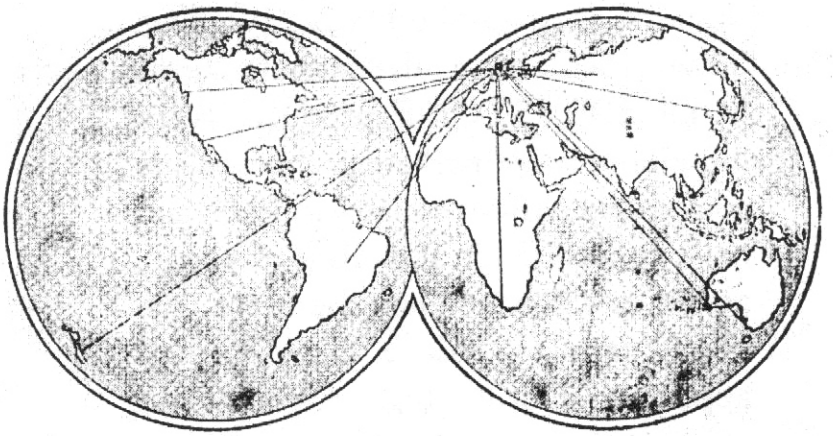
SPAN
THE
WORLD
WITH A SHORT WAVE SET.



CONSTRUCTIONAL DETAILS
:: FOR BUILDING THE ::

EDDYSTONE

SCIENTIFIC SCREENED GRID H.F. SHORT WAVE THREE.

Price: SIXPENCE.

Published by
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Preface.

One of the chief directions in which wireless has been most rapidly extending is to the realm of what are termed the short wave lengths. Perhaps twelve months ago, we should have said, that is, those wavelengths under 100 metres, now we are almost tempted to say those under 50 metres.

In any case, the new wavefield under 100 metres is certainly full of interest to the wireless experimenter. With a well designed short wave receiver, the whole world can be toured, and stations thousands of miles away listened to clearly. The fact that all amateur transmissions are now using the short wavelengths and that the number of regular broadcast. short wave stations is steadily increasing, ensures a never ending field of enjoyment.

Those resident in remote parts of the world can by short wave reception listen to their home country or to other distant programmes; and in the tropics, where atmospheric conditions render ordinary reception useless, a short wave receiver can be operated successfully without severe interference.

We do not think that anyone who possesses an efficient short wave receiver will ever regret the time and outlay spent in this direction, such are its boundless sources of experiment and interest.

Finally, the Eddystone Scientific Short Wave Three is a thoroughly stable yet efficient type of receiver evolved after a long practical experience of short wave sets, and we are confident it will give every satisfaction to its owner. It incorporates the latest type valves and circuit arrangement and is a most powerful receiver.

THE EDDYSTONE SCIENTIFIC SHORT WAVE THREE.

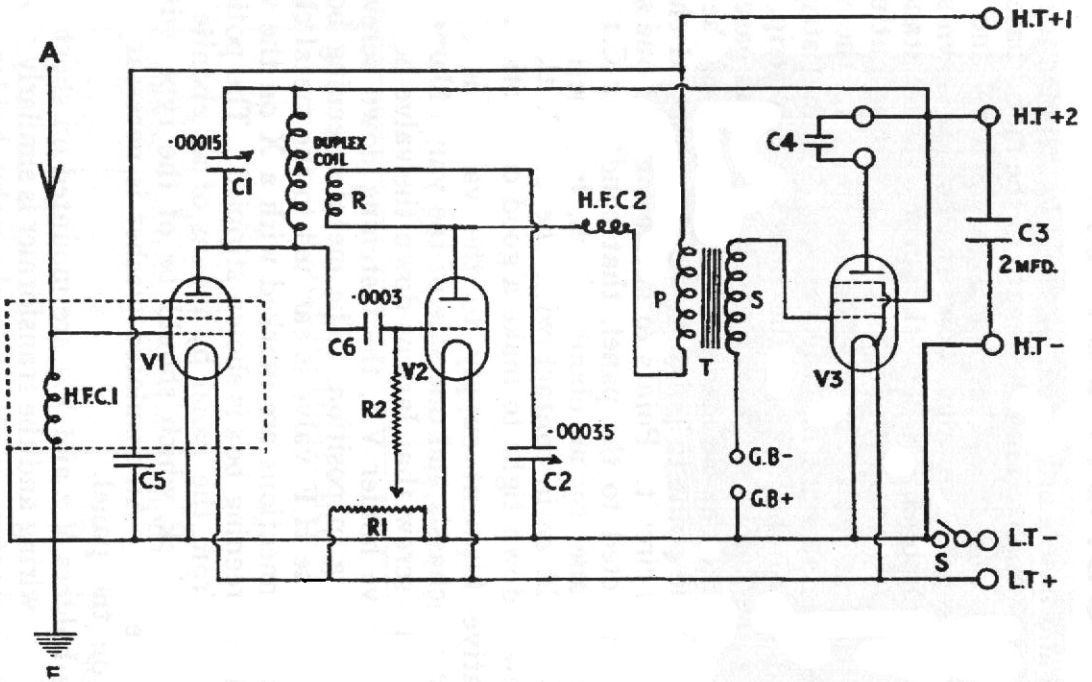
DESCRIPTION.

