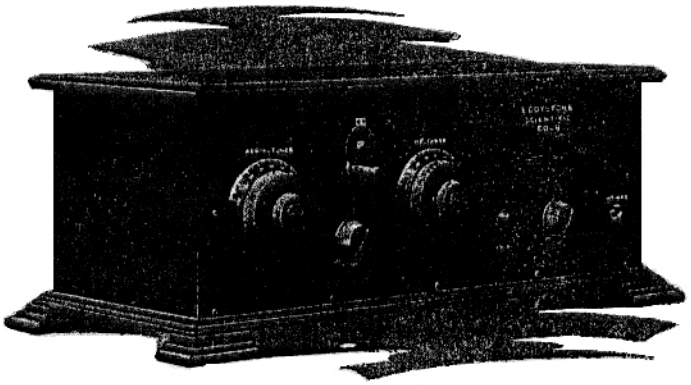
The EDDYSTONE "SCIENTIFIC" FOUR



COMPLETE DETAILS
of CONSTRUCTION
:: and OPERATION ::

Price:
SIXPENCE

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THE EDDYSTONE "SCIENTIFIC" FOUR

Possesses the five main factors of modern requirements.

1. RANGE.
   At least 30 stations on loud speaker.

2. SELECTIVITY.
   At least 6 stations with London working 3 miles away. Radio Paris, Hilversum and other high wave stations received in London with Daventry working.

3. QUALITY.
   Anode bend detection.
   Resistance coupled amplifier.
   Neg. biassed H.F. valve.

4. SIMPLICITY.
   Two dial tuning only.
   Readings identical.
   Stabilized H.F. valve.
   1 Volume Control.
   1 Master Rheostat.

5. ECONOMY.
   Filament current .325 amps. for 4 valves.
   Anode current 15 m/amps.
   Every valve pulls its full weight.
   No waste energy.

Preface.

The Eddystone "Scientific" Four is an up-to-date 4 valve receiver, comprising 1 high frequency valve followed by a detector, and 2 low frequency valves, and although this arrangement is generally common in a 4 valve set, rarely does every valve pull its full weight. In the "Scientific" Four we claim that every valve is being utilised to its best advantage, the result being that the selectivity, range and quality of the set is far above the average. Moreover, this efficiency is not confined to the broadcast waveband from 250-600 metres only, but extends to the high waveband amongst which Daventry, Radio Paris and Hilversum are members. In addition to its high performance, we would point out that it is exceedingly simple in operation and, for the results obtained, very economical, two features which are of great importance to the user.

The selectivity and range are obtained by use of low loss high frequency transformers wound with an expensive kind of Litzendraht wire, using with them a circuit so designed that the damping load across them is as small as possible. Each valve stage is then arranged so that the impedance of the valve is in correct unison with its output circuit, so that the full amplification factor of each valve is approached. Good quality reproduction is obtained by means of a stable H.F. stage with negative bias on the grid of this valve, an anode bend detector followed by a resistance coupled L.F. stage which is fed into the final power valve output circuit by means of a high class intervalve transformer.

Finally the set is such, that in our opinion it cannot fail to give the owner every cause for satisfaction.

THE EDDYSTONE "SCIENTIFIC" FOUR

CONSTRUCTION.

The panel should first be drilled, and if the specified parts are being used, a correct drilling diagram for this will be found on the page opposite, together with similar details for the terminal strips. These items can then be assembled to the baseboard ready for the parts to be mounted previous to wiring. The lay out of the parts can be easily followed from the wiring diagram in the centre of the book, Fig. 4, in conjunction with the photograph of the assembled receiver, showing the inside view of panel and baseboard, Fig. 3. The centre diagram is drawn to scale so that relative distances can be measured.

