
- 79—Other Heater of V4 to Other Side of Humdinger.
- 80—Anode of V4 to L.S. Socket.
- 81—L.S. Socket to Terminal Block.
- 82—Top Tag of .002 mfd. Condenser to Soldering Tag E placed under Screw Fixing Paxolin Strip to the Chassis.
- 83—Bottom Tag of Above Condenser to Anode of V4.
- 84—Red Lead of 20 mfd. Electrolytic Condenser to Soldering Tag E under Nut at Top of Brass Mounting Pillar.
- 85—Black Lead of Electrolytic Condenser to Terminal Block.
- 86—Black Lead of One 8 mfd. Condenser to Terminal Block.
- 87—Red Lead of this Condenser to Terminal Block.
- 88—Red Lead of other 8 mfd. Condenser to Terminal Block.
- 89—Black Lead of this Condenser to Terminal Block.
- 90—Centre Lead of 4v. 2A Winding of Mains Transformer to Terminal Block.
- 91—One Outer Lead of this Winding to Heater Terminal of Valveholder V5.
- 92—Other Outer Lead to other Heater of V5.
- 93—One Lead of 4v. 4A Winding to One Heater Pin of V3.
- 94—Other Lead of this Winding to Other Heater Pin of V3.
- 95—350v. Tapping to Grid Pin on V5.
- 96—Centre Tap to Terminal Block.
- 97—350v. Tapping to Anode Pin on V5.
- 98—One Mains Lead to 0.1 mfd. Condenser.
- 99—Other Mains Lead to On-Off Rotary Switch.
- 100—On-Off Switch to 0.1 mfd. Condenser.
- 101—One 0.1 mfd. Condenser through insulating bush in chassis to Mains Input Connection on Transformer.
- 102—Other 0.1 mfd. Condenser to Mains Input Connection as Lead No. 101.
- 103—Blue Lead of 4-way Cable from Anode of V4 to No. 4 Terminal on L.S. Strip.
- 104—Grey Lead of Cable from Terminal Block to F Terminal on L.S. Strip.
- 105—Red Lead of Cable from Terminal Block to No. 1 Terminal on L.S. Strip.
- 106—Slate Lead of Cable from Terminal Block to F Terminal on L.S. Strip.
- 107—Cathode of V3 to 2.0 mfd. Tapping on Condenser Block.



## 1935 ALL ELECTRIC KILODYNE—continued

block is mounted on brass pillars and in the case of lead No. 84, one of these brass pillars is used for earthing the one side of the electrolytic condenser to the chassis. Leads Nos. 101 and 102 are two leads from the top of the two small tubular .1 mfd. condensers which are mounted at the side of the mains transformer. These two leads are taken through a rubber bush in the panel to the mains input terminal strip on the top of the mains transformer. The leads are taken to soldering tags at the extreme ends of the brass bus-bars underneath this terminal strip. Although lead No. 107 is shown, the number has been omitted. It runs from the cathode or centre pin of valveholder V3 underneath the vertical .006 mfd. condenser at the side of the 1,500 ohm resistance, underneath the 40,000 ohm resistance, to the 2 mfd. terminal of the condenser block.

The position of some of the resistances may be helpful, and these are as follows. The two 40,000, two 30,000 and one 10,000 ohm resistors, shown round the main condenser block, are at a level slightly above the top of the block. The 1 megohm grid leak from the grid pin of valveholder V3 is in a sloping position between this pin and lead No. 25. The 100,000 ohm resistor on the left hand side of the terminal block is on the same level as the bakelite terminal strip. The 250,000 and 40,000 ohm resistances are in sloping positions up to the terminal block. The 5,000 ohm resistor is at a slightly higher level than the 250,000 ohm unit.

### CONNECTING UP.

The loud speaker, the field of which as previously mentioned, forms a smoothing choke, must be connected to the set by means of the 4-way cable. If the receiver is tested before it is placed in its cabinet, the speaker will need mounting on a temporary panel. When mounting the chassis and speaker in the cabinet, we recommend that the speaker be at the side of the set or alternatively over the top of the tuning dial. We do not recommend it being mounted underneath the chassis. When the set is completely wired, connections thoroughly checked over and the valves inserted in their proper holders, the necessary connections for aerial and earth and mains supply can be made. The electric mains are connected to leads Nos. 98 and 99, which are brought out through the side of the chassis, through a small rubber bush. The two screw

plugs which are inserted in the screwed sockets of the mains transformer terminal-strip should be screwed in so that the right voltage for the mains supply in use is employed. One of the plugs is screwed into the socket marked 0 and the other one into one of the three sockets marked, 200, 220 and 240 volts. If 210, 230 or 250 volts is required, the other plug screw, instead of being placed in the socket marked 0 is placed in the socket marked "Plus 10." In the case of a 100 volt transformer, similar procedure is followed. When everything is in order, the set is switched on by means of the switch on the right hand side.

### OPERATING DETAILS.

It will take a short time for the heaters of the A.C. valves to warm up to the proper working temperature before the set will work. As soon as the set is live, the small screw controlling the Humdinger should be adjusted to the position where hum is at a minimum. This control, when set, does not need re-adjustment. For general tuning and station finding, the set is worked in exactly the same way as already described in the case of the battery model. The volume and selectivity control is, however, in this case on the left hand side.

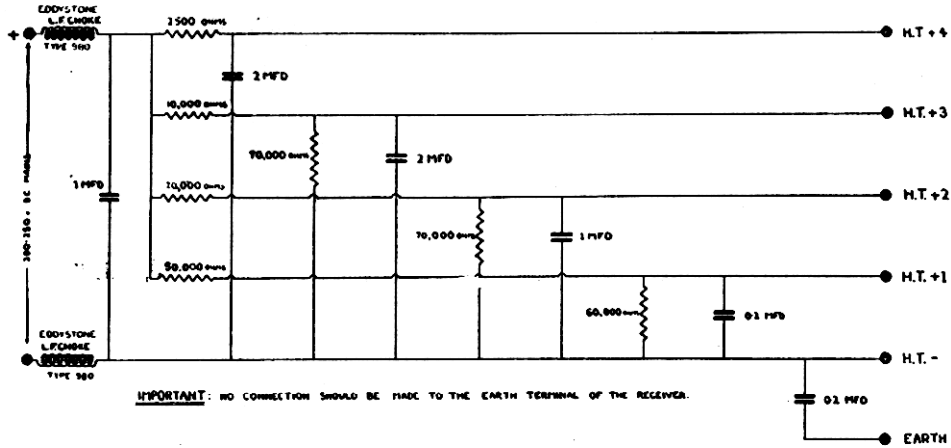
### GRAMOPHONE PICKUP.

It is quite a simple matter to use a gramophone pickup with the Kilodyne receiver. All that is necessary is to plug the two leads from the pickup into the two terminals provided on the receiver. In the case, however, where a volume control is not already incorporated with the pickup, a 250,000 ohm volume control should also be connected across the pickup terminals of the receiver, otherwise distortion, due to valve overloading, may occur. If, when using a pickup, tone is on the high side, this can be made more mellow by connecting a .006 mfd. condenser across the pickup terminals. When a gramophone pickup is in use the reaction condenser in the set should be set at zero position with the vanes fully out. It should also be carefully noticed that leads from the pickup to the set are not run parallel to the loud speaker leads, and moreover, the length of wire in use should be kept as short as possible.

# MAINS ELIMINATOR CIRCUITS

FOR SHORT WAVE RECEIVER USE

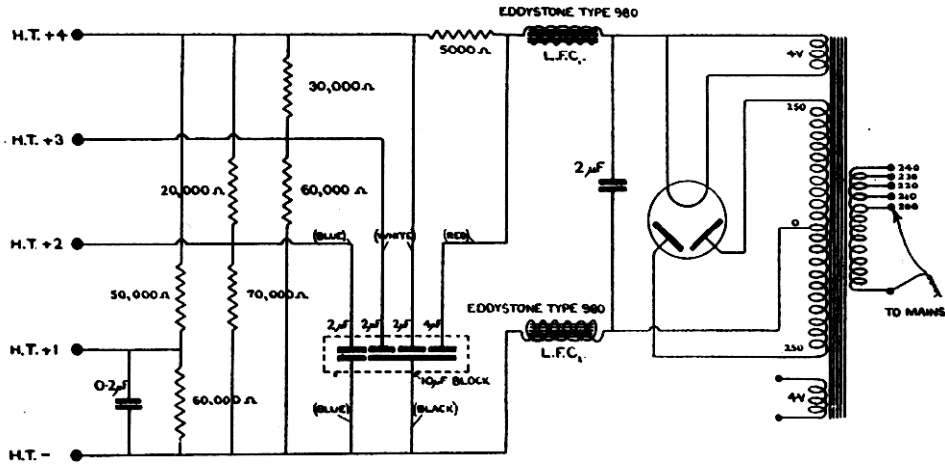
D.C. ELIMINATOR FOR USE ON D.C. MAINS 200-250 VOLT.  
OUTPUT 150 VOLTS AT 20 MILLIAMPERES.



**List of Parts required.**

2 Eddystone L.F. Chokes, Cat. No. 980 ..each	Price 8/6	1 each Erie Resistors, 1 watt, 10,000, 20,000, 50,000, 60,000 .. .. .	Price each 1/-
1 Eddystone Block Condenser, 6.4 mfd., 500v. D.C. test (2 x 1 mfd., 2 x 2 mfd., 2 x 0.2 mfd.) .. .. .	11/6	2 Erie Resistors, 1 watt, 70,000 ohms .. .. .	each 1/-
1 Erie Resistor, 2,500 ohms, 3 watt. .. .. .	1/8	6 Terminals and Terminal Strip .. .. .	2/3
		Suitable Baseboard, 9" x 6" and container.	

ELIMINATOR FOR USE ON A.C. MAINS 100-250 VOLTS, 40/100 CYCLES.  
OUTPUT 150 VOLTS AT 20 MILLIAMPERES.

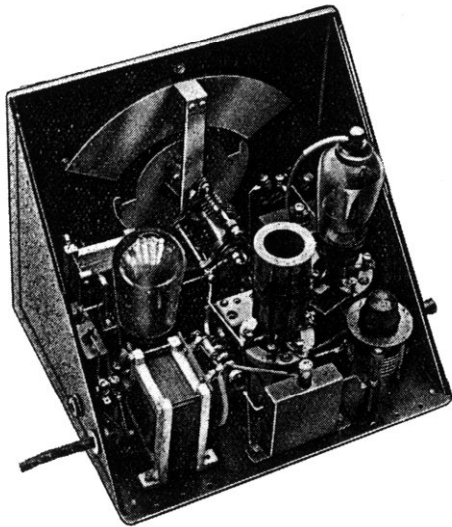


**List of Parts required.**

2 Eddystone L.F. Chokes, Cat. No. 980 ..each	Price 8/6	1 Mains Transformer, 250/0/250 4v. 1 amp. 4v. x amps. required.	Price
1 Eddystone Block Condenser, 10 mfd., 500v. A.C. test (3 x 2 mfd., 1 x 4 mfd.) .. .. .	12/6	1 Erie 5,000 ohm, 3 watt, Resistor .. .. .	1/8
1 Eddystone Valveholder, Cat. No. 501 .. .. .	1/3	1 each Erie Resistors, 1 watt, 20,000, 30,000, 50,000, 70,000 ohms. .. .. .	each 1/-
1 2 mfd. Condenser .. .. .	4/-	2 Erie Resistors, 1 watt, 60,000 ohms .. .. .	each 1/-
1 0.2 mfd. Condenser .. .. .	2/-	7 Terminals .. .. .	1/9
		Suitable Baseboard and Container.	

The output of both eliminators can be increased to give 40-50 milliamps if the 3 watt drop resistors are omitted.

# 1935 AMATEUR BANDS TWO RECEIVER



Showing the interior view of the Receiver.

The object in the design of this set is to provide a highly efficient receiver for use on the amateur bands. There is much to be said for a set employing a small number of valves giving a high degree of amplification with a silent background as compared with a multi-wave super-het. Selectivity is naturally the chief trouble which has to be overcome, and in the 1935 design, this has been considerably improved as the result of the new tuning coil system employed.

## DESIGN.

The set comprises a screened grid valve as detector, full use being made of the high amplification of the valve by means of a high impedance choke coupling. A low frequency transformer would not be of much use in view of the high impedance of the valve and resistance coupling when calculated to match the impedance results in a large voltage drop across the resistance, which makes the set erratic in operation and needs a higher operating voltage. The output valve of the set is a steep slope pentode, again with a high amplification factor. The high frequency choke is placed in series with the grid leak to the second valve instead of in series with the high impedance choke, since this was found to give improved results. The grid leak is taken to a detector bias resistor, giving the grid slightly positive bias. This was found to be better

than if taken to either L.T. + or L.T.—. Automatic grid bias and drop fed high tension are further refinements.

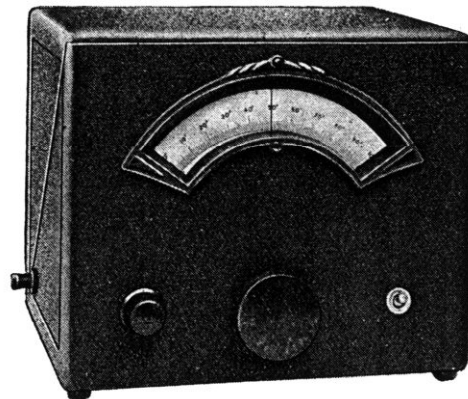
**COILS.**  
The coils used are a special production for the amateur wavebands and are of a 5-pin type. The aerial is fed into a tapping well down the coil which is tuned by a 35 m.mfd. condenser. An additional band spreading condenser is also fitted which is tapped across a portion of the coil. The lower end of the winding is used for reaction purposes. Tuning is very sharp and by means of adjustment of the band spreading condenser, the amateur bands are spread out practically over the whole of the dial.

## REACTION CONTROL.

Next came the important question of reaction control, and after trying various known ways, the rather unusual method of obtaining a definite amount of reaction by means of a pre-set condenser and reaction coil, on the Reinartz principle, was adopted, with the final adjustment made by a potentiometer control of the H.T. voltage to the S.G. of the detector valve. This method ensures that there is no movement of wavelength when reaction adjustment is completed, thus obtaining smooth control right up to the maximum point.

## HAND CAPACITY.

This trouble cannot be tolerated in the efficient amateur receiver, and the design of the "Amateur Bands" Two has eliminated this trouble entirely, even when headphones are in use. It is almost possible to place the



The finished external view shows the open vision tuning dial.

## AMATEUR BANDS TWO—continued

hands on the metal chassis when wearing headphones, without moving a signal being received.

### VALVES.

Detector .. MAZDA S.G.215.  
Output .. MAZDA PEN. 220A.

### CONSTRUCTION.

The receiver is built into an Eddystone 2-piece cast Aluminium cabinet. This gives instant accessibility and at the same time perfect screening, and makes the receiver a compact and robust instrument which is fully portable if required.

The main details of construction can be seen on reference to the wiring plan, theoretical diagram and point to point connections. The following remarks may, however, be of further assistance.

The 40 m.mfd. band spreading condenser is mounted on three 1" pillars tapped 6BA. The 5-pin Frequentite coil base and 4-pin Frequentite valveholder are mounted on pillars  $1\frac{1}{2}$ " high, tapped 6BA. In mounting these two components, lead washers should be placed on top of the pillars and underneath the fastening down screws. This prevents any possible breakage of the holders. The .0003 mfd. grid condenser is mounted by means of its tags across the valveholder and coil holder. These are connections Nos. 3 and 4 in the plan. Lead No. 8 is taken down the supporting pillar of the valveholder to a tag in metallic contact with the baseplate under the pillar. The detector bias resistor is mounted under this valveholder about  $\frac{1}{8}$ " from the baseplate. The Cyldon condenser is mounted under the tuning condenser and is raised on 1"

pillars, tapped 4BA. Lead No. 16 is taken to earth by means of one of the choke fixing screws. The receiver is earthed by means of a terminal on the back hinged portion of the cabinet. This is not shown on the diagrams.

### HIGH TENSION.

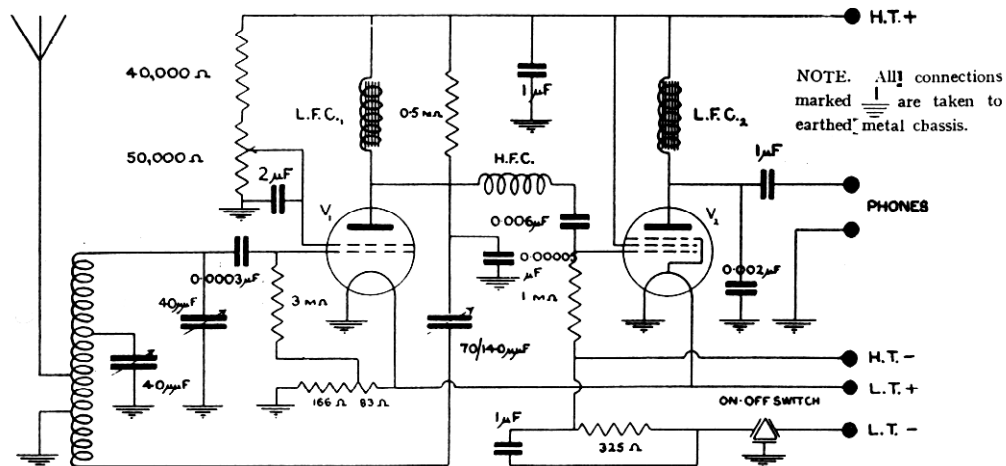
120—150 volts.

### ERRATUM.

In the theoretical diagram, the tuning condenser is shown as 40 m.mfd., whereas the actual value used is 35 m.mfd.

### POINT TO POINT CONNECTIONS.

- 1—Aerial Socket to Coil Holder.
- 2—Fixed Plates of Aerial Series Microdenser to Coil Holder.
- 3—One End of .0003 mfd. Grid Condenser to Coil Holder.
- 4—Other End of Grid Condenser to Grid Terminal of Valveholder V1.
- 5—Moving Plates of Aerial Series Microdenser to Coil Holder.
- 6—Moving Plates of 35 m.mfd. Tuning Condenser to Coil Holder.
- 7—Coil Holder to Soldering Tag E.
- 8—Filament Terminal of V1 to Soldering Tag E.
- 9—Blue Connection of 938 Potentiometer to Negative Filament Terminal of V1.
- 10—Yellow Connection of Potentiometer to Plus Filament Terminal of V1.
- 11—Tapping of Potentiometer to One End of 3 megohm Grid Leak.
- 12—Other End of Grid Leak to Grid Terminal of V1.
- 13—Centre Socket of Coil Holder to Cyldon 70/140 m.mfd. Condenser.
- 14—Fixed Plates of 35 m.mfd. Condenser to Coil Holder.
- 15—Plus Filament Terminal of V1 to similar Terminal of Valveholder V2.
- 16—Negative Filament Terminal of V2 to Soldering Tag E.
- 17—S.G. Anode Terminal of V1 to 2 mfd. Condenser.
- 18—2 mfd. Condenser to Slider of 50,000 ohms Potentiometer.



THEORETICAL CIRCUIT OF THE 1935 AMATEUR BAND RECEIVER.

## AMATEUR BANDS TWO—continued

- 19—One End of 50,000 ohms Potentiometer to Soldering Tag E.  
 20—40,000 ohms Resistance to Potentiometer.  
 21—40,000 ohms Resistance to L.F. Choke 2.  
 22—L.F. Choke 2 to L.F. Choke 1.  
 23—L.F. Choke 1 to Centre Socket of V2.  
 24—L.F. Choke 1 to 1 mfd. Condenser.  
 25—One End of 0.5 megohm Resistance to L.F. Choke 1.  
 26—Other End of 0.5 megohm Resistance to L.F. Choke 1.  
 27—L.F. Choke 1 to 70/140 m.mfd. Condenser.  
 28—Tag of .00005 mfd. Condenser to 70/140 m.mfd. Condenser.  
 29—Remaining Tag of Former Condenser to 6BA Nut E.  
 30—One End of H.F. Choke to .006 mfd. Grid Condenser.  
 31—Other End of H.F. Choke to L.F. Choke 1.  
 32—Soldering Tag of .006 mfd. Condenser to Grid Terminal of V2.  
 33—One End of 1 megohm Grid Leak to Grid Terminal of V2.  
 34—Other End of this Grid Leak to 1 mfd. Condenser.  
 35—1 mfd. Condenser to One Lead of 325 ohms Bias Resistance.  
 36—Other Lead to On-Off Switch.  
 37—On-Off Switch to Soldering Tag E.  
 38—Anode Terminal of V2 to L.F. Choke 2.  
 39—L.F. Choke 2 to Top of .002 mfd. Anode Condenser.  
 40—Bottom Tag of this Condenser to Fixing Nut E.  
 41—L.F. Choke 2 to One Terminal of 1 mfd. Condenser.  
 42—Other Terminal of 1 mfd. Condenser to 'Phone Jack.  
 43—'Phone Jack to Choke Fixing Nut E.  
 44—Flexible Lead from Cyldon 70/140 m.mfd. Condenser to Anode of S.G. Valve.
- BATTERY LEADS.**  
 45—H.T.+ (Grey) to L.F. Choke 1.  
 46—L.T.+ (Red) to Plus Filament Terminal of V2.  
 47—H.T.— (Slate) to 1 mfd. Condenser.  
 48—L.T.— (Blue) to Centre connection of On-Off Switch.