This receiver makes use of a stage of high frequency amplification. Hitherto, short wave receivers have rarely incorporated such a stage, since the additional complications in tuning and stabilizing gave them little advantage, if any, over a well designed detector circuit followed by L.F. amplification. The advent of the 4 electrode screened grid valve, however, with its high amplification factor and needing no external neutralising methods, now allows the full benefit of a H.F. stage to be successfully and easily used in a short wave receiver.

Ordinarily the addition of a H.F. valve entails the use of an additional set of tuning inductances and tuning condenser. This "Eddystone" design, however, incorporates a new arrangement for making use of the special features of the screened grid valve, so that these additional tuning encumbrances are unnecessary.

Referring to the theoretical diagram opposite, it will be seen that a high frequency choke H.F.C.1 is connected between the control grid and filament of V.1. This enables a slightly negative potential to be applied to the grid through the choke, and at the same time effectively stops the high frequency impulses coming in on the aerial from getting to earth and forces them through the valve V.1, where they are amplified before reaching the detector stage. At first sight this method appears much inferior to the normal tuned stage. On the broadcast bands certainly, selectivity is affected, but on the lower waves under 100 metres, tuning is already so critical that this becomes an advantage, and though theoretically the tuned circuit should obtain a higher percentage of efficiency from V.1, in practice the losses occurring in the additional circuit and the greatly increased difficulty in tuning due to the two dials render this method little, if any, superior to the simple arrangement used in the "Eddystone" circuit. The ease of tuning, only one set of inductances to change, and the entire absence of body capacity effects, indeed, make the set a revelation after the detector only type of short wave receiver.

The Eddystone Scientific Three Screened Grid H.F. Short Wave Receiver.



C1	Eddystone .00015 Condenser.	H.F.C.1	Eddystone Scientific H.F. Choke.
C2	,, .00035 ,,	H.F.C.2	,, ,, ,, ,,
C3	Sterling 2 mfd. ,,	R1	Polymet 400 Potientiometer.
C5	,, 1 mfd. ,,	R2	Special 3 meg. Grid Leak.
C4	Polymet ~~.0003~~ .002 ,,	T	Transformer.
C6	Aerovox ~~.0003~~ .0003 ,,	HT+1	75-80 volts.
S	Filament Switch.	HT+2	100-120 volts.

THEORETICAL DIAGRAM OF CONNECTIONS.

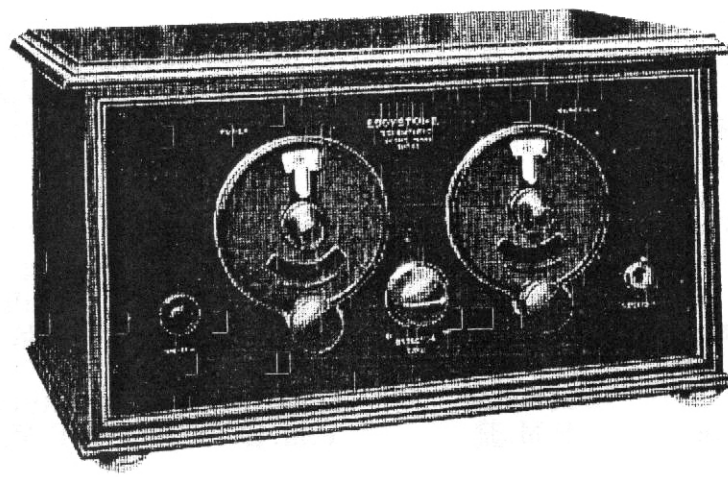
CONSTRUCTION.