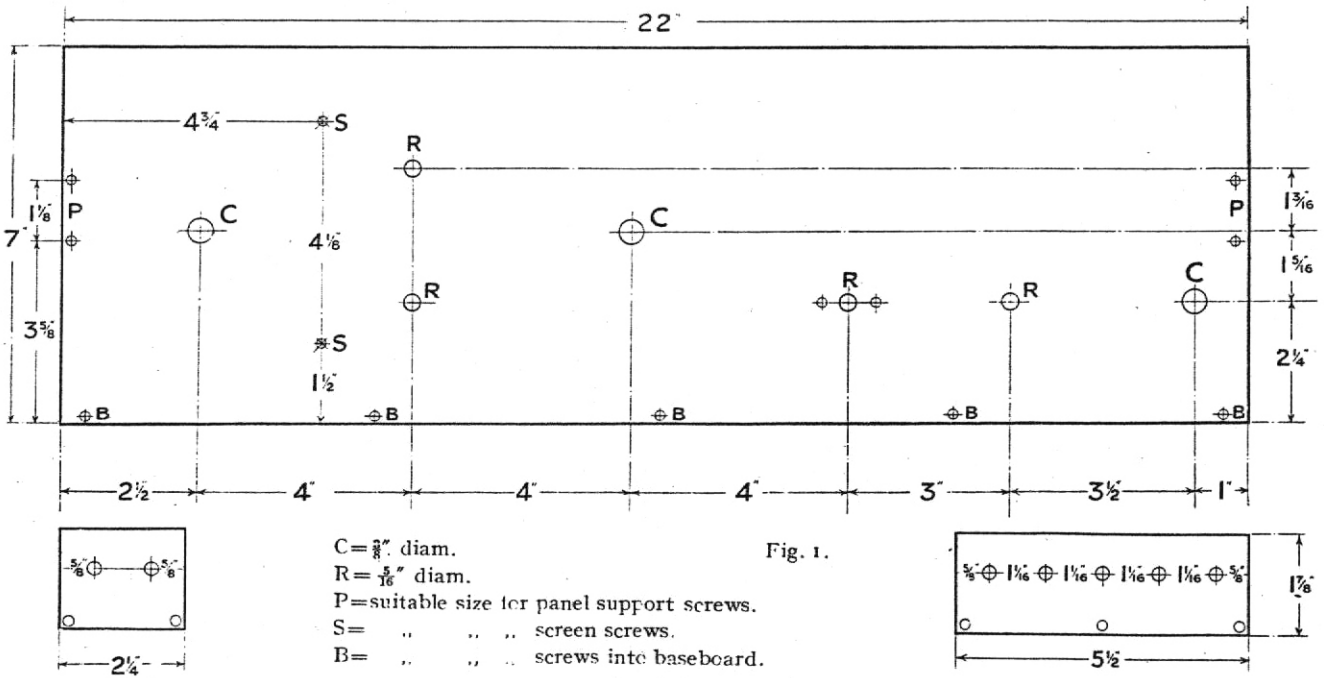
Lay out all the components in correct order on the baseboard before fastening any down, this will ensure correct spacing; the screen, however, can be left till after the set is wired. The actual wiring can then be commenced upon and presents no great difficulties, the connections are all clearly shown in the diagrams. The lay out and connections to the condensers C5 and C6 are perhaps difficult to follow, but if it is known that condenser C5 is joined at the bottom to C6 and vertical to this last named, this matter will be clear also. The only other query may be the connection from C on the aerial coil base to the grid of the first valve, this passes through a hole in the screen, making a good clearance; if desired systoflex can be used to prevent shorting. We do not recommend that any great change be made in lay out or apparatus used, as the present arrangement gives excellent results, and alterations without knowledge may be detrimental to the set pulling as a concerted whole.

The valve holders are mounted on small pillows ½ in. in height, and although this is not essential, it facilitates and shortens the wiring.

THE COILS.

The Eddystone transformers used are wound with 27/42's Litzendraht wire on a 3 in. diameter Former. In the case of the short wave transformers, the Former is pierced with large windows to reduce dielectric losses and to give greater selectivity. The

DRILLING DIAGRAM FOR PANEL AND TERMINAL STRIPS.



C=⅜" diam.
R=5/16" diam.
P=suitable size for panel support screws.
S= ,, ,, ,, screen screws.
B= ,, ,, ,, screws into baseboard.

Fig. 1.

long wave ones, where this is not so important, are on the ordinary Former. To make the set adaptable for the double range of wavebands, they are fitted with a 5 pin ebonite base and are interchangeable. An ebonite rod is fitted across the top of the coil so that it can be lifted out and in easily. On no account should inferior coils be used, as the performance of the set will be much reduced. The actual winding on the coils is given on page 12, together with an illustration of the actual article, Fig. 5.

THE SCREEN.

This is made of sheet aluminium and details for construction are given on page 13. An Eddystone screen of correct size, and drilled ready for use, with the necessary screws and nuts, is however available.

CONTROLS.