## LIST OF PARTS.

	Price
1 Eddystone 2-piece Metal Cabinet, No. 974/A	29/-
1 Eddystone Disc Drive, Cat. No. 970W	10/6
1 Eddystone Scientific Condenser, 35 m.mfd.	6/-
1 Eddystone Microdenser, 40 m.mfd., with scale and knob	5/-
1 Eddystone 4-pin Valveholder, Cat. No. 949	1/5
2 Eddystone 5-pin Valveholders, Cat. No. 950 each	1/8
6 Eddystone No. 4P Pillars 1 $\frac{1}{4}$ ", tapped 6BA each	1 $\frac{1}{2}$ d
2 Eddystone No. 7P Pillars 1", tapped 4BA each	1 $\frac{1}{2}$ d
1 Eddystone L.F. Choke, Cat. No. 980	8/6
1 Eddystone L.F. Choke, Cat. No. 981	12/6
1 Eddystone 2 mfd. 1 Terminal Type Condenser	4/-
2 Eddystone 1 mfd. 1 Terminal Type Condensers	each 3/-
1 Eddystone Tapped S.W. Detector Bias Resistor, Cat. No. 938	1/6
1 Eddystone Special 5-pin Coil for 20 metres	5/6
1 Eddystone Special 5-pin Coil for 40 metres	5/6
1 Eddystone Special 5-pin Coil for 80 metres	5/6
1 Eddystone G.B. Resistor, 325 ohms	1/6
1 Eddystone S.W. H.F. Choke, Cat. No. 948	2/9
1 Cyldon 70/140 m.mfd. Condenser	2/-
1 Elpro 50,000 ohm Potentiometer	4/6
1 B.A.T. 3-pt. On-Off Switch	1/6
1 Igranic P.71 Jack	1/3
1 Igranic P.40 Plug	1/3
1 Erie 1 watt Resistor, 40,000 ohms	1/-
1 Erie 1 watt Resistor, 3 meg.	1/-
1 Erie 1 watt Resistor, 1 meg.	1/-
1 Erie .5 meg. Resistor, $\frac{1}{2}$ watt	1/-
1 T.C.C. Condenser, "M" type, .00005 mfd.	8d.
1 T.C.C. Condenser, "M" type, .0003 mfd.	8d.
1 T.C.C. Condenser, "M" type, .002 mfd.	1/-
1 T.C.C. Condenser, "M" type, .006 mfd.	1/6
1 Helsby 1 mfd. Condenser, 500v. A.C. test	2/6
1 Clix All-in Terminal	6d.
1 Earth Terminal	2d.
1 Set 4-way Leads with Plugs	2/9
1 Bush for Leads	3d.
1 Set Screws, Nuts, Wire, Lead Washers, etc.	2/6

Plus Royalty of 2/6 if kit is purchased complete.

## 1935 KILODYNE FOUR—continued

## LIST OF PARTS.

	Price		Price
1 Diecast Aluminium Chassis, drilled all necessary holes, finished inside and out battleship grey celluloid varnish, complete with three terminal panels	22/6	1 Eddystone 6-pin Coil, type 6LB, 12/26 metres	4/6
1 Panel, drilled and gapped for escutcheon	3/6	1 Eddystone 6-pin Coil, type 6Y, 22/47 metres	4/6
1 Eddystone Scientific Variable Condenser, 160 m.mfd.	7/6	1 Eddystone 6-pin Coil, type 6R, 41/94 metres	5/-
1 Eddystone S.M. Reaction Condenser, .0002 mfd., with dial	6/-	1 Eddystone 6-pin Coil, type 6G, 260/520 metres	6/-
2 Eddystone Screened All Wave H.F. Chokes, Cat. No. 982	each 5/-	1 Ferranti AF4 Transformer	17/6
1 Eddystone Open Vision Disc Drive, Cat. No. 970	10/6	1 T.C.C. "M" Type Condenser, .0003 mfd.	8d.
2 Eddystone 4-pin Valveholders, Cat. No. 953 each	10d.	1 T.C.C. "M" type Condenser, .0001 mfd.	8d.
1 Eddystone 5-pin Valveholder, Cat. No. 954	1/-	1 T.C.C. "M" type Condenser, .002 mfd.	1/-
1 Eddystone 7-pin Valveholder, Cat. No. 985	1/4	1 T.C.C. "M" type Condenser, .006 mfd.	1/6
1 Eddystone 6.4 mfd. Block Condenser, Cat. No. 993	11/6	1 each Erie Resistors, 1 watt type, 30,000, 40,000, 50,000 ohms, 1 meg., 3 meg.	each 1/-
1 Eddystone Volume Potentiometer	5/6	2 Erie Resistors, 1 watt type, 100,000 ohms	each 1/-
1 Eddystone 6-pin Base, Cat. No. 964	1/6	6 Pairs Clix Plugs and Sockets, at 3d. pair	1/6
1 Set Eddystone 4-way Heavy Duty Battery Leads	2/9	1 B.A.T. 3 pt. On-Off Switch	1/6
		Screws, Nuts, Wire, Washers, etc.	2/6
		Marconi Royalty for kit complete	5/-





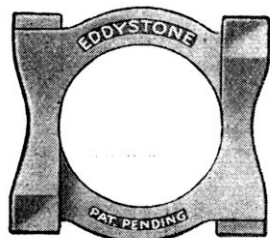
# THE EDDYSTONE CROSSFEEDER AERIAL SYSTEM

FOR NOISE-FREE SHORT WAVE RECEPTION

A short wave receiver, more than any other type of broadcast receiving apparatus, is frequently called upon to reproduce weak signals from a far off source. This necessitates that the receiver be operated in a sensitive condition with a maximum of amplification. Under such conditions, local man-made interference (caused by electric fans, refrigerators, flashing signs, small electric motors, and electric mains switch noises radiated from the house wiring), constitutes a source of considerable nuisance.

There are cases where even a strong short wave signal is spoiled by such interference, but there are many more instances where weak short wave signals, which even so should be clearly and audibly reproduced, are completely drowned and cut up by this man-made static. Now if the signal to noise ratio when receiving on the short waves can be considerably improved and man-made static practically eliminated as compared with the received signal, a tremendous improvement in reception is achieved. Following on lines of research in this direction, the Eddystone Crossfeeder Aerial System has been developed on the following principles.

The average owner of a short wave set seems content to use any type of aerial, and often the better the set in use, the lower the efficiency of the aerial system. Yet it should be the aim of every short wave listener to



Eddystone Crossfeeder Block.  
List Price, 8d.

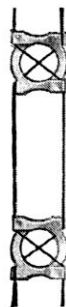


Fig. A. Showing Crossfeeder Aerial System  
in use at Eddystone Works.

erect a really first class aerial, using efficient wire and high class insulation. It is easily realised that if an increase of signal voltage can be introduced from the aerial to the first valve, this increase times the amplification of the set will show up as a much increased output in the loud speaker. The first essential of the Eddystone Crossfeeder Aerial System is that it shall be absolutely efficient as far as materials and insulation is concerned. Next comes the elimination of man-made noise. Experience shows that even in the centre of a busy city, if an aerial is erected high up, unscreened, and the set is used quite close up to the aerial, there is a large reduction in the noise level. This proves that the lead-in wire is responsible for picking up the greatest

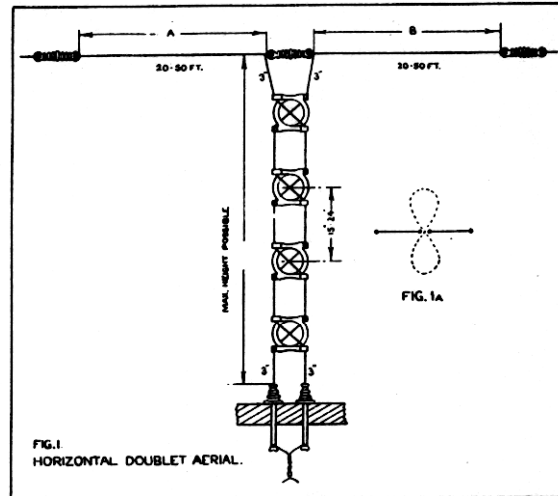
## CROSSFEEDER AERIAL SYSTEM—continued

portion of noise, all the more since interference radiated by certain electrical machines and ignition systems consists of vertically polarised rays which are picked up to a greater extent by the vertical lead-in wire than by the horizontal aerial. If a type of lead-in can be utilised that is a non-collector of energy, the problem is considerably solved.

The Eddystone Crossfeeder System of lead-in and doublet aerial is, therefore, employed, as shown in Figure 1. In this, the lead-in consists of two wires which are crossed over by means of the crossfeeder blocks at regular intervals. By this method, the signal voltage induced in one line is 180° out of phase with that in the other. The pick-up from each lead is impressed on the coil at the bottom of the system, where cancellation takes place. The lead-in thus becomes a conveyor only of the energy from the aerial proper and is itself not a collector. It is of definite importance that the lines should be crossed instead of running parallel in order that the amount of voltage induced in each lead shall be exactly equal, which would not be the case if one lead was nearer the source of noise than the other. Normally, it is sufficient to cross over the leads every 2 ft., but if the interference is very intense, this distance should be reduced to 1 ft. 3 ins.

The use of this crossed lead-in enables a horizontal type of doublet aerial to be employed. The two sides of such an aerial form a complete collector system in themselves without earth connection and they can be erected high up out of the noise field since the length of the crossfeeder line is not important. On the other hand, the collecting system of the conventional single wire aerial with earth connection comprises the single wire as one side of the arrangement and the earth as the other. This ether dielectric condenser forms a great storehouse for man-made static through which the ordinary energy collecting lead-in is usually run. When it is also considered that the earth wire itself may be responsible for picking up or introducing noise, the advantage of the doublet aerial which requires no earth connection can be further appreciated.

With regard to directional properties, the doublet aerial receives energy best from directions at right angles to its own line of direction, being the opposite to the single



wire type. When difficulties of erection are experienced in putting up a balanced doublet, an inverted L type of aerial can also be used with crossfeeder lead down, as shown in Figure 2, but this type of aerial is much more directional, its greatest pick-up being from the direction in which the lead-in end is pointing.

The doublet type of aerial is a form of Hertz aerial well-known to radio transmitters, and as such, the two top sections can be cut to a definite length to give maximum response on certain frequencies. An aerial cut to give maximum efficiency on a certain frequency band will still give as good results as an ordinary aerial on wavelengths outside this band so that it is worth consideration when erecting an aerial to cut the top section to a length which will be in resonance with the station wave which it is most desired to receive consistently. To cut the top lengths A and B, in Figure 1, correctly for any given wavelength, their combined length should be one half of the wavelength under consideration. The formula for working out the length necessary for any given frequency is:—

$$\text{Length in feet} = \frac{468,000}{\text{Frequency in Kc/s.}}$$

As an example, the Empire station GSC on 31,297 metres or 9,585 Kc/s per second would require:—

$$\frac{468,000}{9,585} = 48.8 \text{ feet, total length of top wire.}$$

This would mean the two top sections would be 24.4 feet each in length.

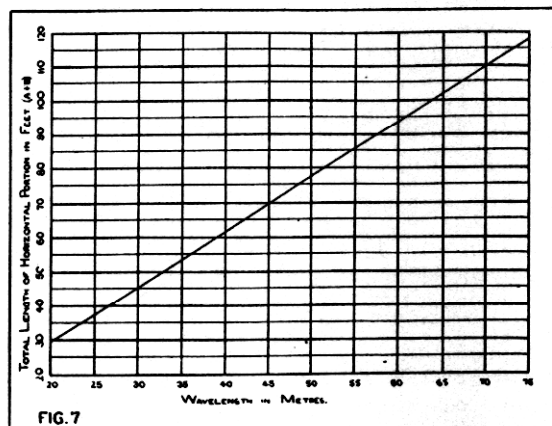
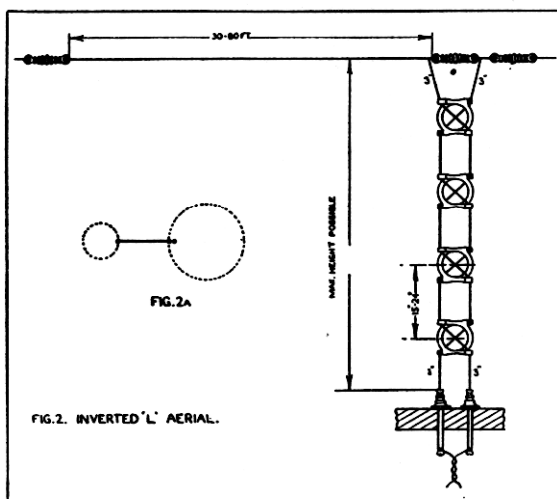
## CROSSFEEDER AERIAL SYSTEM—continued

Figure 7 is a small graph showing the approximate length of top against wavelength. An aerial designed for a wavelength of 31.3 metres would also have a resonant peak at 15.65 metres, due to the harmonic condition. Similarly, an aerial cut for 80 metres would have harmonic resonances at 40 and 20 metres.

The length of feeder line from the receiver to the aerial is not of material consideration for general reception except that it must be over  $\frac{1}{4}$  wavelength in length.

### GENERAL AERIAL INFORMATION.

Figure 1 shows the general lay-out for a horizontal doublet, which is recommended wherever possible, and Figure 2 for the inverted L type of aerial, which it may be necessary to use if the former type is not possible owing to space conditions. Figures 1A and 2A show the greatest field strength of the aerials and also illustrate their directional properties. It should be clearly understood that the Eddystone Crossfeeder Aerial System does not claim to cut out all noise and static. The point is, however, that if the aerial is efficiently erected with the top high and well above the general range of man-made static, a great improvement indeed of the signal to noise ratio is obtained and also some improvement in the elimination of true atmospheric. Figure A shows a doublet aerial with Crossfeeder lead-in erected at our factory, where the doublet top is taken well out of the range of electrical interference. Weak signals can be received on this with perfect readability



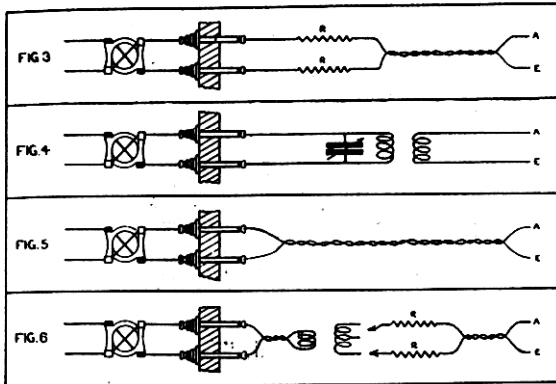
which are absolutely lost on an ordinary aerial. Attention must also be paid to the receiver itself. If the coils and wiring of this are not screened, much of the advantage of the special aerial system will be lost. In erecting the aerial, it is advisable to thread the wires across the blocks all in the same way and great care should be taken to keep the blocks under constant tension in the wires, since if they fall out during erection, they will most surely be broken.

It is important that the aerial insulators, particularly the centre one in the doublet type of aerial be efficient. Eddystone Steatite insulators should be used.

### COUPLING TO THE RECEIVER.

The coupling of the feeder leads to the receiver is a matter which calls for special attention. In the first place, the lead from the lead-in tube to the set should consist of twisted flex. Secondly, no side of the feeder system should be earthed. Figure 3 shows a coupling by means of two resistances, one in each feeder line, taken straight to the aerial and earth terminals of the set. In this case, no earth connection must be used on the receiver. In many cases, this is suitable for short wave reception but not for reception on broadcast wavebands. It is also impossible to use this method if the set is unstable without an earth. This system is very satisfactory when used with sets which already employ an aperiodic aerial coil coupled to the grid coil. In this case, however, the ends of the aperiodic coil are connected to A and E as shown and any

## CROSSFEEDER AERIAL SYSTEM—continued



earth connection which already exists on this coil must be disconnected. The earth connection to the set in general, however, can still be retained. The value of the resistances can be between 200 and 1,000 ohms. In

theory, a smaller resistance is more efficient on short wavelengths, but in practice, very little difference is found.

Figure 4 shows a transformer coupling. This can be effected by coupling a suitable coil to the grid coil of the receiver. This coil may either be aperiodic or tuned as shown in the diagram. Tuning is not generally necessary.

Figure 5 is a modified version of Figure 3, with the resistances omitted, and the remarks made in the case of Figure 3 still apply.

Figure 6 shows a transformer coupling which is connected to the aerial and earth terminals of the receiver. The resistances may either be used or omitted according to circumstances. This method of coupling is critical since the ratio of the transformer requires careful design for different wavelengths.

## BUZZER WAVEMETER—continued from page 25.

## APPROXIMATE COIL CALIBRATIONS

## COIL—LB

0°	—	8.6 metres
20°	—	9.1 metres
40°	—	12.25 metres
60°	—	14.49 metres
100°	—	18.6 metres
140°	—	22.0 metres
180°	—	25.3 metres

## COIL—Y

0°	—	13.8 metres
20°	—	12.25 metres
40°	—	21.6 metres
60°	—	25.75 metres
100°	—	33.0 metres
140°	—	39.6 metres
180°	—	45.0 metres

## COIL—R

0°	—	27 metres
20°	—	33.6 metres
60°	—	50.6 metres
100°	—	65.8 metres
140°	—	78.0 metres
180°	—	89.0 metres

## COIL—W

0°	—	51.5 metres
20°	—	64.75 metres
60°	—	98.75 metres
100°	—	125.0 metres
140°	—	149.5 metres
180°	—	169.0 metres

## COIL—P

0°	—	102 metres
20°	—	128 metres
60°	—	191 metres
100°	—	246 metres
140°	—	292 metres
180°	—	328 metres

## COIL—G

0°	—	142 metres
20°	—	178.5 metres
60°	—	272 metres
100°	—	342 metres
140°	—	414 metres
180°	—	466 metres

## COIL—BR

0°	—	302 metres
20°	—	348 metres
60°	—	522 metres
100°	—	635 metres
140°	—	865 metres
180°	—	912.5 metres

## COIL—GY

0°	—	585 metres
20°	—	800 metres
60°	—	1080 metres
100°	—	1500 metres
140°	—	1810 metres
180°	—	2200 metres

## HEPTODE SUPER-HETERODYNE CONVERTER

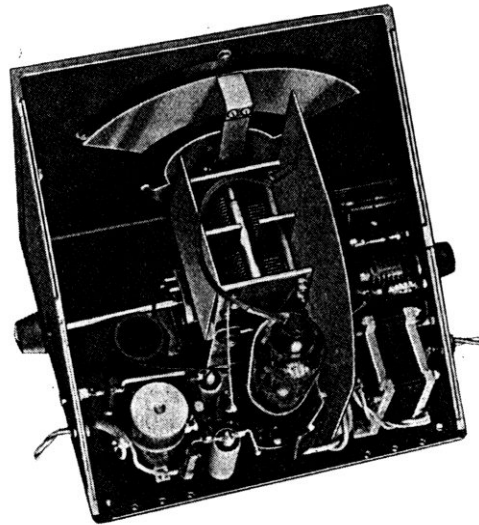
A Converter for use with A.C. all electric broadcast receivers for the reception of short wave signals. 14.6/56 metres.

The use of a super-heterodyne converter enables short wave signals to be reproduced through a standard type of all electric broadcast set. The mode of connection is slightly altered according to whether the broadcast set is of a straight circuit design employing high frequency stages or is of the super-heterodyne type, which matter is referred to later in the text under the paragraph headed "Connecting up." It is not possible, however, to use the converter with a straight all electric receiver which does not employ at least one high frequency stage.