The panel and baseboard should be securely fastened together, the plywood strips which extend the length of the metal baseboard should be screwed underneath at the extreme front and back. This raises the baseboard up and allows the bolting down screws from the various components to clear the surface the set stands on. It also enables a small amount of wiring to be carried out underneath, this wiring is shown by the dotted lines in the wiring diagram. The terminals are mounted on the terminal strip and this is screwed on to the back of the rear wooden strip. The components are then mounted, and since the panel and baseboard are drilled, no mistake can be made. The wiring up of the parts can be seen from the point to point wiring diagram and checked with the theoretical circuit. Points to notice are that one side of the switch is connected to the panel, that condenser C.1 is insulated from the panel by an ebonite bush, but the spindle of condenser C.2 should be in contact with the panel, the locking nut being screwed down tight to make a good connection.

The negative filament supply to the valves is obtained through the metal chassis and one side of the valve filament legs is connected to the screw that fastens down the valve holder. In the case of the valve holder V.1, the fastening down screw also holds the filament leg in position. The metal screening box for the grid portion of the H.F. valve is earthed to the metal chassis. All these chassis connections are marked with a X on the wiring diagram and the screening box is shown stippled. The potientiometer is insulated from the panel by means of an ebonite bush, as is also the P.61 jack, which should be of the type with an insulated bakelite top. An insulated washer is necessary at the back of this, on the panel.

The valve holders V.2 and V.3 are mounted on short erinoid pillars to facilitate wiring and the transformer is similarly mounted up, one of the filament connections to the valve holders passing below it. The wires passing underneath the metal baseboard, should be run in Systoflex sleeving.

See that all joints are securely made or soldered and that an excess of flex is not used, also that all nuts holding apparatus down are tight. All that remains is to mount the dials on the condensers and knobs on the grid control or potientiometer and switch. The dials are supplied with spanners to facilitate mounting.



SHOWING THE FRONT LAY OUT OF THE COMPLETELY FINISHED RECEIVER

WAVELENGTH RANGE TABLE

COIL	TUNER DIAL READINGS					
	0°	20°	40°	60°	80°	100°
D2	14.5 metres	17.5 metres	22.5 metres	27 metres	32.5 metres	38 metres
D3	27.5 metres	30 metres	37 metres	44 metres	50 metres	63 metres
D4	42.5 metres	47.25 metres	54 metres	68 metres	80 metres	99 metres

The above table may vary slightly in the accuracy of the figures given, owing to varying circumstances such as different valves, but will always be approximately correct, and serves as a useful guide

VALVES.

The set is designed for use with British valves of the types specified, genuine valves all bearing the monogram B.V.A., and if other valves are substituted, no responsibility can be taken for the set not performing as we claim.

The correct valves for each position are as follows :—

	H.F. VALVE.	DET. VALVE.	OUTPUT VALVE.
2 volt accumulator.	Mullard P.M.12.	Mullard P.M.1.H.F.	Mullard P.M.22.
4 volt accumulator.	Mullard P.M. 14.	Mullard P.M.3.	Mullard P.M.24.

Osram, Cossor or six sixty valves of similar characteristics may also be used.

The 2 volt range consume a filament current of .55 amps. and a high tension current of 9 to 10 milliamperes.

The 4 volt range have the lower filament consumption of .3 amps., but give a slightly higher high tension flow of 11 to 12 milliamperes.