The set is tuned by means of two condensers and the reading of the dials for any given wavelength is approximately the same. To obtain fine and accurate tuning, two Eddystone Microtune Dials should be fitted ; these have a vernier motion of 128:1 in addition to a direct drive for rapid searching.

The neutralising condenser is also mounted on the panel and is fitted with a special dial marketed by the makers which enables fine adjustments to be made and read. Now although in many sets this condenser is inside and it is recommended that it should be set and left alone, we find that in practice, it is a valuable means of obtaining a reaction effect and, in our opinion, without any detrimental effect on quality. This control can therefore be adjusted as occasion calls for.

The remaining controls are the first rheostat R1, which controls the high frequency valve and enables this valve to be switched off altogether when receiving a local station and for neutralising ; a potientiometer R2 in the centre, which enables the negative bias to the anode bend detector to be brought to zero, and which also acts as a most effective volume control; and lastly a master rheostat R3, which cuts off all the valves and also puts the potientiometer out of circuit. A jack is provided for the Loud Speaker.

VALVES.

The set is adaptable for 2 volt, 4 volt or 6 volt valves without alteration, but in practice the 6 volt valves are the most satisfactory, and are recommended.

The Eddystone "Scientific" Four.

THEORETICAL DIAGRAM OF CONNECTIONS.

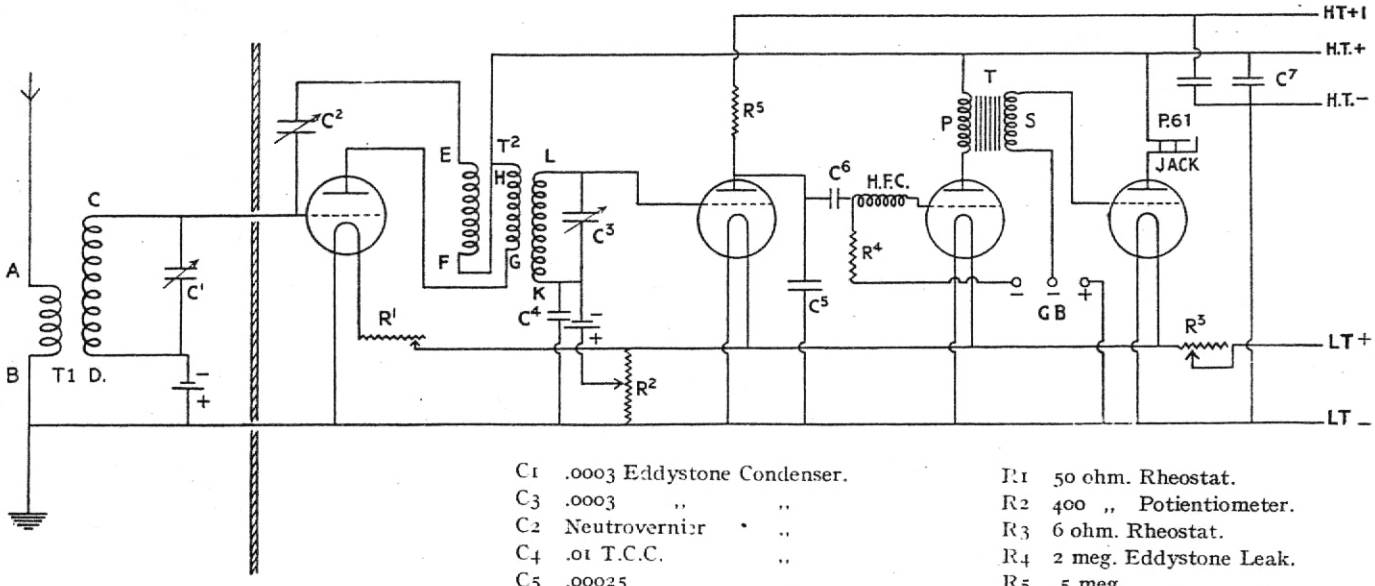


Fig. 2.