This converter employs one of the new A.C. type heptode valves and is superior to the ordinary type of 1 valve converter with single circuit tuning inasmuch as ganged tuning is employed, giving greater signal strength and better selectivity. The valve used is an Osram type MX40 and a portion of the valve functions as a screened grid anode detector, while the other portion of the valve functions as a triode oscillator. There are thus two tuned circuits, the grid circuit being tuned to the incoming signal and the oscillator circuit tuned to the intermediate frequency above or below the incoming signal. Actually, this arrangement needs two sets of coils and the waveranges are switched by a ganged switch assembly. Tuning is carried out by one dial which operates the 2-gang condenser, but there is a small trimmer condenser across the aerial circuit for balancing purposes. In a converter of this type, it is extravagant to use a complete power supply for the operation of one valve. It is not always convenient or possible, however, to draw low tension current for the heater supply so that a small mains transformer is provided in the converter for this purpose. The high tension supply, which would be the costly portion to provide, is obtained from the all electric broadcast set, which can be done in practically every case without difficulty.

### CONSTRUCTION.

The actual assembly and wiring of the dual switched coils, ganged condenser and screens is rather difficult to describe and put into practice. These items are, therefore, mounted into the cabinet at the factory and



Showing the interior view of the Converter.

as far as possible the coil connections are made, only one or two simple instances being left. In order to complete the assembly, the back of the cabinet should be first removed and the remaining components fastened into position. The wiring can then be followed from the wiring plan and point to point connections, but we make the following remarks for greater clarity.

The aerial coil has one wire which is not connected, this is wire No. 1 and it is taken to the aerial terminal. The oscillator coil has two wires not connected, leads Nos. 19 and 20, which are the top and bottom ends of the reaction coil. Leads Nos. 5 and 4 are the bottom tags of the two .006 mfd. condensers which are mounted vertically and soldered straight to the corresponding valveholder tags. Leads Nos. 12 and 13, the top and lower end of the bias resistor, are quite straightforward but this resistor is actually mounted above the .1 mfd. condenser, although in the plan the end view of it is shown slightly to one side. The .0001 mfd. condenser is mounted vertically by means of its bottom tag to the grid terminal of the valveholder and the 5,000 ohm leak is connected across this condenser, also in a vertical position. The 15,000 ohm resistance shown broken is actually mounted above this, across the top of the two

## HEPTODE SUPER-HET. CONVERTER—continued

.1 mfd. condensers. In making lead No. 25 to the choke fastening down screw, the paint should be scraped away so that metallic connection is made. Lead No. 27 is made by soldering the bottom tag of the .002 mfd. condenser to the valve anode, the condenser being mounted vertically. The 10,000 ohm resistance at the side of the high frequency choke is also mounted vertically, the end plan only being shown. The 7-pin valveholder is mounted on two small  $\frac{1}{4}$ " pillars.

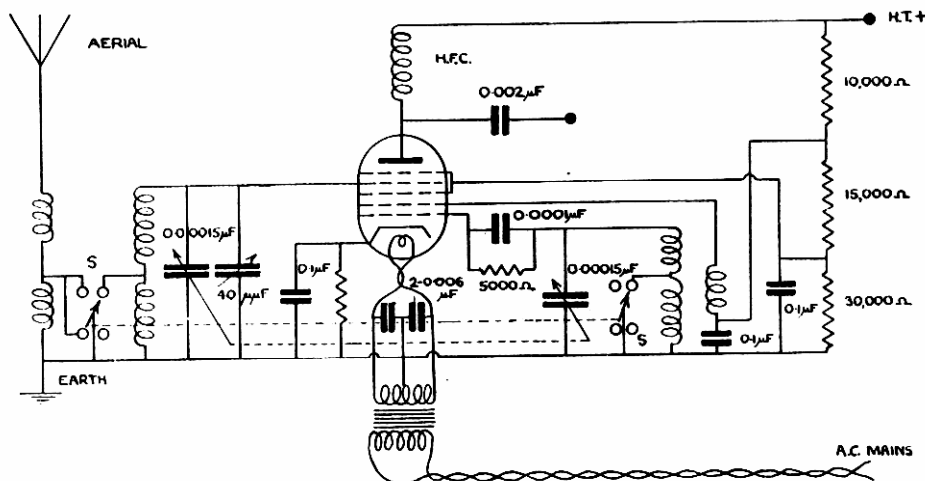
The metal cabinet of the converter must be connected to earth and a terminal for this purpose is provided at the back of the cabinet.

## CONNECTING UP.

When using the converter with a straight circuit set employing one or more high frequency stages, the aerial lead must be taken from the broadcast receiver and connected to the aerial terminal of the converter. A lead is then taken from the output terminal of the converter to the aerial terminal of the set. The set must be tuned to a wavelength between 1,400 and 2,000 metres, a wave being chosen which is free from interference. About 1,800 metres is usually very satisfactory. In a case where the broadcast set is of the super-heterodyne type, the aerial is again changed over to the converter but the output of the converter, instead of being connected to the aerial terminal of the set, must be taken to the input of the first intermediate frequency amplifier in the receiver. To do this, it is best to remove the first detector valve in the super-heterodyne broadcast set and to connect the lead from the converter to the wire which previously went to the detector valve anode.

The actual operation of the converter, in the case of a straight circuit broadcast receiver, is that the converter valve forms the oscillator and detector valve of a super-heterodyne receiver and the tuned circuits in the set which are tuned to the long wavebands become intermediate frequency amplifiers. The detector in the broadcast set becomes second detector and the L.F. stages operate as usual. When used in conjunction with a super-heterodyne receiver, the oscillator and detector valves in the broadcast set are not used and are replaced by the same arrangement in the converter. The intermediate frequency stages of the super-heterodyne set and the second detector and L.F. stages are employed as previously.

The mains input leads of the filament transformer must be connected to the mains and the high tension lead coming from the high frequency choke must be connected to a point on the broadcast receiver where suitable high tension supply is available. The high tension supply necessary to work the converter properly must be about 150 volts, and this is best obtained by taking this lead either to the anode pin of the output valve or the auxiliary grid pin of the pentode output valve or to the high tension plus side of the loud speaker output transformer. The actual voltage for the converter operation is rather critical and if the voltage obtained from the broadcast receiver is in excess of the figure stated, it should be reduced to the correct amount by the insertion of a series resistance. This resistance should be of the 1 watt type and its value can be calculated by dividing the number of volts to be dropped by .006.



Theoretical circuit diagram for Heptode Super-Het. Converter.

## HEPTODE SUPER-HET. CONVERTER—continued

## OPERATION.

When the converter is connected up in the way described and the mains supply is switched on to both converter and broadcast receiver, the combination is ready to reproduce short wave signals. It is only necessary to tune with the centre tuning knob and to adjust the trimmer so that both circuits are in tune, since there are no other adjustments necessary for operation. The wave change knob, which comes through the side, gives two wavelengths. When the knob is turned in an anti-clockwise direction, the converter covers a waveband of 14.6/29 metres and when turned in a clockwise direction, 27.5/56 metres.

## LIST OF PARTS.

	Price
1 Eddystone 2-piece Metal Cabinet, drilled. (The following parts are mounted and wired into position: Dial, 2-gang Condenser, Screens, Dual Switch Gear and Coils). No. 974/S .. .. .	33/6
1 Eddystone Disc Drive, Cat. No. 970 .. .. .	10/6
1 Eddystone 2-gang Condenser, Cat. No. 967 .. .. .	17/6
1 Set Eddystone Screens .. .. .	3/6
1 Eddystone Dual Switch with Knob .. .. .	5/6
1 pair Eddystone Short Wave Coils .. .. .	6/-
1 Eddystone 220/240v. Filament Transformer (other voltages to order) .. .. .	10/6
1 Eddystone Screened All Wave H.F. Choke, Cat. No. 982 .. .. .	5/-
1 Eddystone Microdenser, 40 m.mfd., with knob .. .. .	4/9
3 Eddystone Tubular Condensers, .1 mfd., Cat. No. 987 .. .. . each	2/-
1 Eddystone Grid Bias Resistor .. .. .	1/6
2 Bushes .. .. . each	2d.
2 Plugs and Sockets .. .. . each	3d.
2 T.C.C. "M" type Condensers, .006 mfd. .. each	1/6
1 T.C.C. "M" type Condenser, .0001 mfd. . . .	8d.
1 T.C.C. "M" type Condenser, .002 mfd. .. .	1/-
4 Resistors, comprising 1 each 5,000, 15,000, 10,000 and 30,000 ohms .. .. . each	1/-
2 ¼" Pillars for mounting 7-pin Valveholder. . each	1d.
1 7-pin Valveholder .. .. .	2/-
Wire, Screws, Nuts, etc. .. .. .	1/6

Plus Royalty of 1/3 if kit is purchased complete.

## POINT TO POINT CONNECTIONS.

- 1—Aerial Socket to Primary of Aerial Coil.
- 2—One Terminal of Heater Transformer to A.C. Mains.
- 3—Other Terminal of Heater Transformer to A.C. Mains.
- 4—Bottom Tag of one .006 mfd. Condenser to one Heater Terminal of Valveholder.
- 5—Other Tag of other .006 mfd. Condenser to other Heater Terminal of Valveholder.
- 6—One 4v. Lead of Mains Transformer to one Heater Terminal of Valveholder.
- 7—Other 4v. Lead of Mains Transformer to other Heater Terminal of Valveholder.
- 8—Top Tags of Both .006 mfd. Condensers joined together.
- 9—Top Tag of one .006 mfd. Condenser to Frame Terminal of Ganged Condenser.
- 10—Frame Terminal to Soldering Tag E, placed on Condenser Bracket Fixing Screw (made).
- 11—Cathode of Heptode (6) to 0.1 mfd. Condenser.
- 12—Bottom Connection of Bias Resistance to latter Condenser.
- 13—Oscillator Grid Terminal (2) of Valveholder to Bottom Tag of .0001 mfd. Condenser.
- 15—Oscillator Grid Terminal of Valveholder to 5,000 ohms Resistance.
- 16—Top Connection of latter Resistance to Top Tag of .0001 mfd. Grid Condenser.
- 17—Top Tag of Grid Condenser to Fixed Plates of Ganged Condenser.
- 18—Top of Grid Winding of Oscillator Coil to Fixed Plates of Ganged Condenser (made).
- 19—Oscillator Anode (1) to Bottom of Reaction Winding on Oscillator Coil.
- 20—Top of Reaction Winding to 0.1 mfd. Condenser.
- 21—Top of latter Condenser to one end of 15,000 ohms Resistance.
- 22—Other end of this Resistance to 0.1 mfd. Screened Grid Condenser.
- 23—Screened Grid (3) to latter Condenser.
- 24—One end of 30,000 ohms Resistance to same Condenser.
- 25—Other end of this Resistance to Screw E fixing H.F. Choke to Chassis.
- 26—Anode (7) to H.F. Choke.
- 27—Bottom Tag of .002 mfd. Condenser to Anode.
- 28—Top Tag to Output Socket.
- 29—Lower end of 10,000 ohms Resistance to H.F. Choke.
- 30—Top end of this Resistance to 0.1 mfd. Condenser.
- 31—Flexible Lead from Fixed Plates of Ganged Condenser to Top Cap of Heptode.
- 32—Fixed Plates of Trimmer to Fixed Plates of Tuning Condenser.
- 33—Top of Grid Winding on Aerial Coil to Fixed Plates of Tuning Condenser (made).
- 34—Moving Plates of Trimmer to Screw E on Mounting Bracket of Switch Assembly.
- 35—Flexible Lead from H.F. Choke to H.T.+ Supply.
- 36—Bottom of Grid Winding of Oscillator Coil to Wire No. 10 (made).





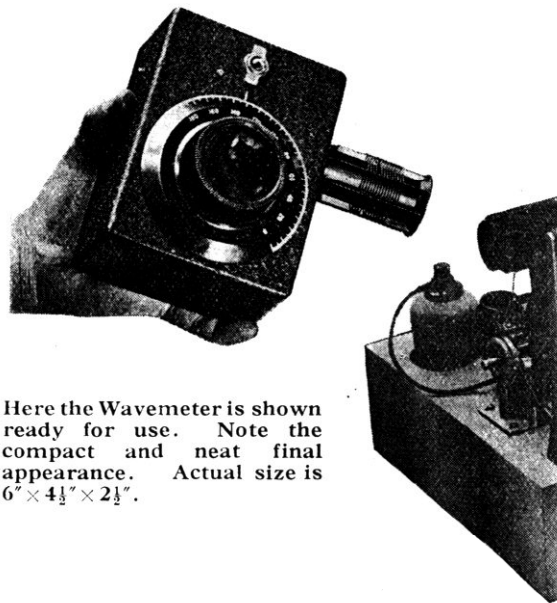
# ALL WAVE BUZZER EXCITED WAVEMETER

8 TO 2.000 METRES.

This wavemeter although of simple design and inexpensive in cost; will be found extremely useful for many purposes and in our opinion, for general all round use, is preferable to the heterodyne type of wavemeter which is much more costly and employs valves and batteries. Tuning with the present design is exceedingly sharp and when the buzzer is employed, it can be used as a signal generator in the same way as a heterodyne instrument. On the other hand, it can equally well be used as an absorption wavemeter with the buzzer switched off and due to the loosely coupled circuit, there is a negligible change in calibration whichever use of the instrument is employed.

The buzzer is very silent in operation, the mechanical noise being hardly audible when the battery is switched on. It is rubber mounted, which prevents mechanical vibration. A resistance shunted across the contacts of the buzzer prevents complete interruption of the circuit, so that a clear generated note free from spluttering is obtained.

The meter is built into a compact cast aluminium box which gives great mechanical strength and rigidity so that it is easy to handle without any frequency change occurring through damage. The construction is very simple indeed and will be easily followed from the accompanying sketches; the buzzer and shunt resistance is already mounted on a bakelite strip ready for fixing in the metal container. It is only necessary to see that the screws which mount the buzzer through the rubber blocks are not too tight so that the whole assembly is fairly flexible. Adjustment for the buzzer contacts is made through the small hole with cover at the end of the case. In addition there is an adjustment for the reed tension, which is easily accessible if the



Here the Wavemeter is shown ready for use. Note the compact and neat final appearance. Actual size is  $6\frac{1}{2} \times 4\frac{1}{2} \times 2\frac{1}{2}$  inches.

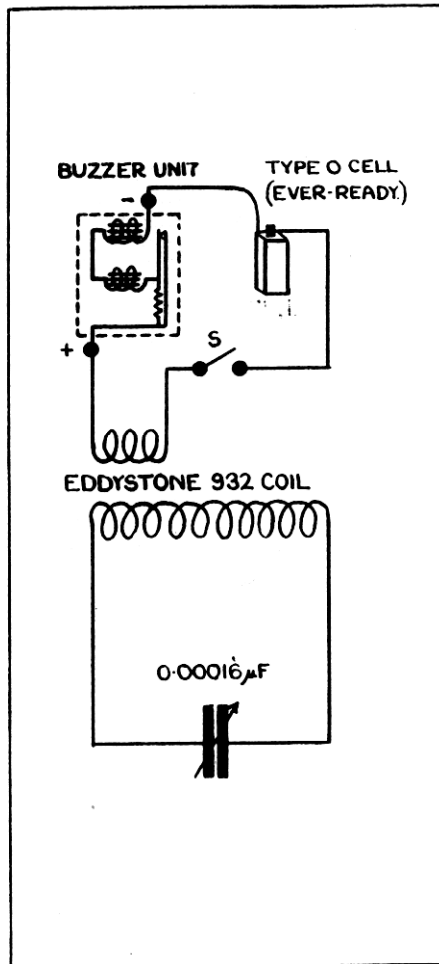
bottom plate of the case is removed. This tension is, however, set at the factory and should not require further adjustment. If adjustment is made at any time, care should be taken to see that the reed does not touch the magnet, otherwise a bad note will result.

A  $1\frac{1}{2}$  volt Ever Ready type O cell is employed to energise the buzzer and this will require replacement every few months, according to the amount of use. The cost of this battery is quite inexpensive, being 7½d.

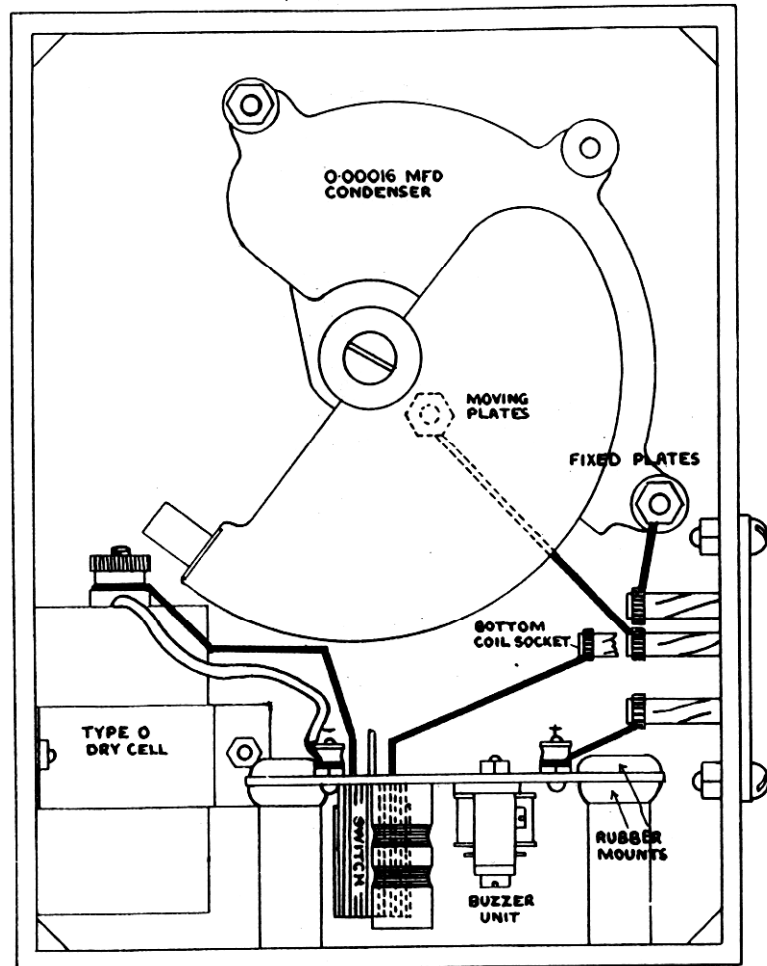
The wavemeter coils are interchangeable and Eddystone 4-pin coils, Cat. No. 932, are employed. These give approximate wave-ranges and settings as per the figures shown, although it must be appreciated that these figures were taken on one instrument only and may vary slightly in individual cases. When assembled, the wavemeter can be

## BUZZER EXCITED WAVEMETER—continued

## THEORETICAL CIRCUIT



## WIRING PLAN



accurately calibrated and graphs drawn by tuning the receiver to five or six stations on each waverange. The frequency of these stations being known, the wavemeter is set accordingly and a graph drawn on plotted paper against the readings obtained. It will be noted that the resultant graph is in every case practically a straight line. In use, whether the wavemeter is employed as a buzzer or as an absorption type, tuning and calibrations are more accurate when the distance away from the receiver is increased. The instrument will also be found useful for lining up 450 K.C. or higher frequency I.F. stages in superheterodynes, and for this purpose a coupling should be obtained from the wavemeter coil to the anode lead from the first detector valve.

## LIST OF PARTS

	Price
1 Eddystone Short Wave Variable Condenser .00016 mfd., Cat. No. 922 .. .. .	8/6
1 Eddystone Cast Aluminium Box, in Brown Crystalline finish .. .. .	12/-
1 Buzzer and Shunt Resistance Unit, mounted on bakelite strip and rubber bushes ..	13/6
1 pair Pillars, 1" x 1/4" diameter .. .. .	3d.
1 Eddystone S.W. Valveholder, Cat. No. 953 ..	10d.
1 4" Dial with 0-180° Scale .. .. .	1/6
1 Battery Clip .. .. .	2d.
1 Ever Ready type O Cell .. .. .	7 1/2d.
1 2-way On-Off Switch .. .. .	1/6
1 Set Eddystone 4-pin Coils, Cat. No. 932, to cover wavelengths required (as price list).	
1 Set Screws, Nuts, Washers, etc. .. .. .	6d.