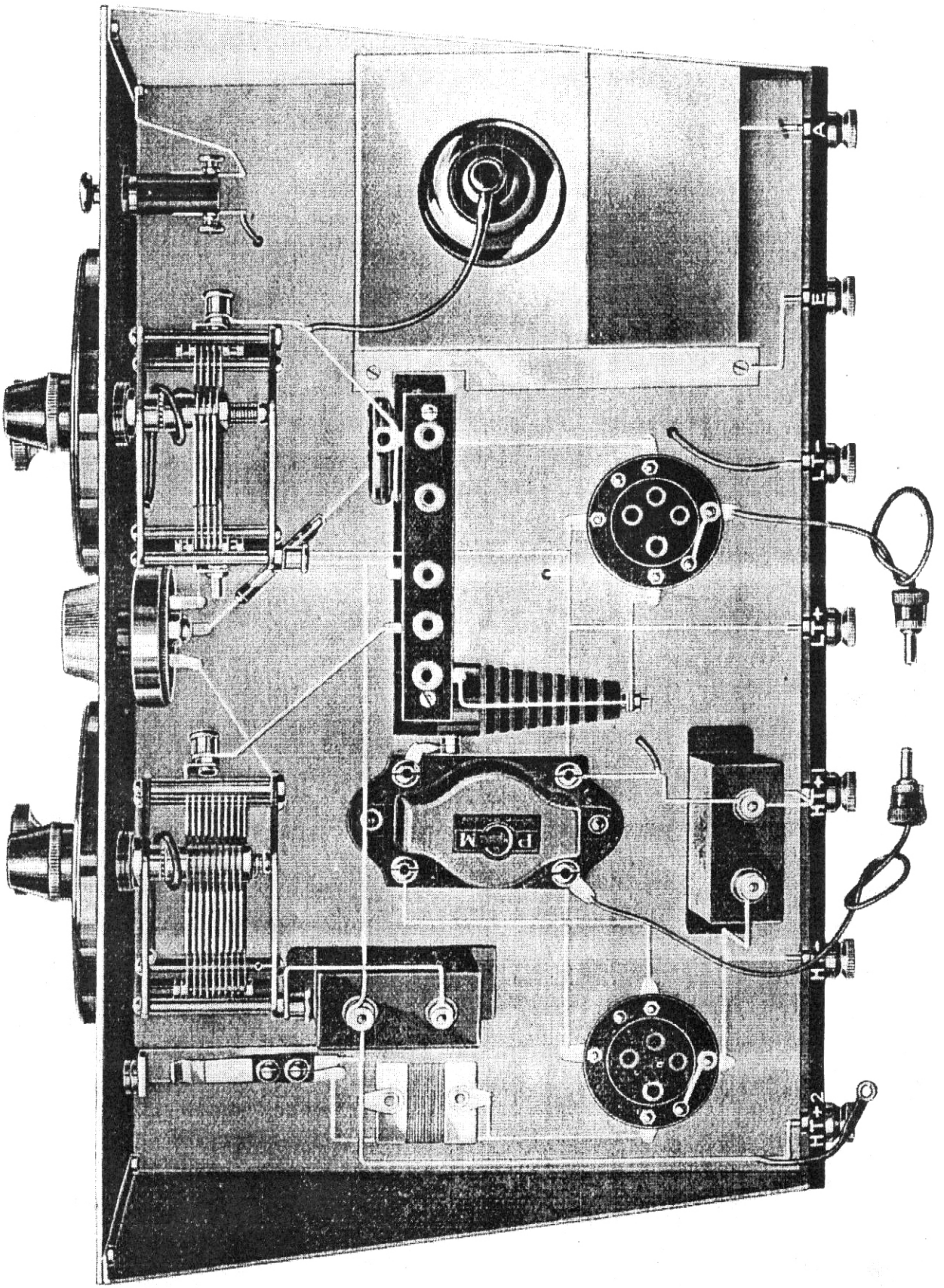
HIGH TENSION.

A 100 volts to 120 volts high tension supply is essential. The tapping H.T.+1 requires from 75 volts to 80 volts and the whole of the voltage is applied to the terminal H.T.+2.

High tension accumulators form a very satisfactory source of supply for a short wave receiver and have the advantage of being rechargeable; they need, however, reasonable attention periodically to keep them in good order. They should not be totally exhausted and left in this condition for long periods. When dry high tension batteries are used, these should be of a large capacity. Small size cells are not economical in the long run and results are affected adversely when they begin to run down. Two Hellesen 60 volt triple capacity type units will give several months' hard service and are recommended.

The set can be operated from a mains supply, but a certain amount of hum, which may be very detrimental for headphone work on weak short wave signals, is usually found.