C1	.0003 Eddystone Condenser.	R1	50 ohm. Rheostat.
C3	.0003 ,, ,,	R2	400 ,, Potientiometer.
C2	Neutrovernier ,,	R3	6 ohm. Rheostat.
C4	.01 T.C.C. ,,	R4	2 meg. Eddystone Leak.
C5	.00025 ,,	R5	.5 meg. ,, ,,
C6	.006 ,,	H.F.C.	Eddystone H.F. Choke.
C7	2 1 mf. T.C.C. ,,		

The correct valves for each position are as follows :—

	H.F. VALVE.	DET. VALVE.	1st L.F. VALVE.	2nd L.F. VALVE
2v.	Mullard P.M.1 H.F.	P.M.1A.	P.M.1 L.F.	P.M.252.
4v.	Mullard P.M.3.	P.M.3A.	P.M.3.	P.M.254.
6v.	Mullard P.M. 5X.	P.M.5B.	P.M.5X.	Cossor / Stentor 6

If it is desired to use other valves, advice should be obtained first to ascertain whether they are suitable.

HIGH TENSION.

120 volts high tension should be used on the H.T. +2 tapping, and this voltage is essential and should not be reduced; the voltage on the H.T. +1 tapping can be varied from 70v.-100v. and the point used which gives the best results. About 90v. is usually found to be correct. High tension accumulators form a very satisfactory source of supply; when dry batteries are used, these should be of large capacity, the ordinary small capacity batteries have too high an internal resistance for a 4 valve set and cannot be expected to give consistent results for long.

We have had specially made for use with this set, a triple capacity 60 volt unit, two of which will give good hard service for at least three months; this battery is listed as the X.L. triple 60, and the price of 17/6 per unit is extremely low for the size and quality of the battery. Other batteries, such as Eveready or Hellesen, are, however, quite suitable.

If a high tension mains unit is used, this should be capable of passing at least 40 milliamps, since although the actual consumption of the set is only half this at a maximum, a smaller unit is not satisfactory. The By-pass condensers across each tapping should also be increased to 2mf. if a mains unit is to be used.

GRID BIAS.

A 15 volt grid bias battery is used; the tapping G.B.—1 will require to be 1½v.-3v. while the tapping G.B.—2 will need to be from 10.5v. to 15v. Always use as much grid bias as is permissible for the quality necessary, as this saves high tension from the batteries.

Photograph of Interior of Set showing lay out and wiring.

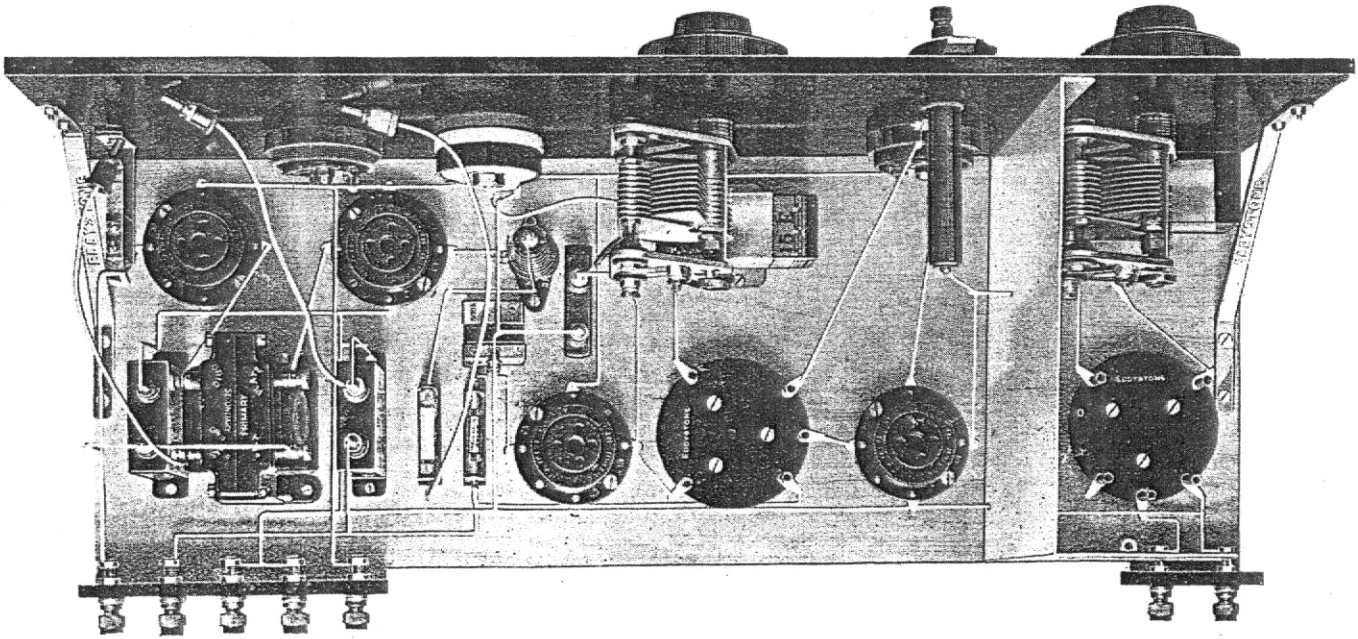


Fig. 3.