Continued on page 19

# ULTRA SHORT WAVE RECEIVER

66 Mc/s — 30 Mc/s (4.5-10 METRES)

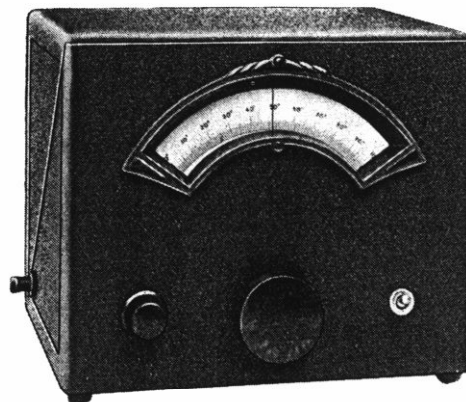
The ultra short waves are now becoming widely used for communication and television purposes and amateurs all over the world are carrying out experimental work on the possibility of their further application. Results up to date show that the use of these ultra short waves is particularly adaptable for short distance telephony over what is practically an optical range. Within these limited distances, even small power gives a clear and strong signal. The general working distance seems to be about twenty to twenty-five miles, but this range is reduced in cities, due to buildings and other obstructions, or is increased up to fifty to eighty miles when the transmitter is taken on to high hilly ground or two or three thousand feet up by aeroplane.

The designer of a receiver for ultra short wave reception can utilise most of the fundamental circuit arrangements in common use for broadcast reception. There are, however, difficulties as far as the amateur is concerned both in the design of the ordinary straight circuit and in the super-heterodyne circuit and for the present conditions, the super-regenerative receiver appears to afford the most satisfactory solution for the experimenter who is commencing this class of work. In the super-regenerative arrangement, the frequency of the incoming signal is split up by a super-imposed frequency known as the quench frequency, which is generated in the receiver itself. This method renders the tuning comparatively flat compared with the other circuit arrangements, in which the tuning is very critical indeed.

In fact, with such arrangements, a weak signal can be completely overlooked or is very difficult to find. Further, unless the transmitter is crystal controlled, the slightest variation in frequency at the transmission end or any variation of tuning at the receiving

end will cause the signal to completely disappear. The super-regenerative method enables these weak signals to be broadly tuned and slight variations at either transmitter or receiver end are by no means pronounced.

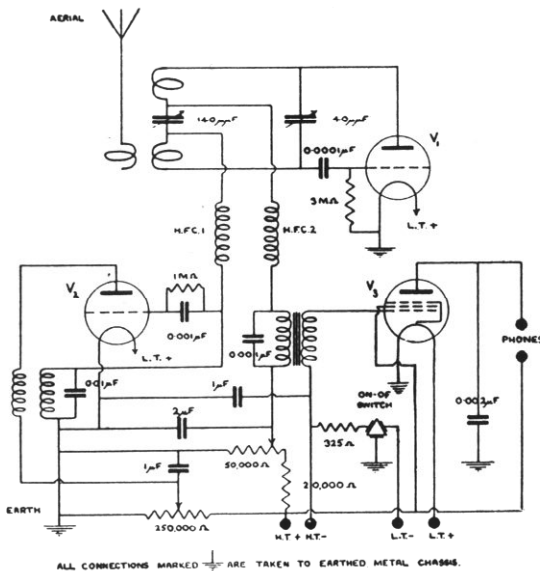
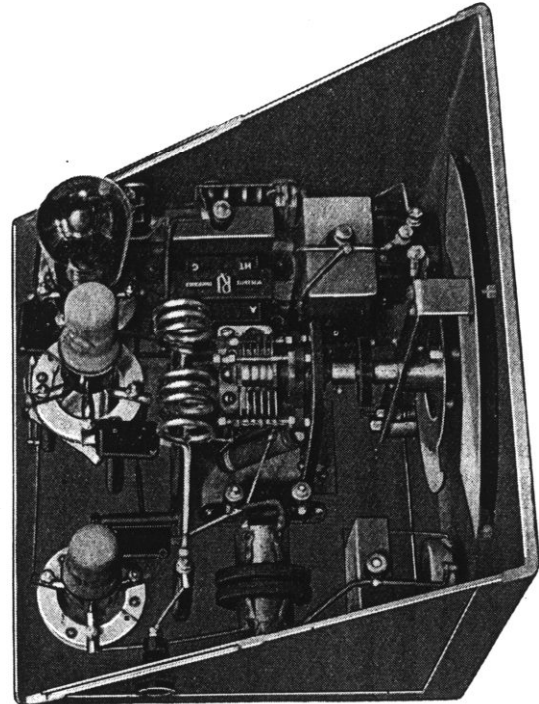
One of the characteristics of the super-regenerative receiver is the quench noise which can be heard when the receiver is not in tune with any incoming signal and which diminishes practically to zero when a signal of sufficient amplitude is picked up. The smallness of the amount of quench noise which remains when weak signals are received constitutes the successful design of this type of set. It is common practice in super-regenerative receiver design to have the anodes of the detector and quench valves in parallel and to use a common high tension supply. Although this works very well in practice,



This shows the outside appearance of the Receiver, the right hand side switch shown should actually be a knob control.

ULTRA SHORT WAVE RECEIVER—continued

LIST OF PARTS		Price
1 Eddystone 2-piece Metal Cabin't, drilled, No. 974/U	29/-	
1 Eddystone Disc Drive, Cat. No. 970W	10/6	
1 Set Eddystone 5-metre Coils, including stand, aerial coupling coil and pillar	5/-	
1 Eddystone Tuning Condenser Outfit, comprising 40 m.mfd. condenser with short spindle, insulated bracket, flexible coupler and brass spindle	7/9	
2 Eddystone 5-metre H.F. Chokes, Cat. No. 947	1/8	each
1 Eddystone 325 ohm Bias Resistor	1/6	
2 Eddystone Special S.W. Valveholders, Cat. No. 949	1/5	each
1 Eddystone Special S.W. Valveholder, Cat. No. 950	1/8	
1 Eddystone Quench Coil Unit, Cat. No. 958	4/6	
2 Eddystone 1 mfd. 1 terminal type Condensers	3/-	each
1 Eddystone 2 mfd. 1 terminal type Condenser	4/-	
1 Set Eddystone 4-way Leads, with plugs and spades	2/9	
1 Eddystone Bush for leads	3d.	
2 Eddystone No. 903 Knobs for Potentiometers	6d.	each
1 Erie 250,000 ohm Potentiometer	3/6	
1 Elpro 50,000 ohm Potentiometer	4/6	
2 2" Pillars, 3/8" diameter, tapped 4BA	2d.	each
3 No. 5P Pillars for mounting valveholder V1	2 1/2d.	each
1 R.I. Hypermite L.F. Transformer	12/6	
2 Erie Grid Leaks, 1 meg. and 3 meg.	1/-	each
1 Erie Resistance, 20,000 ohms	1/-	
1 Cyldon 140 m.mfd. Trimmer	2/-	
1 T.C.C. "M" type Condenser, .0001 mfd.	8d.	
2 T.C.C. "M" type Condensers, .001 mfd.	1/-	each
1 T.C.C. "M" type Condenser, .002 mfd.	1/-	
1 T.C.C. Upright, type 34, Condenser, .01 mfd.	3/-	
1 Claude Lyons 3 point On-Off Switch	1/6	
1 Igranic P.71 Jack	1/3	
1 Igranic, P.40 Plug	1/3	
1 All-in Terminal	6d.	
1 WO Earth Terminal	2d.	
1 Set Screws, Nuts, Wire, Lead Washers, etc.	1/6	
Plus Royalty of 3/9 if kit is purchased complete.		



it has the disadvantage that if the amount of quenching in the circuit is reduced for weak reception, there is also a drop of voltage on the detector anode so that the sensitivity and efficiency of this portion of the set suffer. In this present new Eddystone design, the circuit has been modified so that both the quench valve and detector valve receive different high tension supply and the quench frequency is fed to the detector stage by grid modulation. Separate high tension controls in the form of variable potentiometers are arranged to control the anode voltages of both quench and detector valves and this arrangement permits the detector valve to be always operated at the point of maximum sensitivity and efficiency while the amount of quench can be reduced to the lowest limit necessary for reception purposes. In the Eddystone receiver, therefore, a weak signal can be received with maximum efficiency as far as the detector is concerned and with the smallest possible amount of quench noise.

## ULTRA SHORT WAVE RECEIVER—continued

## CONSTRUCTIONAL DETAILS.

The receiver is built into a two piece Eddystone diecast metal cabinet, which affords perfect screening and absolute rigidity, in addition to which it is of a very suitable and convenient size for portable purposes. The top half of the cabinet should be taken off the hinges so that the receiver components can be more easily fixed and wired. Owing to the compact size of the set, some of the components need to be put in and wired first before the parts are placed in position. The dial and the two potentiometers should be mounted first, followed by the switch, 2 mfd. fixed condenser and the two 1 mfd. condensers. The rest of the components can then be mounted and wired. It is advisable to put in the coupling piece, the mounting bracket for the tuning condenser and the tuning condenser, and get these correctly lined up, but for ease in wiring the components situated underneath

the tuning condenser, this latter item can be temporarily removed. The spindle of the standard Microdenser needs to be shorter so that it does not protrude too far into the coupling piece and if the condenser is purchased separately, a short length of the spindle may have to be cut off. With the low loss Frequentite valveholders used it is advisable to prevent any chance of fracture and so lead washers should be placed under the small pillar feet of the valveholder before mounting to the pillars or down to the baseboard. The same lead washers should also be used under the head of the screw on top of the valveholder ring. Countersunk screws and not round head screws should be used for fastening the valveholders down. The actual wiring details are clearly given in the wiring plan and point to point connections, but the following observations may be useful.

## POINT TO POINT CONNECTIONS.

- 1—Aerial Socket to Aerial Coupling Coil.
- 2—Anode of Valveholder V2 to Quench Coil.
- 3—Filament Terminal of V2 to Soldering Tag E at bottom of pillar supporting Valveholder V1.
- 4—Filament Terminal of V1 to Soldering Tag E.
- 5—Soldering Tag E to .002 mfd. Condenser.
- 6—Soldering Tag E to Filament Terminal of V3.
- 7—.001 mfd. Condenser to Grid of V2.
- 8—1 megohm Grid Leak to Grid of V2.
- 9—1 megohm Grid Leak to .001 mfd. Condenser.
- 10—.001 mfd. Condenser to .01 mfd. Condenser.
- 11—Filament Terminal of V2 to Filament Terminal of V3.
- 12—Filament Terminal of V1 to Wire No. 11.
- 13—Anode of V1 to Coil Holder.
- 14—One End of 3 megohm Grid Leak to Filament Terminal of V1.
- 15—Other End of Grid Leak to Grid of V1.
- 16—.0001 mfd. Condenser to Grid of V1.
- 17—.0001 mfd. Condenser to Coil Holder.
- 18—Coil Holder to Fixed Plates of Microdenser (the other fixed plates connection is left free).
- 19—Moving Plates to Coil Holder.
- 20—Coil Holder to Centre Tag of 140 m.mfd. Cydon Condenser.
- 21—Centre Tag of 140 m.mfd. Condenser to H.F. Choke 2.
- 22—Other Tag of 140 m.mfd. Condenser to Coil Holder.
- 23—End of H.F. Choke 1 to 140 m.mfd. Condenser.
- 24—Other End of H.F. Choke to .01 mfd. Condenser.
- 25—.01 mfd. Condenser to Quench Coil.
- 26—Quench Coil to .01 mfd. Condenser.
- 27—Quench Coil to 1 mfd. Condenser.
- 28—1 mfd. Condenser to Centre Tag of .25 megohm Potentiometer.
- 29—250,000 ohm. Potentiometer to One End of 20,000 ohm Resistance.
- 30—Other End of 20,000 ohm Resistance to 50,000 ohm Potentiometer.
- 31—.25 megohm Potentiometer to Soldering Tag E.
- 32—End of 20,000 ohms Resistance to Centre Pin of Valveholder V3.
- 33—Latter Pin to 'Phone Jack.
- 34—End of .002 mfd. Condenser to Anode of V3.
- 35—Anode of V3 to 'Phone Jack.
- 36—Grid of V3 to G Terminal of L.F. Transformer.
- 37—G.B. Terminal of Transformer to 1 mfd. Condenser.
- 38—H.T. Terminal to 2 mfd. Condenser.
- 39—A Terminal to .001 mfd. Condenser.
- 40—H.F. Choke 2 to A Terminal of Transformer.
- 41—.001 mfd. Condenser to 2 mfd. Condenser.
- 42—2 mfd. Condenser to Slider of 50,000 ohms Potentiometer.
- 43—50,000 ohms Potentiometer to Soldering Tag E.
- 44—Soldering Tag E to Centre Bottom Tag of On-Off Switch.
- 45—One End of 325 ohms Resistance to 1 mfd. Condenser.
- 46—Other End of 325 ohms Resistance to On-Off Switch.

## BATTERY LEADS.

- On-Off Switch to L.T. — (Blue).  
 Filament Terminal of V3 to L.T. + (Red.)  
 1 mfd. Condenser to H.T. — (Slate).  
 'Phone Jack to H.T. + (Grey).



## ULTRA SHORT WAVE RECEIVER—continued

The 140 m.mfd. reaction condenser is mounted underneath the Microdenser on two 2" pillars and H.F. Choke 2 lies under this condenser with its highest end nearest the coil holder pillars, its bottom end being about  $\frac{1}{4}$ " from the baseboard. H.F. Choke 1 is mounted under the Microdenser at the side of the 140 m.mfd. condenser and slopes the other way, its bottom end being some  $\frac{3}{8}$ " from the baseboard. Lead No. 3 is made to a soldering tag in connection with the baseboard of the set, this tag being clamped down by one of the 2 $\frac{3}{4}$ " pillars supporting the centre valveholder. Lead No. 4 runs down this same pillar and is joined to the tag at the bottom.

Lead No. 7 is made by actually placing the tag of the .001 mfd. condenser over the screw of the valveholder V2 terminal. The 3 megohm grid leak, the wire ends Nos. 14 and 15 of which are connected across the two legs of the valveholder, lies immediately under the valveholder ring. The .0001 mfd. condenser from this same valveholder to one of the coils is in a horizontal position just above the valveholder ring. The 20,000 ohm resistance connected to the 50,000 ohm potentiometer lies in a practically vertical position at the side of the potentiometer, its bottom end being about  $\frac{1}{2}$ " from the baseboard.

Lead No. 33 from the centre terminal of valveholder V3 is taken under the valveholder. The .001 mfd. condenser from the anode terminal of the Hypermite Transformer runs in a vertical position parallel to the side of the 2 mfd. condenser. The 325 ohm bias resistor runs level with the top of the switch, so that leads Nos. 45 and 46 are very short.

All the earth points of the circuit are taken down to the metal cabinet and in making these connections, it should be seen that the paint is scraped away so that a good metal to metal contact exists. The cabinet is then earthed as a whole by means of the earth terminal attached to the back of the top cover of the cabinet.

## OPERATING INSTRUCTIONS.

The set presents no difficulty in operation. Tuning is carried out by the main control and the procedure is to set the right hand potentiometer which controls the detector oscillations to a point just past half way, with the quench control at minimum, which is when it is turned in an anti-clockwise direction. The detector valve is brought into a condition so that it is just oscillating by adjustment of the fixed reaction coupling afforded by the Cyldon 140 m.mfd. condenser. It should then be possible on all occasions to control the oscillation of the detector valve by use of the right hand potentiometer. The detector valve is always used in an oscillating condition since these oscillations have to be broken up by the quench frequency. The oscillations of the quench valve are controlled by the left hand potentiometer and the amount of quench necessary can be adjusted for each individual signal. It is possible to operate the set purely as a detector and L.F. stage if the quench control is turned right back so that it does not operate and the right hand potentiometer is then used as a reaction control.

## AERIAL.

The set can be used on an ordinary broadcast aerial, but better results may be obtained on much shorter lengths of wire. The usual methods of aerial construction for efficiency should be followed.

## VALVES.

Both the quench and detector valves in our trial receiver were Osram type HL2K, this being of the catkin construction, and the output valve is a Mazda Pen 220A. It is important that this valve should be used because the automatic bias has been calculated to suit its characteristics.

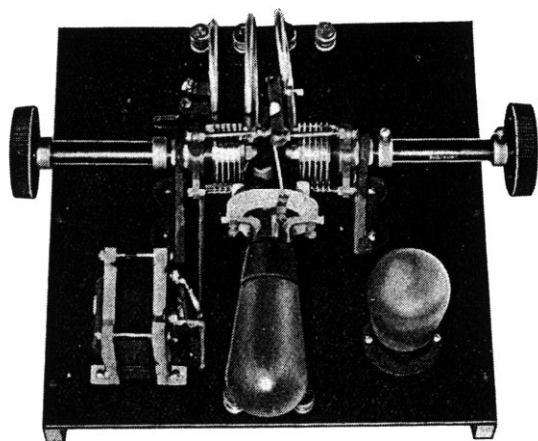
## POWER SUPPLY.

The high tension supply should be 120 volts and the low tension accumulator 2 volts.



# ULTRA SHORT WAVE TRANSMITTER

45 Mc. — 70 Mc. (4.3 — 6.7 METRES).



*The Transmitter lay-out is exceedingly simple as the photograph shows.*

An ultra short wave transmitter provides much scope for interesting experimental work. A small power transmitter, with a receiver such as previously shown, working with a station possessing similar apparatus can carry out duplex working over limited distances as easily as with a telephone. The apparatus is moreover of a portable nature so that the experimental field is considerably widened.

In considering the construction of an ultra S.W. transmitter, it was decided to use a simple design which would be of small size for portability and also cheap to build and easy to operate. Since for general experimental work and limited range, small power is quite effective, it was decided to design a transmitter to operate from battery supply. The general range of the instrument is from 5 to 25 miles unless arrangements are made to take the transmitter on to high ground, when greater range may be expected.

The circuit used is a Split Colpitts type with a loosely coupled aerial coil. The aerial is a half wave radiator, which is preferably erected in a vertical rather than a horizontal position since this gives better ground wave propagation with less directional properties. The aerial is coupled to the transmitter by means of twin transverse feeders, Eddystone Crossfeeder Blocks being used. One side of the feeder line is connected to the aerial proper

and the other side terminates in an open end. The actual aerial and feeder erection is as shown in Figure 1. The length of wire in a half wave aerial in feet, necessary for a given wavelength is found by multiplying the wavelength to be used by 1.56. Thus, for a 5 metre transmission, the length of aerial should be 7.8 feet. The length of feeder wires must be at least one quarter wave, that is, one half the aerial length, and can consist of any number of odd quarter wavelengths, for instance, 3, 5, 7, etc.

To tune the transmitter to resonance with the aerial, cut the aerial wire exactly in half and insert a small low consumption bulb in holder (a 60 m/Amp. fuse bulb is ideal) in the centre of the aerial. Since the aerial is half wave, fed with feeders giving a voltage node at the ends, current will be at maximum in the centre of the aerial. The transmitter is therefore tuned until the bulb shows maximum brilliance when aerial and transmitter are in resonance.

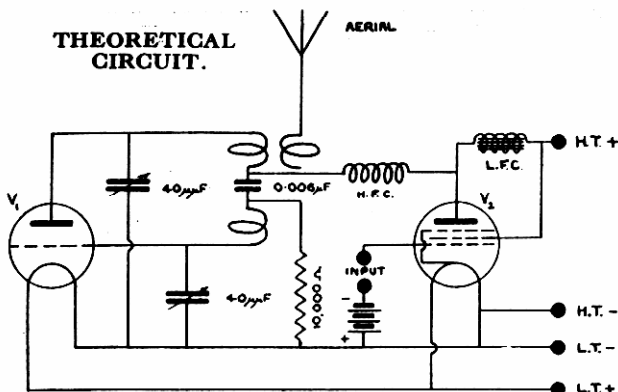
The valve used as oscillator is an Osram type LP2. This gives a reasonable power output for the input in use and gives consistent results. The modulating portion of the set comprises a steep slope pentode type Osram PT2, which is choke coupled to the oscillator. No further L.F. amplification is required. The microphone circuit is as shown in Figure 2.

## POWER SUPPLY.

The high tension supply should be 150/200 volts. The current consumption of the LP2 valve at 150 volts is 12 milliamps, giving an input wattage of 1.8 watts, which due to the type of aerial and the high frequency is usefully radiated. The PT2 is biased to 4.5 volts negative and with 150 anode volts draws 10 milliamps. The source of supply should, therefore, be suitable for a total drain of 22 milliamps and if dry batteries are used, these should be of large capacity. The total filament current consumed is .4 amps. at 2 volts.