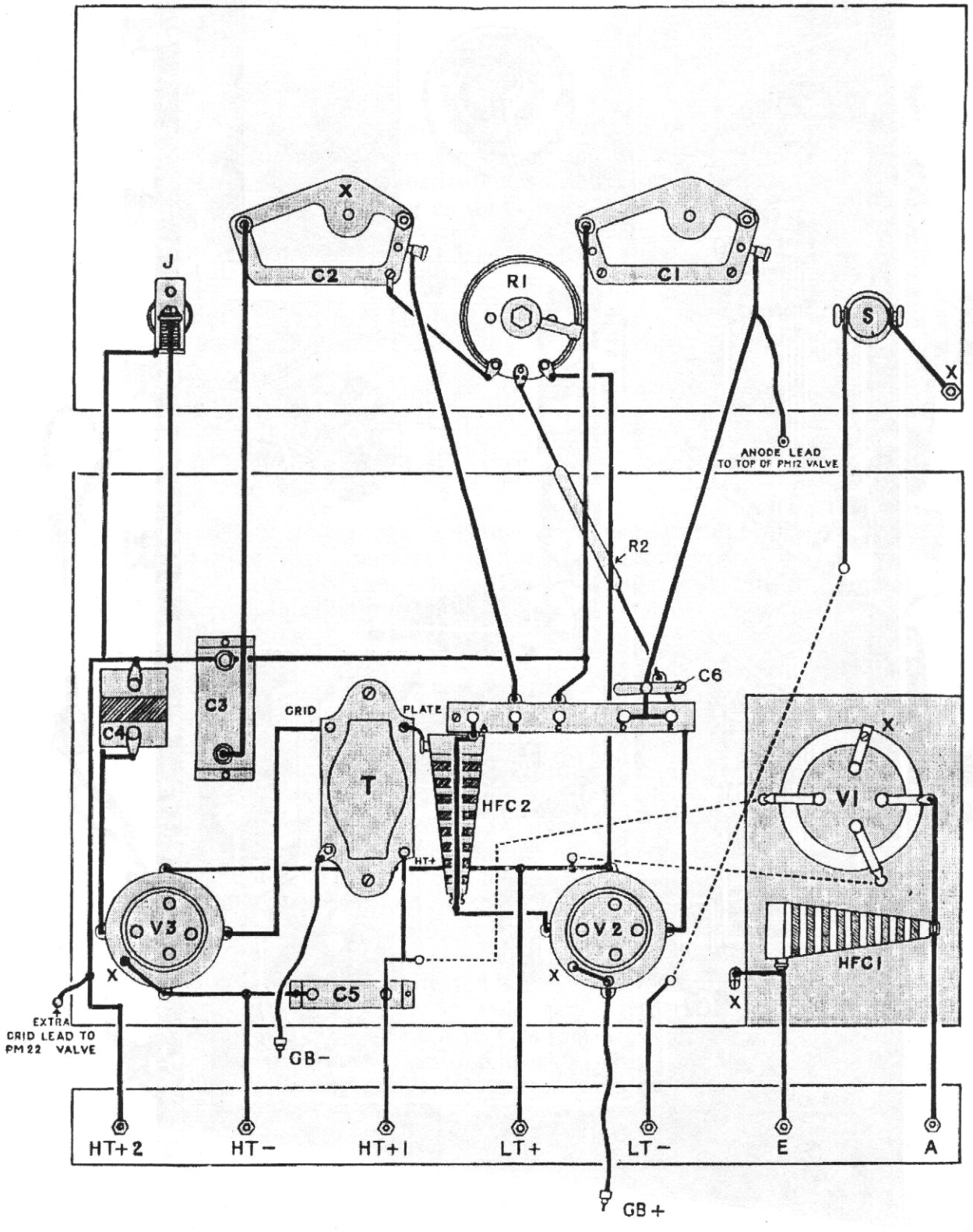
THE EDDYSTONE SCREENED GRID H.F. SHORT WAVE RECEIVER.



Photograph showing Wiring and Baseboard lay out.

The Eddystone Scientific Short Wave Three.

COMPLETE WIRING DETAILS SHOWING PANEL, BASEBOARD AND TERMINAL STRIPS.



GRID BIAS.

A 15 volt battery should be used, the lead marked G.B.– should be taken to 9v. or 10½v. negative if 100 volt H.T. is used, or 10½v. to 12v. if 120 volts is applied. The G.B.+ lead is taken to the positive of the battery.