The Eddystone "Scientific" Four.

COMPLETE WIRING DETAILS SHOWING PANEL, BASEBOARD AND TERMINAL STRIPS.

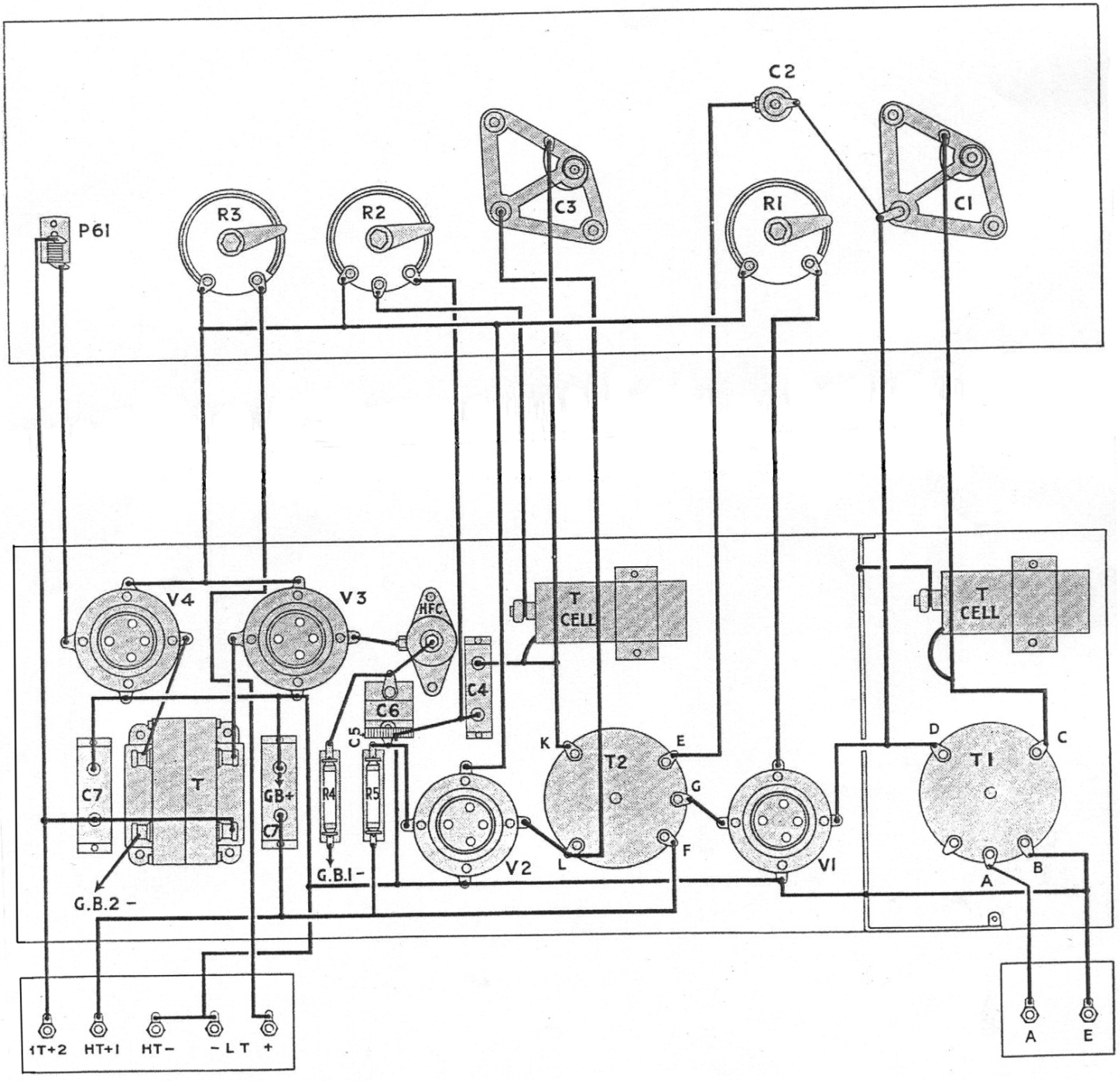


Fig 4.