The aerial coupling is made variable. This adjustment is not critical, but it should be set in the position when the bulb shows maximum brilliance.

ULTRA SHORT WAVE TRANSMITTER—continued



The construction is simple and is shown in the accompanying diagrams. The following points are, however, explained for greater clearness.

The valveholder has two small metal clips fastened to the underside screw of the grid and anode terminals. Each clip is fastened to a fixed plate terminal of each Microdenser. Thus, in addition to mounting the valveholder, these clips form the connections 1 and 8. The .006 mfd. condenser bridges over the end of one coil to the end of the other coil. A screw is threaded through the tag holes of the condenser, through the end of the coil, and locked with locking nut and terminal head. In order to mount the coils correctly, if one end of the anode coil is fastened on to the back fixed plate terminal of the Microdenser and one end of the grid coil similarly fixed to the other Microdenser, the coils are in position and the .006 mfd. condenser will bridge the other ends. The H.F. Choke is vertical, the one end being level with the end of the coil, the other end practically touching the baseboard. Wire No. 9 in the set was composed of two soldering tags bent over and their ends soldered together.

The two Microdenoders must make good contact with the metal brackets and the paint should be cleaned from the brackets to see that this contact is made. On the bracket in which two fastening screws are used for wiring connections underneath, the heads of the screws must make good metallic contact with the bracket in the same way.

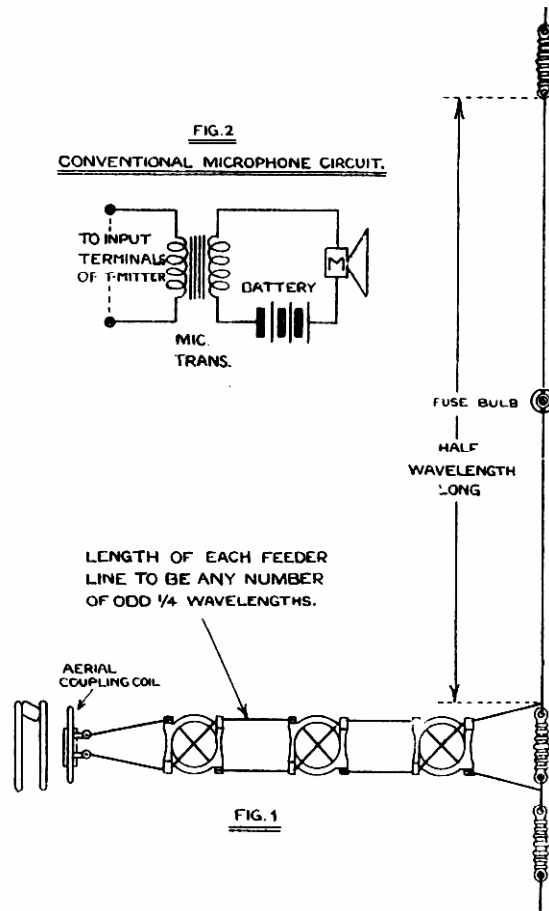
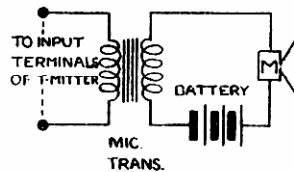
Systoflex is used to cover the 18 gauge tinned copper wire used for wiring. The bakelite baseboard will require drilling and a small round hole cutting for the valveholder and a small oblong slot about 1½" x ¼" wide for variation of the aerial coil coupling. The baseboard is raised by means of two 1" wooden plywood strips.

LIST OF PARTS.

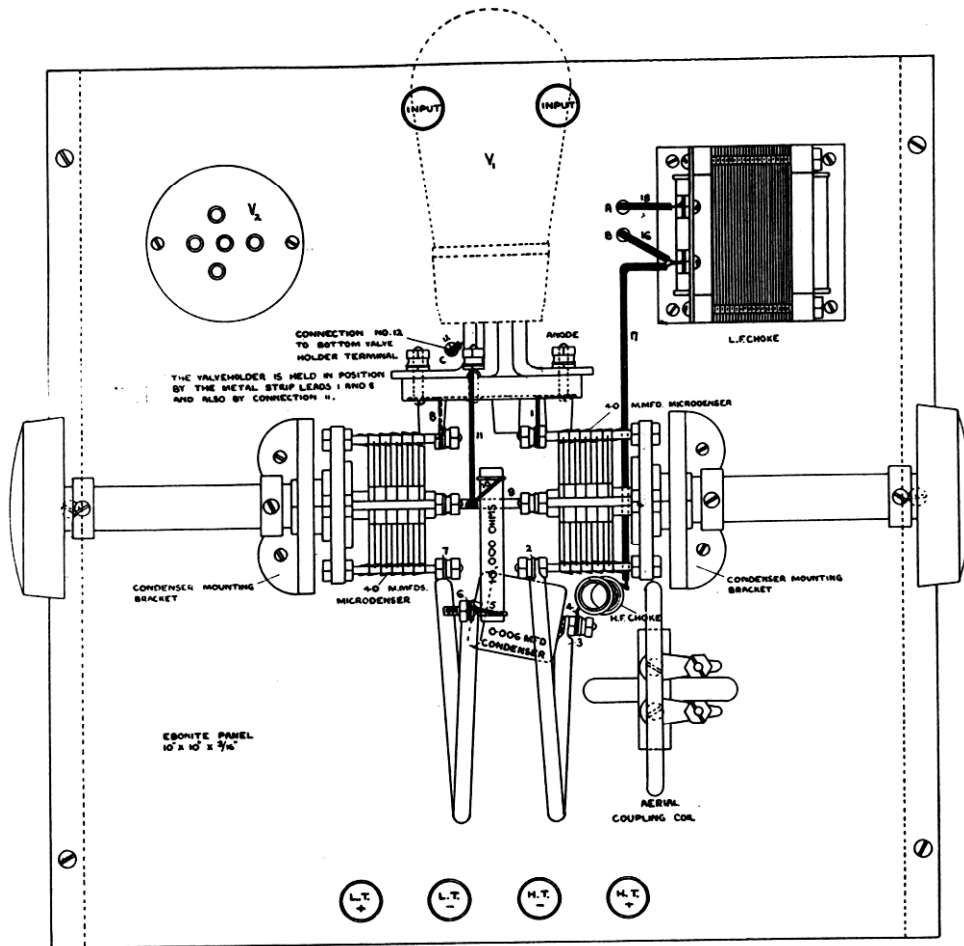
Price

1 pair Eddystone 40 m.mfd. Microdenoders, Cat. No. 900	.. pair	8/6
1 pair Eddystone Metal Brackets, Cat. No. 945	.. pair	2/4
1 pair Eddystone 3" Extension Spindles, Cat. No. 943	.. pair	3/-
1 pair Eddystone 2" Knobs, ¼" hole, Cat. No. 902	.. pair	1/6
1 Eddystone Special S.W. Valveholder, No. 949		1/5
1 Eddystone S.W. Valveholder, No. 954		1/-
1 Eddystone 5-metre H.F. Choke, Cat. No. 947		1/8
1 Eddystone Modulator Choke, No. 980		8/6
1 Eddystone G.B. Battery Clip		2d.
1 Set of 3, Eddystone Coils with bracket, washers and wing nut		3/6
1 pair Eddystone Angle Brackets for valveholder mounting	.. pair	3d.
1 Erie 10,000 ohm 1 watt type Resistor		1/-
1 T.C.C. .006 mfd. type "M" Condenser		1/6
1 Bakelite Baseboard, 10" x 10" x ¼"		3/6
1 pair Wood Strips, 10" x 1" x ½" ply	.. pair	6d.
6 Belling Lee Terminals, L.T.+, L.T.-, H.T.+, H.T.-, Input+, Input-	.. each	4½d.
Wire, Systoflex, 2 Wander Plugs, Screws, Nuts, etc.		2/6

FIG. 2  
CONVENTIONAL MICROPHONE CIRCUIT.

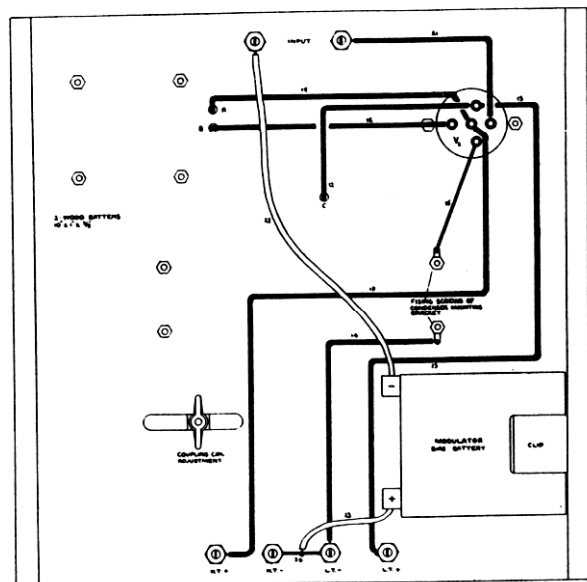


# ULTRA SHORT WAVE TRANSMITTER—continued WIRING PLAN



### POINT TO POINT CONNECTIONS.

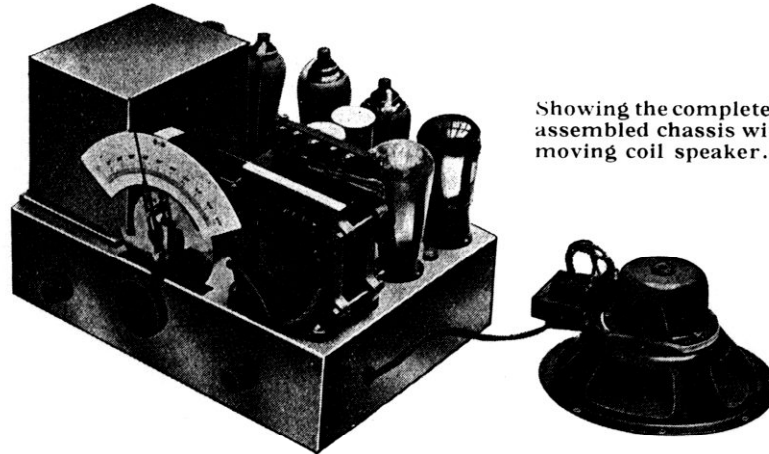
- 1—Metal Strip from Anode Terminal of Valveholder V1 to Fixed Plates of Microdenser.
- 2—End of Anode Coil to Fixed Plates of Microdenser.
- 3—Other End of this Coil to .006 mfd. Condenser.
- 4—Lead of H.F. Choke to .006 mfd. Condenser.
- 5—One End of 10,000 ohm Resistance to Other Side of .006 mfd. Condenser.
- 6—This Side of .006 mfd. Condenser to One End of Grid Coil.
- 7—Other End of Grid Coil to Fixed Plates of Microdenser.
- 8—Metal Strip from Grid Terminal of V1 to Fixed Plates of Microdenser.
- 9—Wire Connecting the Moving Plates of the Microdensers.
- 10—End of 10,000 ohm Resistance to Moving Plates of Microdensers.
- 11—Moving Plates of Microdensers to Top Filament Terminal of V1.
- 12—Bottom Filament Terminal of V1 through hole c in Baseboard to Positive Filament Terminal of V2.
- 13—Positive Terminal of V2 to L.T.+ Terminal.
- 14—L.T.— Terminal to One Fixing Screw of Condenser Mounting Bracket.
- 15—Other Fixing Screw to Negative Filament Terminal of Valveholder V2.
- 16—Anode Terminal of V2 through hole b in Baseboard to One Side of L.F. Choke.
- 17—Same Side of L.F. Choke to End of H.F. Choke.
- 18—Other Side of L.F. Choke through hole a in Baseboard to Centre Pin of V2.
- 19—Centre Pin of V2 to H.T.+ Terminal.
- 20—H.T.— Terminal to L.T.— Terminal.
- 21—Input Terminal to Grid Terminal of V2.
- 22—Flexible Lead from other Input Terminal to Negative Tapping of Bias Battery.
- 23—Grid Bias Plus to Connection No. 20:



Under Baseboard Wiring Plan

## 6 VALVE SHORT WAVE SUPER-HETERODYNE RECEIVER

Complete with moving coil loud speaker, 4 switched waveranges covering 13 to 68 metres, ganged tuning and Automatic Volume Control.



Showing the completely assembled chassis with moving coil speaker.

The design of an efficient short wave super-heterodyne receiver presents many technical problems and is by no means easy if really satisfactory operation and performance are insisted upon. The receiver described here has had many months of experimental work spent upon it which are now justified by the excellent results which it gives.

The set comprises six valves, including full wave rectifier, and has in addition a metal rectifier giving automatic volume control. The first detector is a screened grid valve working as an anode bend rectifier. A vari-mu screened pentode operates as intermediate frequency amplifier on 450 Kc/s. The second detector is a screened high frequency pentode with power grid rectification which is resistance coupled to a directly heated pentode output valve. A separate triode valve is used as oscillator. A switch is fitted so that the automatic volume control can be cut out and a manual volume control used in its place. The aerial circuit and oscillator are tuned by means of a ganged condenser with a small non-critical trimmer across the aerial coil so that maximum efficiency is obtained, the associated coils being switched give four waveranges covering in all 13/68 metres. The value of the tuning condensers 100 m.mfd., is small, so that a high inductance to capacity ratio is obtained and tuning is not unduly critical although selectivity is achieved.

The receiver, including the power supply, is built on a strong cast aluminium alloy chassis which forms a really splendid base for the construction of the set, and we would point out that to do justice to the instrument, the

mounting of the components and the wiring deserve to be carried out in the same workman-like manner. In this type of receiver, it is essential that there shall be no loose screws or nuts, no bad soldered joints, that all connections made to the chassis should effect good metallic contact and that any leads which pass through the chassis should be well insulated. The shielding box for the coil unit is also a one-piece metal casting so that perfect screening of the oscillator circuit is effected. The care taken in the design of this circuit effectively prevents any interlocking.

The mains transformer is a particularly well designed and massive component, so that good regulation without over-heating is assured. Good regulation is very important as far as valve life is concerned. The high tension winding of the transformer gives 350-0-350v. output. The speaker field is, however, used as a smoothing choke. This has a resistance of 2,750 ohms and gives 100v. drop so that the voltage to the set is 250v. The speaker field is connected in the negative lead, so that the potential difference between the coils and frame of the speaker is only 100v. The frame of the speaker should be earthed.

### VALVES.

Oscillator	..	Osram MH4 Catkin.
First Detector	..	Osram 5-pin MS4B Metallised.
I.F.	..	Mullard VP4 5-pin Metallised
Second Detector	..	Mullard SP4 5-pin Metallised
Output	..	Mullard PM24M
Rectifier	..	Mullard DW3

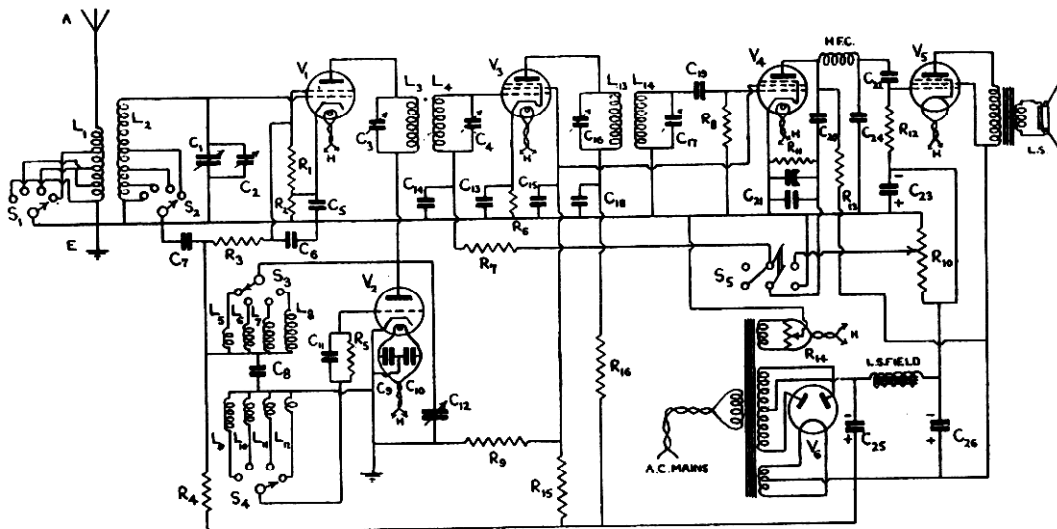
## 6 VALVE S.W. SUPER-HETERODYNE RECEIVER—continued

## CONSTRUCTION.

The construction of the receiver is well shown in the wiring plan and with the help of the point to point connections, the wiring should be easily followed. The receiver is, however, one which requires some technical knowledge to build and erect successfully. Some points in the construction are explained below at length to ensure greater clarity.

The coils and switch gear are already mounted on the chassis and wherever possible, the necessary connections have been made. The tapped coil under the chassis and the double gang switch form the aerial circuit of the receiver while the switched coil unit in the screening box on top of the chassis is the circuit associated with the oscillator. In the aerial circuit, there are three connections from the coil not connected up (leads Nos. 1, 3, and 6) and these leads are labelled with their number. Lead No. 4, which is taken through hole a in the chassis, is actually joined to the front insulated terminal of the ganged condenser. Leads Nos. 4 and 5 go to the bottom fixed plate terminal of the trimmer condenser, which is shown broken away from the condenser in the wiring diagram since it actually comes directly under the top terminal, which is also shown. Leads Nos. 7 and 8 are soldered to the tag E fitted on the dial. The special dial and condenser are supplied mounted together. To complete the assembly on the chassis, the  $\frac{1}{4}$ " rod projecting from the front of the dial must be pushed through the rubber bush in the panel and the two brackets at

the back of the ganged condenser bolted down to the chassis. This is the only mounting for these parts, which are slightly flexible due to the rubber mounting. Lead No. 28 has already been joined to the coil unit and is brought through the chassis and labelled. At the top of condenser C14, a small insulated paxolin strip with double eyelet tag is mounted to support the resistance R4 by means of its wire end (lead No. 29). Lead No. 30 is also taken to this tag. Leads Nos. 45 and 46 are taken to the condenser terminal proper of the condenser. Lead No. 31 is already soldered to the switch arm and brought through hole c in the small screened section on the left of the wiring plan. The two condensers C9 and C10 are mounted longways vertically and their two ends (leads Nos. 34 and 35) must make good metallic connection with the chassis by means of the screw e which is one of the valveholder fixing screws. Wire No. 40 is already soldered to the switch arm and is brought through hole d and suitably labelled. Switch S5 has tags at the bottom, top and back. A small view of this switch showing the six contacts with the back contacts in the centre, is drawn on the wiring plan to the left of the switch. Lead No. 49 is taken to condenser C20 which is mounted vertically, lead No. 66 being taken from the same tag of the condenser. Condenser C19 is mounted vertically between the grid of V4 (lead No. 59) and grid lead of the I.F. unit (lead No. 60). Lead No. 64 is a lead made in screened systoflex from the top terminal of the valve, through the chassis



THEORETICAL CIRCUIT DIAGRAM OF THE SIX VALVE SUPER-HET. RECEIVER.