A 1½ volt cell can be inserted in series with H.F.C.1 at the earth end, with the negative side to the choke, and the positive connected to earth and L.T.– if desired. This does not materially affect results, but a saving of 1 milliamp H.T. current is obtained. On a very powerful local signal, it is an advantage. This cell is not shown on the diagrams.

CONNECTING UP.

Care should be taken to see that all leads are correctly made, and to see that the extra leads to the first and last valves are not lying loose in the set when the batteries are connected. Grid bias leads should also be correctly inserted in the grid battery first. When the set is ready for trial, before inserting the valves, it is as well to test the voltage across the filament legs of the valve holders to make sure that no H.T. connection has been made in error, or an old bright valve can be tried in the set. Remove the H.T. connections temporarily, insert and join up the correct valves, join up the grid bias and put in one of the duplex coils. Join up phones or loud speaker to the jack.

OPERATING THE SET.

Pull on the switch, turning both dials, however, to zero before doing so, and also the detector grid control to negative. A distinct click should be heard as soon as the filaments are switched on. Increase the reaction dial slowly; at a certain point the set will begin to oscillate, this will be noticeable immediately, since a low rushing sound will be heard. Then commence to turn the tuning dial slowly, increasing the reaction dial gently to keep the set in an oscillating condition if this should be necessary. The reaction dial only requires to be increased just enough to make the set oscillate. Probably the first signals to be heard will be morse code. When a telephony transmission is picked up, it will be heard first as a shrill whistle, which varies in intensity if the tuning is varied. To receive clearly the speech or music, decrease the reaction dial reading, retune slightly on the tuning dial and the transmission should be quite clear. Clear telephony can never be received with the receiver oscillating,

although for C.W. morse signals this condition is necessary. The grid control knob can now be turned round towards the positive side until the best position is found. For the very short waves, it will probably have to be full negative, while a slightly more positive position will be found better as the wavelength increases. This control should always enable the set to slip smoothly in and out of oscillation; if a plop occurs when the reaction is increased, the control is too near a positive potential. The coils will require changing to accommodate the various wavelength ranges. A rough chart showing the approximate wavelength ranges and condenser settings will be found on page 5.

RESULTS.

The set used on an ordinary type 90 feet long aerial, 30 feet high and not badly screened, gave loud speaker results regularly from the American Stations KDKA on 43 and 27 metres, and 2XG, 2XAF and 2XAD; the Australian Station 2FC; the Dutch Stations PCJJ and PCLL; and numerous French, German and amateur transmissions. These results were obtained during the summer period and were on the whole most consistent. Using headphones, the range on the weaker stations was chiefly governed by atmospheric conditions, and a large number of transmissions from all parts of the world were logged at different periods. 5SW, the English Station, only gave a poor carrier wave, but from our reports and experiences from previous models of short wave receivers we have sent abroad, we have no hesitation in stating that this station would be received well in other countries, when out of the area of bad reception caused by the skip effect of short waves. On the broadcast waveband, the set did not prove highly selective, at 35 miles from 5GB this station interfered with nearby transmissions, although Manchester, London, Bournemouth and a large number of Continental stations were received without interference. The range of the set is excellent and if no powerful local interference is present, stations can be tuned in all round the dial. It must be remembered that the tuning condenser is only of .00015 capacity, but the special broadcast coil nevertheless covers a range from 230-500 metres. Quality from the receiver is excellent and the volume ample on broadcast, and of quite sufficient amplitude on short wave stations to be heard over a room. A sensitive loud speaker of the cone or horn type should be used.

AERIAL AND EARTH SYSTEM.

Contrary to expectation, it is not necessary to take any extreme precaution with the aerial system to make it suitable for short wave results. The average broadcast aerial answers extremely well on the low wavelengths, and unless it is desired to erect a special aerial that is to be used for short wave working only, can be used without alteration. In fact, very bad aerials that give poor results on long waves give quite good reception of short wave stations. Loss from screening by nearby objects is also less.