OPERATING THE SET.

When the receiver is finished and connected ready for use, the valves can be inserted, although as a precaution against burning them out, before switching on, make certain that the voltage across the filament sockets of the valve holders is that of the accumulator.

The local or nearest station should be tuned in with all valves on; the strength of signals in this case should be so great that to prevent overloading the last valve, it will be necessary to detune, this is best done on the aerial condenser, leaving the grid tuner correctly tuned to the station. Before proceeding further, the correct neutralising setting of the Neutrovernier should be found; this is best done by leaving the receiver tuned to the local station and then switching off the H.F. valve, retune the set slightly until the local station is strongest. Now turn the Neutrovernier dial in the direction in which signals get weaker: at a certain point no signal should come through whatever, but if the dial is turned still further in the same direction, they will reappear; the silent point is the correct neutralising position for the set.

When the correct neutralised position has been found, a note should be kept of the dial reading for future reference; the condenser reading, however, can be increased slightly, to obtain a reaction effect for increased volume on distant stations. The dial readings for each given wavelength should be similar on each dial, so that in searching for distant stations the dials should be rotated together.

The grid bias should be adjusted until a milliameter if included in the plate circuit of the last valve registers a fairly steady reading for all signals. If the needle kicks violently as varying notes appear, distortion is occurring either through the signals overloading the valves or incorrect bias is causing the same effect.

RESULTS.

On a standard 100 ft. aerial, 30 ft. high, 3 miles from 5IT, the old Birmingham station on 326 metres, the set was capable of eliminating the 5IT transmitter, and bringing in plenty of other English and Foreign programmes. During the test a loud speaker only was used, and volume in many cases was so great that the set had to be detuned. Altogether, 37 stations were logged, but this number could be considerably increased with the set in constant use. When the set was taken into the country, 25 miles

away, stations could be received at degrees all round the dials. On the Daventry wave band, in the first mentioned locality, five other long wave stations were received without interference from Daventry. In the case of Radio Paris, this station could be received at volume, but Daventry could not be entirely eliminated.

Quality from the set was exceedingly good, and on the local transmission, was all that could be desired.

THE AERIAL AND EARTH SYSTEM.

This system plays such an important part in the actual results obtained, and is so often neglected, that we have thought it may be of use to publish here a few remarks concerning it.

Remember that if signal strength from the aerial is 1, and the amplification of the set 200, the output strength is 200, but if the first named is 2 the output strength is then 400.

The main essentials of a good aerial are: good insulation at all points, not more than 100 ft. total length, as high as possible, and as far away from all objects such as roofs, walls and trees as can be obtained. For the aerial wire, we recommend 7/22 enamelled copper, this is preferable to the alternative bare copper, as it does not oxidize. At least two good insulators should be used at each end, of good size and with a long leakage path. A very good type is similar to the Climax low loss, the ordinary small egg size are not very efficient, especially when they become dirty from smoke, etc. The lead in should be taken off as close to the insulator as possible at a distance of 5-6 ft. from the wall of the house, and taken to a good quality lead in tube. If an earthing switch or lightning arrestor is in use this should be carefully chosen to avoid leakage by dirt or damp. A single wire aerial is recommended, but if more wires have to be used, they should be kept as far apart as convenient.

Inside the house, the lead from the aerial to the set should be well insulated and as short as possible, it is a bad plan to have the wire nailed round the wall for any distance. Never use twin or twisted wires for the aerial and earth leads to the set.

The earth can be taken to a water pipe if available, or to any suitable metal object buried well into the ground, if damp all the better. It is an advantage to use insulated wire for the earth lead, as this avoids premature earthing.

NOTE.—The shorter the aerial the better the selectivity, although after a certain limit, signal strength will also suffer.

The Transformers.

The illustration shown is the short wave H.F. transformer; particulars of this and of the other coils are below.