## 6 VALVE S.W. SUPER-HETERODYNE RECEIVER—continued

## LIST OF PARTS.

1 Eddystone Cast Aluminium Chassis, drilled with all holes and finished battleship grey, complete with cast aluminium screening box (the coils and switch gear are already mounted and wired on this chassis)	50/-
1 Eddystone Multi Wave Oscillator Coil and Tapped Aerial Coil with necessary ganged switch gear	45/-
1 Eddystone Special Dial and 2-gang Condenser Assembly with rubber mounting	35/-
1 Eddystone Microdenser, 40 m.mfd., with knob and dial (C2)	5/-
5 Eddystone 5-pin Valveholders, Cat. No. 954	each 1/-
1 Eddystone 4-pin Valveholder, Cat. No. 953	10d.
1 Eddystone Volume Control, 625 ohms, with knob (R10)	6/-
2 Eddystone I.F. Transformers, 450 Kc/s, Cat. No. 974	each 10/6
7 Eddystone Tubular Condensers, .1 mfd., Cat. No. 987 (C5, C6, C7, C13, C14, C15, C18)	each 2/-
1 Special Moving Coil Loud Speaker with output transformer	40/-
1 Eddystone 4 section H.F. Choke with mounting rod and screw	4/6
1 Eddystone 5-way Terminal Block, Cat. No. 997	1/2
1 Mains Transformer 350-0-350v, 4v. 5 amps., and 4v. 2 amps., C.T. 60 m/Amps. (200 volt range or 100 volt range as required)	45/-
2 8 mfd. Electrolytic Condensers, 500v., Peak Working (C25 and C26)	6/-
1 20 mfd. Electrolytic Condenser, 50 volt. working (C23)	4/-
2 10,000 ohm Resistors, 1 watt (R3 and R16)	each 1/-
1 100,000 ohm Resistor, 1 watt (R1)	1/-
1 40,000 ohm Resistor, 1 watt (R13)	1/-
3 250,000 ohm Resistors, 1/2 watt (R8, R11 and R12)	each 1/-
1 D.P.D.T. Toggle Switch Bulgin Cat. No. 98 (S5)	2/3
1 Humdinger (R14)	2/6
1 Eddystone Bias Resistance, 375 ohms (R6)	1/6
1 Eddystone Bias Resistance, 390 ohms (R2)	1/6
1 1 megohm Resistor, 1 watt (R7)	1/-
1 10,000 ohm Resistor, 3 watt (R9)	3/-
1 5,000 ohm Resistor, 1 watt (R5)	1/-
1 Aerial Plug and Socket	6d.
1 WX6 Westector	7/6
2 T.C.C. "M" type Condensers, .0001 mfd. (C11 and C19)	each 8d.
1 T.C.C. "M" type Condenser, .002 mfd. (C21)	1/-
1 T.C.C. "M" type Condenser, .001 mfd. (C20)	1/-
1 T.C.C. "M" type Condenser, .0003 mfd. (C24)	8d.
3 T.C.C. "M" type Condensers, .006 mfd. (C9, C10 and C22)	each 1/6
1 30,000 ohm Resistor, 3 watt (R15)	3/-
1 5,000 ohm Resistor, 3 watt (R4)	3/-
1 4-way Lead	2/9
1 W.O. Terminal	2d.
1 Large Grommet	3d.
1 Length Mains Flex	1/6
Screws, Nuts, Washers, Wire, Screened Systoflex, Oiled Slewing, Connecting Braid, etc.	3/6
Royalty for Complete Kit	7/6

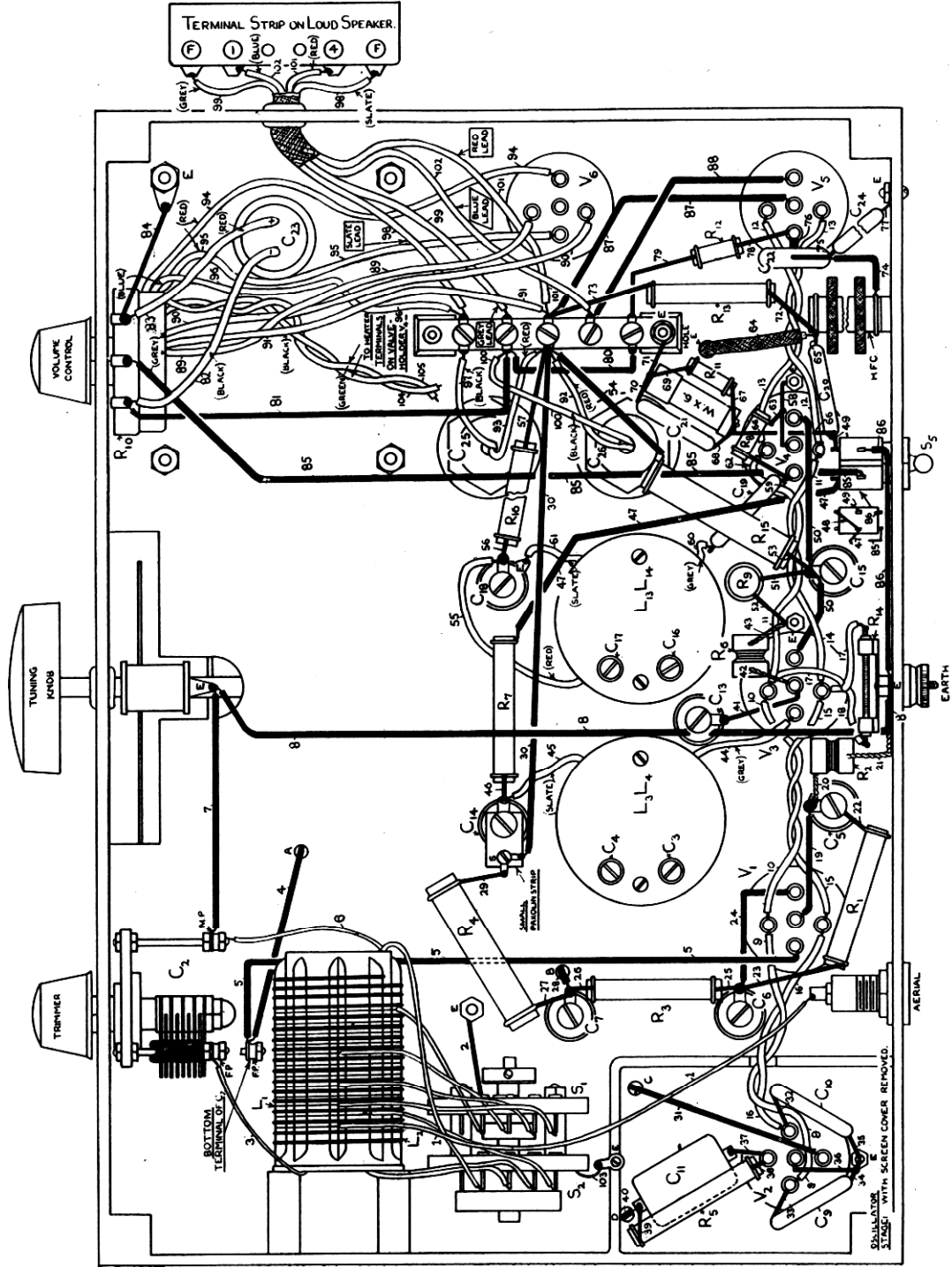
## POINT TO POINT CONNECTIONS.

- 1—Aerial Socket to end of Primary Coil L1.
- 2—Contact Arm of S1 to Earthed Screw E.
- 3—End of Grid Winding L2 to Fixed Plates of Trimmer C2.
- 4—Bottom Fixed Plates Terminal of C2, through hole a in chassis, to front section (C1) of 2 Gang Condenser.
- 5—Fixed Plates of C2 to Grid of V1.
- 6—End of Grid Winding L2 to Moving Plates of C2.
- 7—Moving Plates of C2 to Soldering Tag E on Disc Drive.
- 8—Soldering Tag E to Earth Terminal.
- 9—Twisted Lead from Heater of V2 to Heater of V1.
- 10—Twisted Lead from Heater of V1 to Heater of V3.
- 11—Twisted Lead from Heater of V3 to Heater of V4.
- 12—Twisted Lead from Heater of V4 to Heater of V5.
- 13—Twisted Lead from Heater of V5 to Heater of V4.
- 14—Twisted Lead from Heater of V4 to Heater of V3.
- 15—Twisted Lead from Heater of V3 to Heater of V1.
- 16—Twisted Lead from Heater of V1 to Heater of V2.
- 17—One Heater of V3 to one side of Humdinger R14.
- 18—Other Heater of V3 to other side of Humdinger R14.
- 19—Cathode of V1 to C5.
- 20—One End of R2 to C5.
- 21—Other End of R2 to Earth Terminal.
- 22—One End of R1 to C5.
- 23—Other End of R1 to C6.
- 24—C6 to Anode of V1.
- 25—One End of R3 to C6.
- 26—Other End of R3 to C7.
- 27—One End of R4 to C7.
- 28—C7, through hole b in chassis, to Top Centre Terminal of Switched Coil L5-L8.
- 29—Remaining End of R4 to Screw S on Paxolin Strip fixed on top of C14.
- 30—Screw S to Centre Terminal of Terminal Strip.
- 31—Anode of V2, through hole c in chassis, to Switch Arm S3.
- 32—One End of C10 to One Heater of V2.
- 33—One End of C9 to other Heater of V2.
- 34—Remaining End of C9 to Valveholder Fixing Screw E.
- 35—Remaining End of C10 to Valveholder Fixing Screw E.
- 36—Cathode of V2 to Valveholder Fixing Screw E.
- 37—Grid of V2 to C11.
- 38—One End of R5 to Grid of V2.
- 39—Other End of R5 to C11.
- 40—C11, through hole d in chassis, to Switch Arm S4.
- 41—Cathode of V3 to C16.
- 42—One End of R6 to Cathode of V3.
- 43—Other End of R6 to Valveholder Fixing Screw E.
- 44—Grey Lead of First I.F. Transformer to Grid of V3.
- 45—Slate Lead of First I.F. Transformer to C14.
- 46—One End of R7 to C14.
- 47—Other End of R7 to A.V.C. Switch S5 (Left hand connection of middle contacts.)
- 48—Wire No. 47 to Back Right Hand Connection of S5.
- 49—Middle Right Hand Connection to C20.
- 50—Screen Grid of V3 and V4 to C15.
- 51—Top of R9 to C15.
- 52—Bottom of R9 to Valveholder Fixing Screw E.
- 53—One End of R15 to C15.
- 54—Other End of R15 to Centre Terminal of Terminal Strip.
- 55—Red Lead of Second I.F. Transformer to C18.
- 56—One End of R16 to C18.
- 57—Other End of R16 to Centre Terminal of Terminal Strip.
- 58—Cathode of V4 to Valveholder Fixing Screw E.
- 59—One End of C19 to Grid of V4.
- 60—Other End of C19 to Grey Lead of Second I.F. Transformer.
- 61—Slate Lead of Second I.F. Transformer to Soldering Tag E placed under C18.
- 62—One End of R8 to Grid of V4.
- 63—Other End of R8 to Valveholder Fixing Screw E.
- 64—Screened Lead from Anode of V4 to H.F. Choke.
- 65—Remaining End of C20 to H.F. Choke.
- 66—Wire No. 49 to one end of WX6 Westector.
- 67—One End of R11 to one end of WX6.
- 68—One End of C21 to one end of WX6.
- 69—Remaining End of R11 to other end of WX6.
- 70—Remaining End of C21 to WX6.
- 71—WX6 to Screw E on Terminal Strip.
- 72—One End of R13 to H.F. Choke.
- 73—Other End of R13 to Centre Terminal of Terminal Strip.
- 74—End of H.F. Choke to Top Tag of C22.
- 75—One End of C24 to Top Tag of C22.
- 76—Bottom Tag of C22 to Grid of V5.
- 77—Remaining End of C24 to Earthed Screw E.
- 78—One End of R12 to Grid of V5.
- 79—Other End of R12 to Terminal Strip.
- 80—Bottom Connection of Terminal Strip to other connection on Terminal Strip.
- 81—One Side of Volume Control R10 to above connection.
- 82—Same Side of R10 to Black Lead of C23.
- 83—Red Lead of C23 to other side of R10.
- 84—Latter connection of R10 to Screw E fixing Mains Transformer to chassis.
- 85—Slider of R10 to Bottom Left Hand Connection of S5.
- 86—Bottom Right Hand Connection of S5 to Earth Terminal.
- 87—Auxiliary Grid of V5 to Terminal Strip.
- 88—Anode of V5 to Terminal Strip.
- 89—One Grey Lead on Transformer to one Filament Terminal on V6.
- 90—Other Grey Lead on Transformer to other Filament Terminal on V6.
- 91—Black Lead on Transformer to Centre Terminal on Terminal Strip.
- 92—Red Lead of C26 to Centre Terminal on Terminal Strip.
- 93—Red Lead of C25 to Centre Terminal on Terminal Strip.
- 94—One Red Lead on Mains Transformer to Anode Terminal on V6.
- 95—Other Red Lead on Mains Transformer to Grid Terminal on V6.
- 96—Blue Lead on Mains Transformer to Terminal Strip.
- 97—Black Lead on C25 to Latter Terminal.
- 98—Slate Lead of 4 way Cable from above Terminal to one F connection on L.S. Strip.
- 99—Grey Lead of Cable from Terminal Strip to other F connection on L.S. Strip.
- 100—Black Lead of C26 to Terminal Strip.
- 101—Red Lead of Cable from Terminal Strip to No. 4 connection on L.S. Strip.
- 102—Blue Lead of Cable from Terminal Strip to No. 1 connection on L.S. Strip.
- 103—Slider Connection of S2 to Soldering Tag E, which is placed under one of the fixing screws of the oscillator screen cover.
- 104 }
- 105 } Green Leads of Mains Transformer to Heater Terminals of V4.

The following connections are made on the top of the chassis :-

- 1—Screened Lead from Anode of V1 to Blue Lead on Primary (L3) of First I.F. Transformer.
- 2—Screened Lead from Anode of V3 to Blue Lead on Primary (L13) of Second I.F. Transformer.
- 3—Wire No. 64 Screened Lead from Anode of V4, through hole e in chassis, to H.F. Choke.
- 4—Wire No. 4, front section (C1) of 2-gang Condenser, through hole a in chassis, to Fixed Plates of Trimmer C2.
- 5—Wire No. 28, Top Centre Terminal of Switched Coil L5-L8, through hole b in chassis, to C7.
- 6—Wire No. 31, Switch Arm S3, through hole c in chassis, to Anode of V2.
- 7—Wire No. 40, Switch Arm S4, through hole d in chassis, to C11.
- 8—Primary of Mains Transformer to A.C. Mains.

6 VALVE S.W. SUPER-HETERODYNE RECEIVER  
WIRING PLAN



## 6 VALVE S.W. SUPER-HETERODYNE RECEIVER—continued

hole e, near the terminal block, to the high frequency choke. The metal screening of this lead should be earthed to the fixing screw e of the terminal strip, which connection is not shown in the plan. The H.F. choke is shown broken to give a clearer view. Condenser C22 near valveholder V5, is mounted vertically, the lower terminal going direct to the grid socket of the valveholder. The top terminal is joined to the high frequency choke and the condenser C24. Lead No. 84, one side of the resistance R10, is taken to a tag in metallic contact with the chassis and fastened down by one of the fixing screws of the mains transformer. Leads Nos. 85 and 86, the bottom connections of the switch, are the connections nearest the edge of the chassis. Lead No. 103 is already made—the tag must be put back under the metal cover when this is replaced.

There are eight connections which have to be made on top of the chassis and no wiring plan of these is given. Lead No. 1, the blue lead of the first I.F. transformer, is threaded through the hole in the chassis and taken to the top terminal of the valve VI. This lead is carried in screened systoflex, the metal screening of which must not touch the metallised coating of the valve. A small quantity of large diameter oiled sleeving is supplied to cover the three screened leads. Lead No. 2 is made in the same way as lead No. 1. Wire No. 64, itemised under heading No. 3, has already been mentioned, as have also wires Nos. 4, 28, 31 and 40, itemised under headings 4, 5, 6 and 7. The A.C. mains leads under heading No. 8 are connected to the terminal strip of the mains transformer by means of the soldering tags, which are in contact with the brass bus-bars. The two screw plugs which are inserted in the screwed sockets of the mains transformer terminal strip should be screwed in so that the right voltage for the mains supply in use is employed. One of the plugs is screwed into the socket marked 0 and the other one into one of the three sockets marked 200, 220 and 240 volts. If 210, 230 or 250 volts is required, the other plug screw, instead of being placed in the socket marked 0 is placed in the socket marked "Plus 10." In the case of a 100 volt transformer, similar procedure is followed. When everything is in order, the set is switched on by means of the switch on the right hand side.

## OPERATING THE RECEIVER.

When the receiver is completely wired and connections have been thoroughly checked, the valves can be inserted in their respective holders and the set switched on. The heaters of the A.C. valves require a short time to heat up to the correct working temperature. When this has been done, the adjustment to the Humdinger, by means of the small slotted screw head, can be made. This screw should be set in the position where a minimum of hum is found, and no further adjustment of this component is necessary. The trimmer condensers of the I.F. transformers must be set so that these units are tuned to 450 Kc/s. It is important that both these transformers be in tune otherwise the amplification factor of the set will be poor. Further, if the correct intermediate frequency is not employed the aerial trimming condenser will not function properly. The I.F. stages are best tuned using a wavemeter and the buzzer type described elsewhere in the manual is ideal. 450 Kc/s represents a wavelength of approximately 666 metres. The wavemeter should be first coupled to the aerial lead by wrapping a few turns of the aerial lead round the wavemeter coil. The I.F. unit trimming condensers C4, C3, C17 and C16 are then adjusted in the order named. Final and more accurate trimming is then carried out in the same way by coupling the wavemeter coil to the anode lead from the first detector valve. When adjusting the trimmer condensers the shank of the screwdriver should have a small piece of systoflex slipped over the metal so that this shank does not touch the metal screening can. The switch S5 gives automatic volume control or manual control, and in practice, when the switch is up, the A.V.C. is in operation while with the switch down, the manual volume control comes into operation. The remaining controls consist of the one knob operating the tuning dial and in conjunction with this, the small trimmer condenser on the extreme left is used. The wave switch is on the left hand side of the chassis. The loud speaker is a fundamental part of the design since the field coil forms a smoothing choke and if this is mounted in the same cabinet as the chassis, we recommend that it be placed above or at the side rather than below. If the receiver is tested out of the cabinet, the loud speaker should be mounted on a temporary baffle.



# ONE VALVE SUPER-HET. SHORT WAVE CONVERTER

BATTERY MODEL.

13.5 TO 85 METRES.

**For converting any broadcast receiver which employs one or more H.F. valves for use on the short wavelengths.**

This converter is for use in front of a standard broadcast receiver and enables the set to receive signals on the short wavelengths between 13 and 85 metres. The converter works on the super-heterodyne principle, a screened grid valve being used which works as a combined anode bend detector and frequency changer. The converter is worked from batteries, a high tension supply of 100/150 volts being required and a 2 volt low tension accumulator. The adjustment of voltage for the screened grid valve is automatically dropped in the converter itself by means of a resistance and decoupling condenser. A small 4.5 volt bias battery is used to bias the grid of the valve for detection and  $1\frac{1}{2}$  to 3 volts is required, according to the amount of high tension voltage in use.

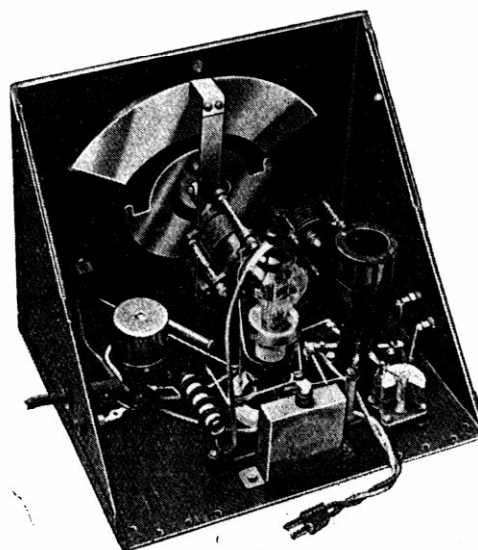
The valve used is a Mazda screened grid high frequency type SG215.

## CONSTRUCTION.

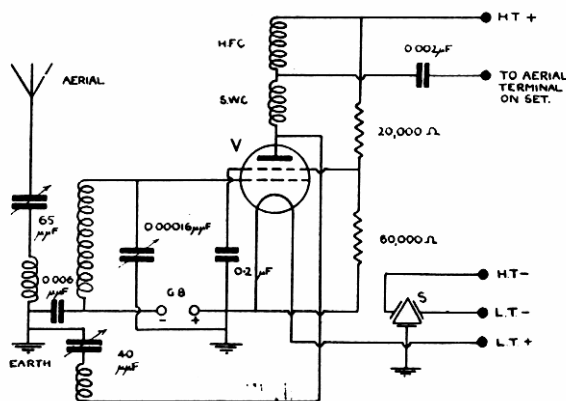
The converter is built into an Eddystone 2-piece Metal Cabinet which is compact in size and gives complete screening. For the convenience of assembly, the back of the cabinet should be first removed. The actual lay-out of the parts and the wiring connections are quite straightforward and afford little difficulty. The following points are, however, mentioned for greater clearness.