The above paragraph is not intended, however, to imply that no trouble whatever should be taken in regard to the aerial for short wave use, but more to imply that those who are unable to erect ideal aerials can still get short wave results from a poor aerial. Naturally a really efficient aerial, unscreened, well insulated and with a low capacity leakage to earth, will give better results. If the aerial is to be used for longer waves as well, we should recommend an L type or T type 80 to 85 feet total length, of enamelled copper or phosphor bronze 7/22 wire, at least 30 feet high and in as open a position as possible. The insulators should be of a low loss type and not of the variety where the two wires form a condenser between them, which may cause a capacity leak to earth. This latter condition should also be guarded against in the leading-in arrangements and in any form of switching or lightning protectors in the aerial lead. The lead to be set should be short and well away from the earth lead. Loose or dirty connections and broken strands of wire should also be guarded against; we have known trouble from these sources to make a short wave receiver unpleasantly noisy. Such noise is liable to be attributed to atmospherics or local noise, since it disappears when the aerial is disconnected. For short waves only, the same insulating conditions apply, but a 60 feet length of wire is sufficient, and it should be taken as high as possible and dropped down to the lead-in as vertical as convenient. The earth connection does appear to make material difference to results on waves under 50 metres; it may be best with or without it, and experiment should decide. Over 50 metres, it is generally an advantage. It may be responsible in some cases for bringing in additional external noise. When used, it should be well-made in the usual manner.

Remedy for Faults.

The few causes of trouble which may occur are as follows :—

NOISY RECEIVER.

Loose wire or bad contact. See that valve pins and coils are fitting well into their sockets, that there are no loose nuts on chassis, that accumulator, G.B. and H.T. connections are tight and that H.T. battery is silent.

FIERCE REACTION.

See that the potientiometer or grid control winding is unbroken.

NO SIGNALS.

Test the H.F. chokes and transformer windings for continuity, the condensers for insulation, and see that the variable condenser plates are not touching. If the reaction condenser plates touch, the H.T. battery will be shorted. A .005 fixed condenser can be inserted in series with the lead from the reaction coil to prevent this, if desired. Again, see that coils and valve legs are tight in their sockets.

List of Parts

FOR EDDYSTONE SCREENED GRID SHORT WAVE RECEIVER.

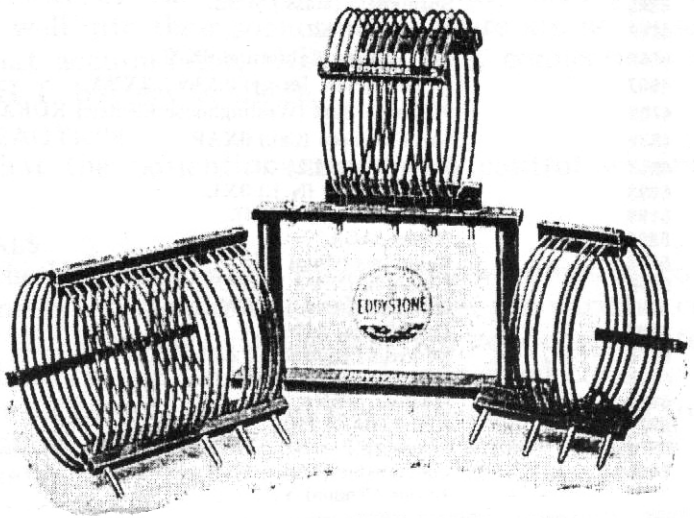
1 Eddystone Oak or Mahogany finish aluminium Panel, drilled and engraved.
1 Eddystone aluminium Baseboard, drilled—and sidewings.
1 Eddystone aluminium Screening Box.
1 Eddystone .00015 short wave variable Condenser, with ebonite bush.
1 Eddystone .00035 ditto.
2 Eddystone Scientific H.F. Chokes.
1 Eddystone push pull Switch.
2 Indiagraph Vernier Dials.
1 Sterling 2 mfd. Condenser.
1 Sterling 1 mfd. Condenser.
1 Polymet .0003 Condenser.
1 Aerovox .002 Condenser.
1 Igranic Jack P.61—Insulated bush with Plug.
1 Eddystone short wave Valve Holder.
2 Cason Valve Holders.
1 Eddystone Terminal Strip, drilled and engraved.
7 N.P. Terminals.
1 Mullard Permacore Transformer.
1 400 ohm Potientiometer with insulated bush.
1 Special type 3. meg. Grid Leak.
1 Eddystone Duplex short wave Coil Set with stand.
1 yard insulated Flex.
8 Oz. reel 16g. tinned Wire.
Quantity Screws and Nuts.
6 Erinold Supports.
6 Tags, length of Systoflex.
2 Wander Plugs.
Cabinet if desired is extra.