The valveholder should be mounted with lead washers between the pillars and the cabinet and also under the heads of the fastening down screws on top of the valveholder ring. Round head and not countersunk head screws should be used. This is advisable to prevent possible fracture of the valveholder, which is made from the special low loss insulating material "Frequentite." Lead No. 4 from the earth terminal is taken down to a screw and not bolted to the cabinet baseplate and the paint should be scraped away so that good metallic contact is obtained. The short

wave high frequency choke is supported by the wire ends of the choke itself, one side being mounted by means of a small  $\frac{1}{8}$ " 6BA tapped pillar on the base-plate. Lead No. 9, which is a flexible lead for connecting to the top anode connection of the screened grid valve, is also taken from this bush. Lead No. 14 from the moving vanes of the condenser is taken down vertically to lead No. 6 which, in turn, is taken to one of the screws used for bolting down the valveholder to the baseboard. The head of this screw should be in good metallic contact with the underside of the base-plate. The 60,000 ohms resistance is mounted in a vertical position, the higher end (lead No. 29) connecting to the top of the .2 mfd. condenser and the lower end (lead No. 30) to the fastening down screw of the same condenser. This screw must also make good metallic contact with the base-plate. The paint should also be scraped off the condenser case itself at this point so that the case of the condenser is also earthed. The case of the condenser forms the other terminal of this unit.



## BATTERY SUPER-HET. CONVERTER—continued



## OPERATION.

The aerial is taken off the usual terminal of the broadcast receiver and connected to the aerial terminal of the converter. The output terminal of the converter near the main bush is then connected by an ordinary wire lead to the aerial terminal of the set. The receiver is then switched on and must be tuned to a wavelength preferably between 1,200 and 2,000 metres. Naturally, a wavelength will be chosen which does not cause any interference due to a station broadcasting on the long waveband, which might otherwise interfere with results. If a reaction control is fitted on the broadcast receiver, this can be utilised to give slightly increased volume. It is absolutely essential that the broadcast receiver should contain at least one high frequency stage because in the combined arrangement, the combination forms a short wave super-heterodyne receiver in which the first detector and oscillator are in the converter, the high frequency stage or stages becoming intermediate frequency amplifiers, the detector in the set becomes second detector and the low frequency stages work in the normal manner. It is, however, possible to use the converter with an existing super-heterodyne receiver by connecting it in the aerial lead in exactly the same way or the input lead can preferably be taken to the anode of the primary of the first I.F. Transformer. If the broadcast receiver already employs batteries, these may be used for supplying current to the converter or alternatively separate batteries may be employed.

The valve and batteries having been connected and an additional earth lead connected to the earth terminal on the converter, the converter may be switched on. To receive short wave stations, the converter must be

made to oscillate by adjustment of the 40 m.mfd. reaction condenser on the left hand side of the converter and then tuning is carried out with the centre tuning knob. The valve in the converter must always be in an oscillating condition, but it will be generally found that best results are obtained when the reaction control is set so that the valve is only just in oscillation. Short wave stations are very sharp and critical to tune and the dial should be rotated slowly so that stations are not missed. In this type of converter, the same signals will be tuned in at two positions on the dial, this being caused by the intermediate frequency in use, working either above or below the frequency of the incoming signal.

## POINT TO POINT CONNECTIONS.

- 1—Aerial Socket to Fixed Plates of Aerial Series Condenser.
- 2—Moving Plates of latter to Coil Holder.
- 3—Coil Holder to Earthed Screw E.
- 4—Earth Socket to Screw E.
- 5—Moving Plates of Reaction Condenser to Filament Terminal of Valveholder V.
- 6—Filament Terminal to Fixing Screw E holding Valveholder to Chassis.
- 7—Fixed Plates of Reaction Condenser to Coil Holder.
- 8—Coil Holder to Screw on Insulating Bush.
- 9—Flexible Lead from latter Bush to Anode of S.G. Valve.
- 10—One End of .006 mfd. Condenser to Earthed Screw E.
- 11—Other End of this Condenser to Coil Holder.
- 12—Flexible Lead from No. 10 Wire to G.B.+ Plug.
- 13—Flexible Lead from No. 11 Wire to G.B.— Plug.
- 14—Moving Plates of Tuning Condenser to Wire No. 6.
- 15—Fixed Plates of Tuning Condenser to Coil Holder.
- 16—Grid Terminal of Valveholder to Wire No. 15.
- 17—On-Off Switch to Wire No. 6.
- 18—Red Battery Lead from Filament Terminal of Valveholder to L.T.+ Plug.
- 19—Blue Battery Lead from On-Off Switch to L.T.— Plug.
- 20—Slate Battery Lead from On-Off Switch to H.T.— Plug.
- 21—Cream Battery Lead from H.F. Choke to H.T.+ Plug.
- 22—End of S.W. Choke to H.F. Choke.
- 23—One End of .002 mfd. Condenser to H.F. Choke.
- 24—Other End of above to Output Socket.
- 25—Remaining End of S.W. Choke to Screw on Insulating Bush.
- 26—One end of 20,000 ohms Resistance to H.F. Choke.
- 27—Other end of this Resistance to S.G. Terminal of Valveholder.
- 28—S.G. Terminal of Valveholder to 0.2 mfd. Condenser.
- 29—One end of 60,000 ohms Resistance to 0.2 mfd. Condenser.
- 30—Other end of above Resistance to Earthed Screw E.



## 100 WATT C.W. AND TELEPHONY TRANSMITTER

This is a modern telephony and C.W. transmitter incorporating crystal control, full modulation and complete operation from A.C. mains. Two crystals, either of which can be selected by a switch, give a master frequency in the 3.5 Mc/s or 7 Mc/s bands. Using the first crystal, coils which are interchangeable comprise L3, L5 and L9, so that the crystal oscillator, the buffer amplifier and final power amplifier operate on 80, 80 and 80 metres respectively. Using the second crystal, the coils are changed and the operation is then on 40, 40 and 40 metres, respectively. C.W. operation on 20 metres can be obtained by change of L3 and L5 only, when operation is on 40, 20 and 20 metres, V4, the buffer amplifier stage, being used as a frequency doubling stage. Telephony on 20 metres can be used if a 14 Mc/s crystal is fitted, the operation then being on 20, 20 and 20 metres, but we have not actually had experience of this. With the full 100 watts power input available, a world wide range only limited by ether conditions is possible. For local work, 80 metres is preferable—there is always a skip distance of 40 metres, which will vary according to season.

The transmitter is built in three units. Unit A comprises the master oscillator valve with frequency controlling crystals, which can be seen on the extreme right of the photograph. The buffer amplifier is the centre screened section and the final output amplifier valve on the left.

Two crystals are employed, one for the 3.5 Mc/s or 80 metre band and one for the 7 Mc or 40 metre band. The master oscillator valve is an Osram pentode type PT4 (V5), which gives a large output for the small H.T. voltage required. The tuned anode circuit of this valve employs a 6-pin interchangeable coil. The valve used for the buffer stage is a Mullard T25D (V4). This is metallised and is operating in class C, which gives full modulation for telephony. Both the valves in these stages derive their H.T. power supply (i.e., 500 volts) from the subsidiary power pack in unit C.

The final output amplifier is a Mullard T61D (V3), which is an excellent S.W. transmitting valve with a steep slope characteristic and is operating in class B. The H.T. voltage on the plate of this valve is

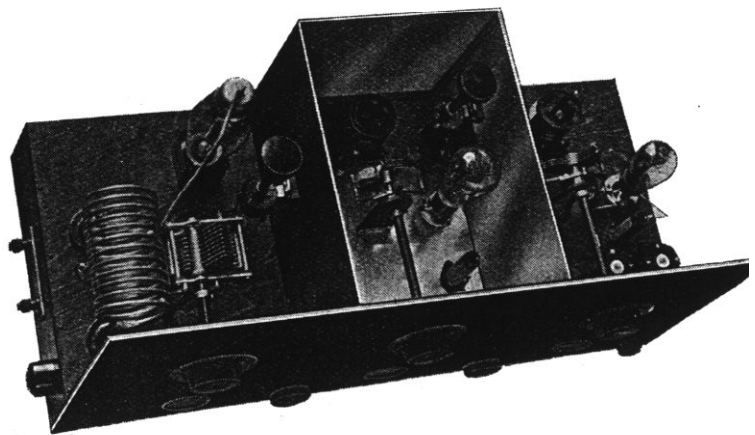
1,000 volts, which is supplied from the main power pack unit B. Milliampere meters register the current in each valve stage for simplicity of tuning.

Grid bias for both buffer and output amplifier is obtained from a 250 volt grid bias power supply unit mounted under the base-board of this unit A and shown in diagram 3. The rectifying valve for this unit is a Mullard DW2 (V6) and is also mounted underneath. The bias is variable, a potentiometer for each being provided.

A jack is fitted on the front of the panel for C.W. operation into which the key is plugged, the system employed being grid blocking.

The actual aerial coupling to the output stage can follow any conventional arrangement, space being provided for a coupling coil if a Zepp fed Hertz is used. The present design gives a full 100 watt telephony input rating, this can either be increased or decreased according to the anode voltage applied.

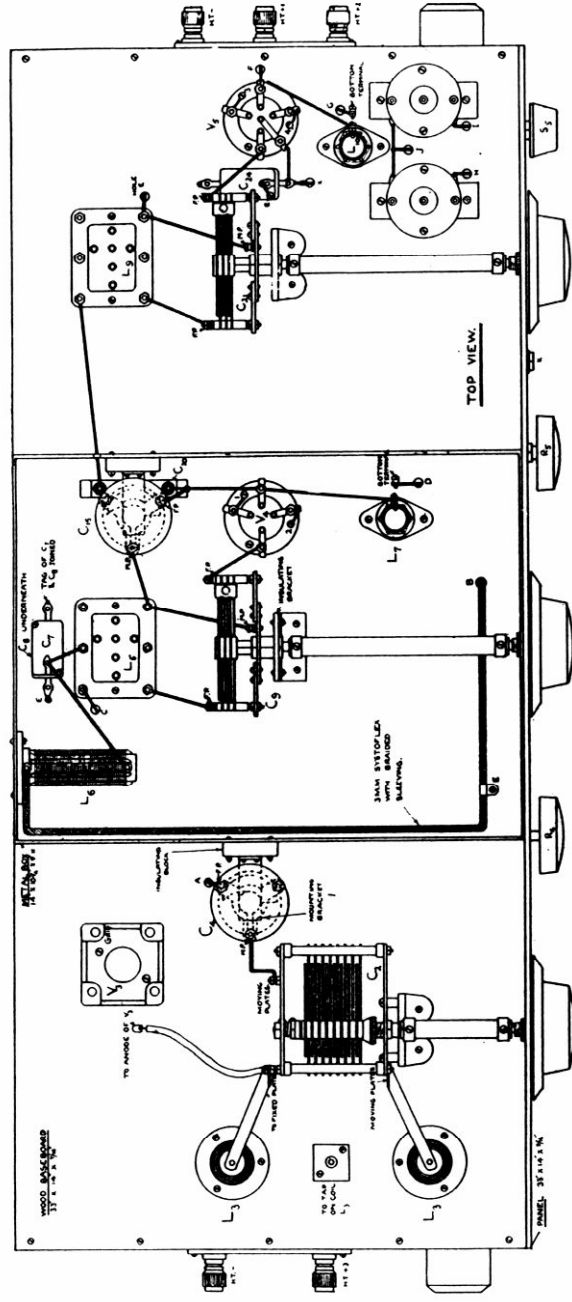
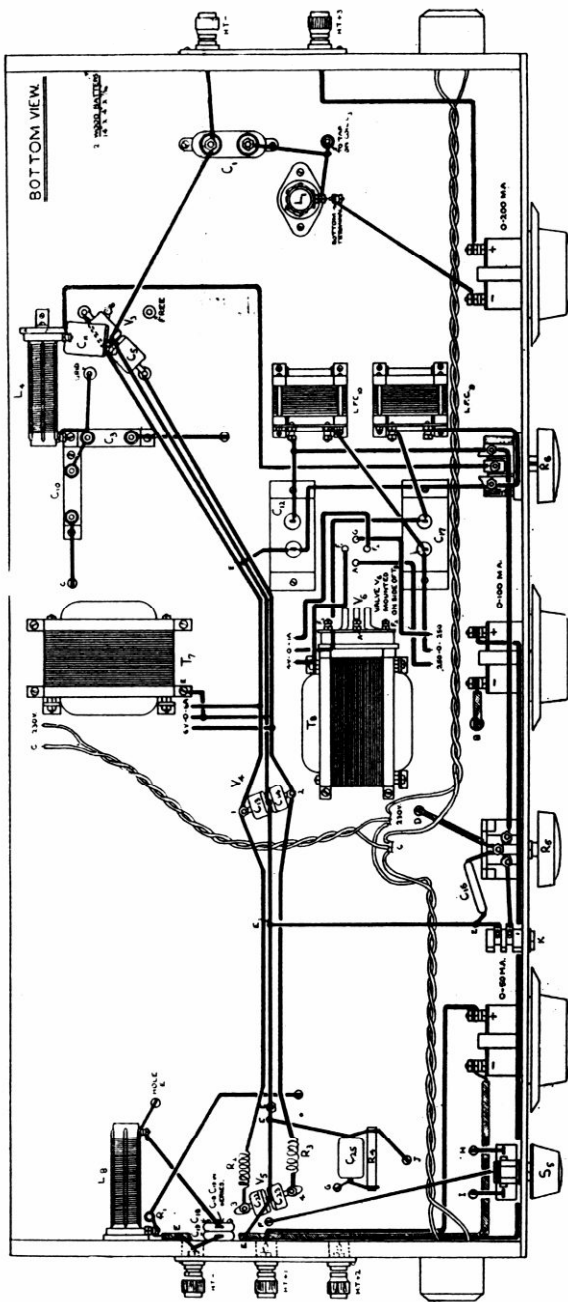
The second unit B is the main power supply for the output amplifier. The rectifying valves are of the mercury vapour type, which afford excellent regulation and are Osram type GUI (V1 and V2). Two are used to give full wave rectification. The high voltage output mains transformer is on the right of the assembly, two heavy chokes in series for smoothing are employed in the positive feed in conjunction with three reservoir condensers. The small transformer on the top right supplies the heaters of the two GUI's. The primary and secondary windings of this transformer have to be exceptionally well insulated from each other since the full H.T. voltage must be



UNIT A

100 WATT C.W. & TELEPHONY TRANSMITTER—cont'd

WIRING PLAN UNIT A



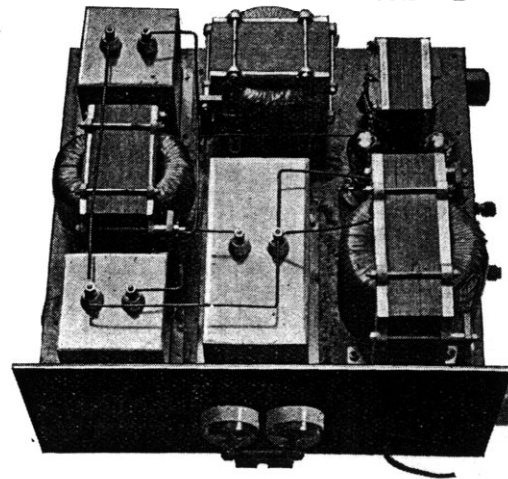
SHOWING ABOVE AND BELOW BASEBOARD VIEWS OF HIGH FREQUENCY UNIT WITH BIAS ELIMINATOR.

## 100 WATT C.W. AND TELEPHONY TRANSMITTER—continued

## UNIT B

## LIST OF PARTS.

UNIT A.	Price
1 Bakelite Panel, 33"×14"× $\frac{3}{16}$ ", drilled ..	30/-
1 Wooden Baseboard, 33"×14"×7 ply ..	5/-
2 Wood Side Battens, 14"×4"×7 ply ..each	1/3
2 Bakelite Terminal Strips, 4 $\frac{1}{2}$ "×1"× $\frac{3}{16}$ " ..each	6d.
1 Bakelite Strip with centre socket, 1"×1"× $\frac{3}{16}$ " ..	6d.
5 Belling Lee Terminals type B, 2 H.T.—, H.T.+1, H.T.+2, H.T.+3 ..	each 6d.
2 Eddystone .00016 mfd. Condensers, Cat. No. 922 (C21 and C9) ..	each 8/6
3 Eddystone 4" Engraved Dials ..	each 1/6
2 Eddystone 6-pin Bases, Cat. No. 510 ..	each 2/-
1 Eddystone 5-pin Valveholder, No. 950 ..	1/8
1 Eddystone L.L. Valveholder, 4-pin, No. 501 ..	1/3
1 Eddystone 4-pin Valveholder, No. 949 ..	1/5
2 Eddystone 6" Extension Spindles, No. 944 ..	each 2/-
3 Eddystone 3" Extension Spindles, No. 943 ..	each 1/6
1 Eddystone Transmitting Condenser, .0001 mfd., No. 979 ..	10/6
2 Eddystone Microdensers, 40 m.mfd. (C4 and C15) with knobs and scales ..	each 5/-
4 Eddystone S.W. H.F. Chokes, No. 923 (L.6, L.7, L.8, L.10) ..	each 2/6
2 Eddystone S.W. H.F. Chokes, No. 925 (L.1, L.4) ..	each 3/6
1 Eddystone Condenser Mtg. Bracket, No. 945 ..	1/2
2 Eddystone Insulated Mtg. Brackets, No. 971 ..	each 1/9
2 Eddystone L.F. Chokes (L.F.C.9 and 10) Cat. No. 980 ..	each 8/6
2 Eddystone Stand-off Insulators with sockets No. 916S ..	each 1/3
2 Eddystone 2" knobs, $\frac{1}{4}$ " hole ..	each 9d.
2 Eddystone Ebonite Blocks and Brackets for Mounting Microdensers ..	each 1/3
1 Metal Screening Box, 14"×10 $\frac{1}{4}$ "×9" ..	12/6
1 Elpro 50,000 ohm Potentiometer R5 with knob ..	5/-
1 Colvern 20,000 ditto R6, with knob ..	5/6
3 Lengths Screened Systoflex ..	each 9d.
1 T61D Valveholder (Mullard) ..	7/6
8 T.C.C. "M" type Condensers, .006 mfd. (C.7, 8, 11, 16, 18, 19, 24/2) ..	each 1/6
7 T.C.C. "M" type Condensers, .002 mfd. (C.5, 6, 13, 14, 22, 23, 25) ..	each 1/-
3 Dubilier type 620, .0005 mfd. (C3, 10, 20) ..	each 1/3
1 Dubilier 5,000 volt Test Condenser, .002 mfd. (C1) ..	19/6
2 Helsby 2 mfd. Condensers, 500v., A.C. test (C12-17) ..	each 3/6
3 Milliammeters, 0-50, 0-100, 0-200 ..	each 25/-
2 5 amp. 2 pin Plugs and Sockets ..	each 9d.
1 Erie 50,000 ohm 1 watt Resistance (R1) ..	1/-
1 Erie 50,000 ohm 1 watt Resistance (R4) ..	1/-
2 Resistances, 1 ohm (26g. Eureka) (R2, R3) ..	3d.
1 Igranic Jack, P71 ..	1/3
1 Igranic Plug, P40 ..	1/3
1 Wearite SPDT Rotary Switch ..	3/6
1 each 7 Mc/s and 3.5 Mc/s Crystals in enclosed plug-in type holders with bases ..	each 30/-
1 Bayliss Transformer, 6v. 6 amps ..	21/-
1 Bayliss Transformer, 250/0/250 60 m/amps., with 4v. 1 amp. secondary ..	27/6
1 Mullard T61D Valve ..	£6/10/0
1 Mullard T25D Valve ..	35/-
1 Osram PT4 Valve ..	18/6
1 Mullard DW2 Valve ..	12/6
2 Special 6-pin Coils for 80 metres ..	each 6/-
1 Anode Coil for 80 metres ..	5/-
2 Special 6-pin Coils for 40 metres ..	each 6/-
1 Anode Coil for 40 metres ..	4/-
Wire, Systoflex, Screws, Nuts, etc. ..	2/6