If a complete set of parts is purchased, a royalty of 5/- for the first valve holder and 2/6 for the remaining two is payable to the Marconi Company, but not if the set is to be used for experimental purposes solely.

List of Principal Short Wave Stations

Metres	Kilocycles	Alterations.
90	3333	Nairobi (Kenya).
70	4285	Springfield (Mass.) WBZ.
70	4285	Vienna, OHK2.
66.04	4542	Los Angeles (California) 6XAL.
65.18	4602	Newark (New Jersey) 0.5 kw., 2XBA.
63	4762	Pittsburg East (Westinghouse Electric) KDKA (U.S.A.).
62	4838	San Francisco (Cal.) 6XAR.
61	4918	Paris (Radio LL) GC.
59.96	5003	Bound Brook (N.J.) 3XL.
58.5	5128	New York City (2XE).
56.7	5291	Nauen, AGJ.
54.02	5553	Columbus (Ohio) 8XJ.
54	5555	Brooklyn (N.Y.) WCGU.
52.02	5767	Cincinnati (Ohio) WLW.
51	5882	Casablanca, AIN.
51	5882	Bergedorf (Germany) AFL, 3 kw.
50	6000	Karlsborg (Sweden) SAJ.
50	6000	Moscow, RFN.
43.5	6896	Rome (Italy) IMA.
43	6976	Pittsburg East (Westinghouse Electric) KDKA.
42.8	7009	Constantine (Tunis) 8KR.
40.2	7463	Lyons (Rhone) YR.
37.65	7968	Doberitz, AFK.
37.5	8000	Ibarakiken (Japan) JHBB.
37	8108	Radio Vitus.
37	8108	Vienna, EATH.
32.9	9118	Perth (W.A.) 6AG.
32.5	9231	Sydney, 2BL.
32.5	9231	Copenhagen, 7MK.
32.5	9231	Paris, Eiffel Tower FL.
32	9375	Melbourne, 3LO.
32	9375	Berne (Switzerland) EH90C.
32	9375	Detroit (Mich.) 8XAO, 0.75 kw.
31.93	9395	Bandoeng, Java (Radio Service) ANE.
31.5	9523	Helsingfors, 0.3 kw.
31.4	9554	Hilversum (Holland) PCJJ.
31.4	9554	Schenectady (General Electric Co.) N.Y., 2XAF, 10 kw. (Aer.).
30.91	9706	New York, 2XAL.
30.7	9772	Madrid, EAM.
28.5	10526	Sydney, 2FC.
27	11111	Pittsburg, 8XK.
26.92	11144	New York, 2XAG.
24	12500	Chelmsford, 5SW, 15 kw. Aer.
22.83	4838	Oakland (California) 6XG.
22.8	13158	Fort Wayne (Indiana) WOWO, 1 kw.
22.1	13575	Richmond Hill (N.Y.) 2XE.
21.96	13861	Schenectady (General Electric Co.) 2XAD.
18	16666	Kootwijk (Holland) PCLL.
17.2	17441	Nauen, AGC.
17	17647	Bandoeng, Java (Radio-Malabar) ANH, 30 kw.
16.02	18726	Rocky Point (Long Island) 2XG.
15.93	18832	Bandoeng, Java (Radio Service) ANE.
15.5	19354	Nancy (France).

EDDYSTONE
Duplex Coils.



THESE ARE THE COILS USED IN THE SHORT WAVE RECEIVER DESCRIBED IN THIS BOOKLET.

They are a set of interchangeable coils designed for use following screened grid H. F. valves either in tuned anode or in tuned grid circuits, with Reinartz reaction winding incorporated.

Absolutely low loss, yet rigid and strong, with patent four leaf contact pins. Can also be used for aerial coil with aperiodic coupling. Full instructions and diagrams with each set.

Coil D.2, for 14/38 metres.
Coil D.3, for 28/63 metres.
Coil D.4, for 42/100 metres.
With Stand
Price, **19/-** per set of three.

Coils for any wave range can be supplied ; The following additional coils from stock :-

D.1, 10/17 metres	**5/-**
D.6, 230/500 metres	**8/6**
D.8, 1000/1900 metres	**10/-**