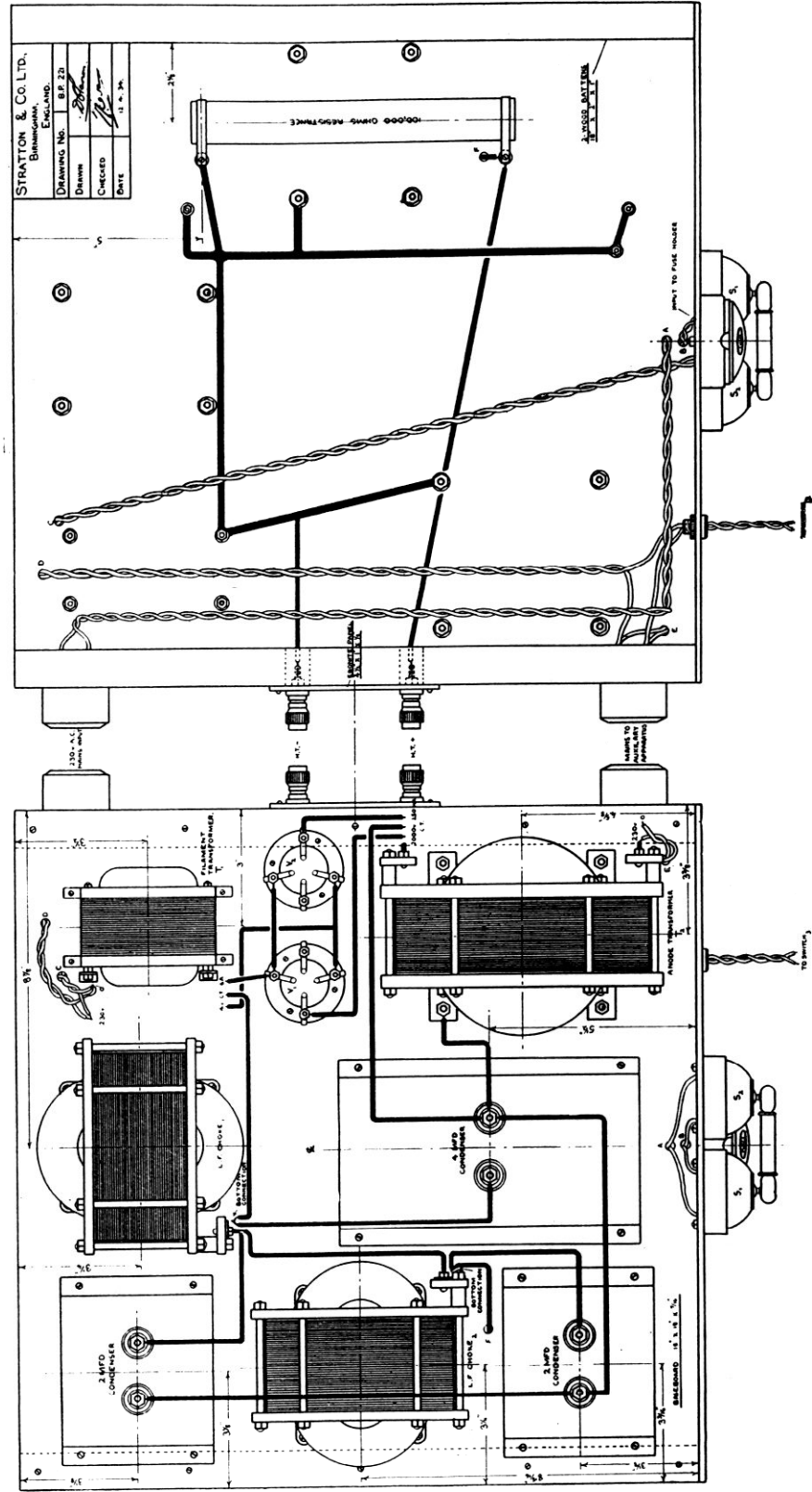


withstood. A load resistance R16 is in shunt with the H.T. output to reduce danger from peak voltages and it also gives better regulation of output. The main power input double switch for all three units is fitted to the front of unit B. This immediately supplies power to the rectifying valve heaters, which must be kept permanently in action due to the long time (60 seconds) required before they heat up. A subsidiary mains lead is brought out from this unit and taken to a switch on the operating bench so that power to the other sections of the transmitter can be switched on and off as the transmitter is brought in or out of operation. When starting up at first, the main double switch must be switched on at least 60 seconds before current is supplied by the subsidiary switch to the remaining units. Diagrams 4 and 5 show the general assembly of unit B.

UNIT B.	LIST OF PARTS.	Price
1	Bakelite Panel, 18"×10"× $\frac{3}{16}$ " ..	12/6
1	Wooden Baseboard, 18"×18"×7 ply ..	3/6
2	Side Battens, 18"×2"×1" ..	each 1/6
1	Bayliss Transformer 1000/0/1000 (T2) ..	£8/10/0
1	Bayliss Transformer, 4v. 6 amp., with special insulation (T1) ..	30/-
2	Bayliss L.F. Chokes 20H. at 250 m/Amps ..	each 50/-
2	Helsby 1,000 volt A.C. Wkg. 2 mfd. Condensers (C40, 41) ..	each 30/-
1	Helsby 1,000 volt A.C. Wkg. 4 mfd. Condenser (C42) ..	56/-
1	Erie 10 watt Resistance, 100,000 ohms (R16) ..	7/6
2	Eddystone L.L. Valveholders, Cat. No. 501 ..	each 1/3
1	Belling Lee 2-way Fuse Unit ..	2/6
1	Twin Coupled 5 amp. Switch ..	3/-
1	5 amp. Switch ..	9d.
2	5 amp. Plugs and Sockets, 2-pin ..	each 9d.
1	Bakelite Terminal Strip, 4 $\frac{1}{2}$ "×1"× $\frac{3}{16}$ " ..	1/-
2	Belling Lee Terminals, type B., H.T.—, H.T.+3 ..	each 6d.
	Bolts, Screws, Nuts, Wire, Tags, Bush, Systoflex, etc. ..	2/6
2	Osram GUI Valves ..	each 25/-

# 100 WATT C.W. AND TELEPHONY TRANSMITTER.

## WIRING PLAN UNIT B

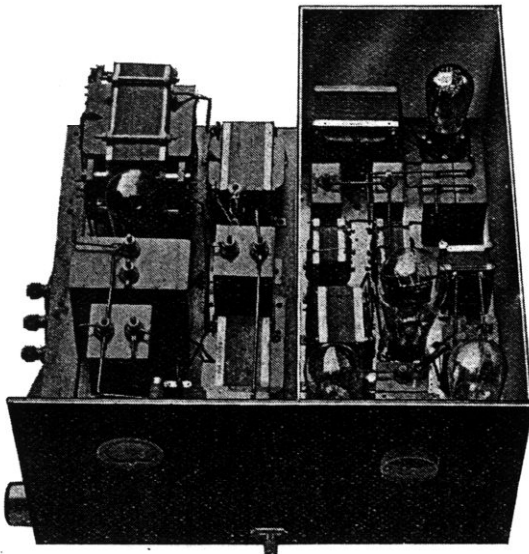


SHOWING ABOVE AND UNDERNEATH VIEWS OF BASEBOARD LAY-OUT OF MAIN POWER UNIT.

## 100 WATT C.W. AND TELEPHONY TRANSMITTER—continued

The third unit C comprises the speech amplifier, which employs a resistance coupled L.F. stage followed by a second stage with parallel fed transformer coupling using a 30h. L.F. choke as the anode impedance. The first valve is a Mazda AC/HL (V9) and the second a Mazda AC/PI (V10). Music or speech is fed into this stage by the use of two jacks mounted on the panel and controlled by a double fader potentiometer. In the same screened compartment is the modulator valve fed from the speech amplifier (a Mullard DO/25 (V11)). This valve is choke coupled to the buffer amplifier on unit A. A 3-way lever switch on the front panel controls the use of telephony or C.W. operation. When the transmitter is used for C.W., this switch puts out of use the whole of the power supply to the speech amplifier and modulator and transfers the subsidiary power unit H.T. supply directly to the buffer amplifier instead of this supply passing through the modulator stage. At the back of the compartment is a power pack with Mullard DW2 (V8) rectifying valve giving H.T. and heater current to the speech amplifier.

On the same unit at the left side is the subsidiary power supply, giving 500 volts output at 150 m/amps. This supplies H.T. to the crystal oscillator valve (V5), to the buffer amplifier valve (V4) and to the modulator valve (V11). A filament winding on the transformer in this pack supplies heater current to the rectifier (V7) which is a Mullard type DW4.



UNIT C

## CONSTRUCTION.

This we leave to the ability of the constructor, who will have the necessary technical knowledge to enable him to follow the photographs, diagrams and theoretical circuit arrangement. A set of full size blue prints can be obtained at a cost of 5/-.

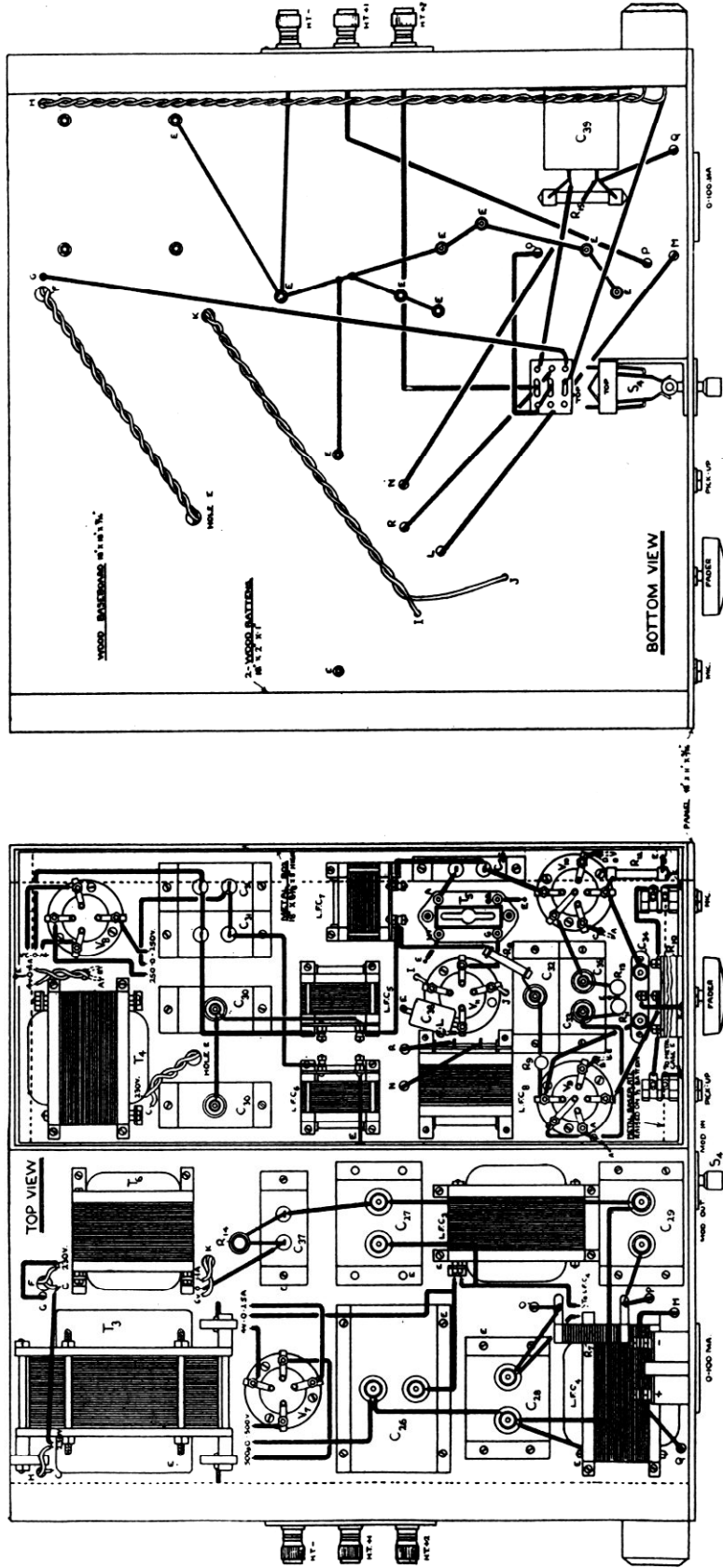
Constructional advice or details for operation and adjustment can be obtained with sets of parts.

UNIT C.	LIST OF PARTS.	Price
1	Bakelite Panel, 18" x 11" x $\frac{3}{16}$ " ..	16/-
1	Bakelite Terminal Block, $4\frac{1}{2}$ " x 1" x $\frac{3}{16}$ " ..	1/-
3	Belling Lee Terminals, type B., H.T.—, H.T.+1, H.T.+2 ..	each 6d.
1	Baseboard, Stained, 18" x 18" x 7 ply ..	4/-
2	Side Battens, 18" x 2" x 1" ..	each 1/6
1	Metal Screening Box with lid ..	14/-
1	Bayliss Transformer (T3) 500/0/500, 150 m/amps, with 4v. 2.5 amp. secondary winding ..	£3/0/0
1	Bayliss Transformer (T4) 250/0/250, 60 m/amps, with 4v. 1 amp. and 4v. 4.4 amps. ..	30/-
1	Bayliss Transformer (T6) 6v. 1.1 amp. ..	18/6
2	Bayliss L.F. Chokes, type 304 (L.F.C.3-4) each	21/-
3	Eddystone L.F. Chokes, type 980 (L.F.C. 5- 6-7) ..	each 8/6
1	Bayliss Modulation Choke (L.F.C.8) ..	20/-
1	Helsby 4 mfd. type 512 (C26) ..	22/6
3	Helsby 2 mfd. type 512 (C27, 28, 29) ..	each 11/9
3	Eddystone 2 mfd. Condensers, type 990 (C30/2, 32) ..	each 4/-
1	Helsby 500v., A.C. test, 1 mfd. Condenser (C36) ..	2/6
4	Helsby 500v., A.C. test, 2 mfd. Condensers (C31/2, 37, 39) ..	each 3/6
1	Eddystone 2 x 1 mfd. Condenser, type 991 (C33, 35) ..	4/6
3	Eddystone 4-pin Valveholders, type 501 ..	each 1/3
2	Eddystone 5-pin Valveholders, type 500 ..	each 1/6
1	T.C.C., .002 mfd. Condenser, type "M" (C38) ..	1/-
1	T.C.C., .01 Mica Condenser, type 34/25A (C34) ..	3/-
1	each 1 watt Resistors, 20,000 ohms (R8), 80,000 ohms (R9) ..	each 1/-
1	A.E.D. Double Fader, R10 ..	10/6
2	Eddystone Bias Resistors, 1,500 ohms (R11, 13) ..	each 1/6
1	.5 meg. Grid Leak, 1 watt (R12) ..	1/-
1	Dubilier 2,500 ohm Spiroh Resistance (R14) ..	3/-
1	Dubilier 10,000 ohm Spiroh Resistance (R7) ..	3/6
1	Dubilier 3,000 ohm 3 watt Resistance (R15) ..	3/-
1	R.I. Hypermite Transformer (T5) ..	12/6
1	3-way Double Pole Lever Switch ..	6/6
1	M/Ammeter, 0/100 m/amps ..	25/-
1	5 amp. 2 pin Plug and Socket ..	9d.
2	Igranic P71 Jacks ..	each 1/3
2	Igranic P40 Plugs ..	each 1/3
1	Eddystone 2" Knob ..	9d.
1	Sub Baseboard, metal lined, $17\frac{3}{4}$ " x $7\frac{1}{4}$ " x 7 ply	3/-
	Wire, Systoflex, Screws, Nuts, etc. ..	2/6
VALVES.		
	Mazda. AC/HL ..	13/6
	Mazda. AC/PI ..	17/6
	Mullard. DO/25 ..	30/-
	Mullard. DW2 ..	12/6
	Mullard. DW4 ..	20/-



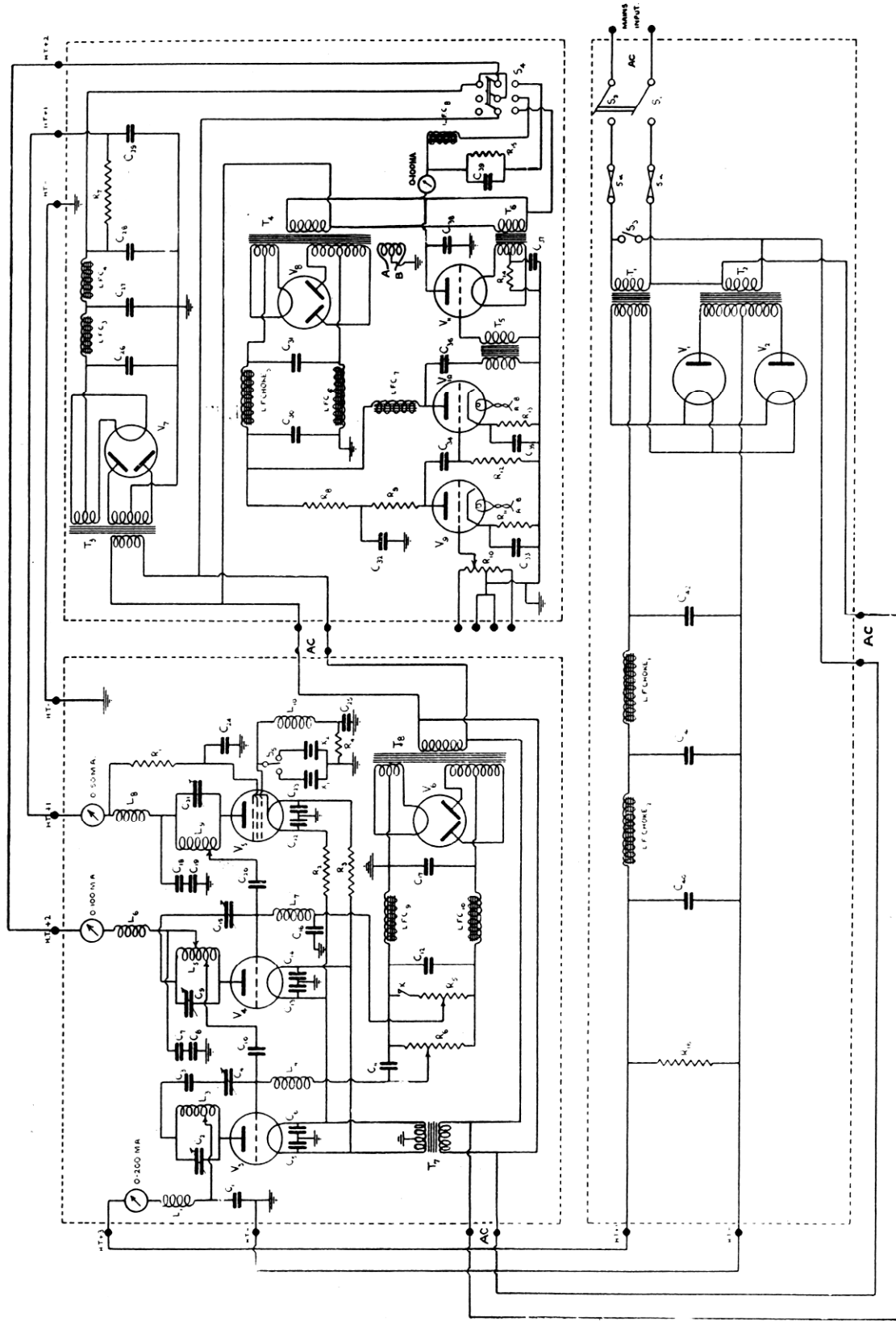
# 100 WATT C.W. AND TELEPHONY TRANSMITTER

## WIRING PLAN UNIT C



SHOWING ABOVE AND UNDERNEATH BASEBOARD VIEWS OF SPEECH AMPLIFIER AND SUBSIDIARY POWER PACK.

# 100 WATT C.W. AND TELEPHONY TRANSMITTER



COMPLETE CIRCUIT DIAGRAM, SHOWING THE H.F. PORTION OF TRANSMITTER PROPER, THE MAIN HIGH VOLTAGE POWER PACK AND THE SPEECH AMPLIFIER WITH SUBSIDIARY POWER SUPPLY.

## COMPILER'S NOTE.

All the sets and apparatus described in this Manual have been subjected to thorough tests and trial before inclusion, with satisfying results. Much as we desire that they should give equal satisfaction to all who make use of the articles herein, we would point out that we cannot enter into long correspondence concerning difficulties which may arise through faulty construction or the substitution of different components. With the assurance that, if built exactly according to instructions without errors, they are capable of first class results, we would request that constructors who may have any troubles in the initial instances should check their apparatus over carefully before writing to us. Finding out the cause of one's own troubles is, moreover, not only a reason for self-satisfaction but is highly instructive.



Telephone No. 297.

*J. W. Rogers,*

WIRELESS, PHOTOGRAPHIC  
And ELECTRICAL SUPPLIES.

32-34, Road, WELLINGBOROUGH

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