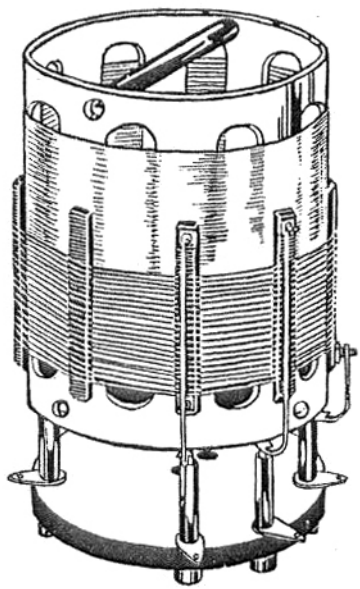


Fig. 5.

AERIAL TRANSFORMER. SHORT WAVE. 270-550 metres.
Primary winding 12 turns No. 30 D.S.C. wire.
Secondary winding 66 turns 27/42 Litzendraht wire.

AERIAL TRANSFORMER. LONG WAVE. 1000-3000 metres.
Primary winding 50 turns No. 30 D.S.C. wire.
Secondary winding 245 turns No. 35 D.S.C. wire.

H.F. TRANSFORMER. SHORT WAVE. 270-550 metres.
Primary winding 15 turns 40g. D.S.C.
Neutralising winding 15 turns 40g. D.S.C.
Secondary winding 68 turns 27/42 Litz. wire.

H.F. TRANSFORMER. 1000-3000 metres.
Primary winding 45g. D.S.C. wire.
Neutralising winding 45 turns 40g. D.S.C.
Secondary winding 200 turns 35g. D.S.C.

The number of turns on the primary windings of the aerial transformer can be reduced to obtain more selectivity or vice versa; the signal strength, however, will also be affected.

The Screen.

Made from Sheet Aluminium .036" thick.

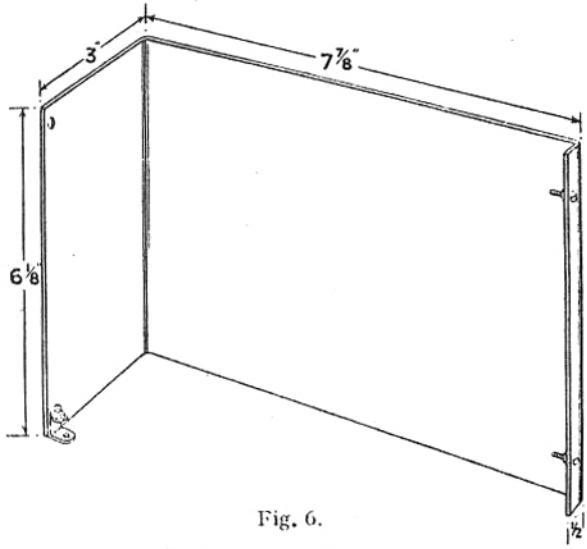


Fig. 6.

List of Parts.

1 Bakelite Panel 22" × 7" × 3/16".
1 Eddystone Cabinet with baseboard 22' × 8'.
1 each Terminal Strips 5½" × 1⅞" & 2¼" × 1⅞".
1 pair Eddystone Panel Supports.
1 Gambrell Neutrovernier Condenser.
1 Gambrell Dial for above.
1 Eddystone 400 ohm Potientiometer.
2 Eddystone .0003 L.L. Condensers.
2 Eddystone 128:1 Microtune Dials.
4 Eddystone "Scientific" Valve Holders.
1 Eddystone H.F. Choke.
2 T.C.C. 1 mfd. Condensers.
2 Eddystone Grid Leak Clips.
1 Eddystone 2 meg. Grid Leak.
1 Eddystone .5 meg. Grid Leak.
1 Ferranti Transformer.
1 Eddystone Screen with screws.
1 T.C.C. .01 Condenser.
2 Siemens T Cells.
1 P61 Jacks.
1 Aerovox .0002 Condenser.
1 Aerovox .002 Condenser.
7 Belling Lee Terminals.
1 pair Eddystone Short Wave Transformers. 5 pin.
1 pair Eddystone Long Wave Transformers. 5 pin.
2 5 pin Bases for above.
1 15 volt Grid Bias Battery.

The cost of the parts exactly as above, including the panel drilled and engraved, amounts to **£12 9s. 9d.**

List of Principal European Stations.

Metres	Kc.	Alterations	EUROPEAN.
2650	113		Paris (Eiffel Tower), FL.
2000	150		Kovno (Lithuania), 15 kw.
1750	171		Paris (Radio-Paris) CFR.
1604.3	187		Daventry (5XX).
1450	207		Moscow (Old Komintern), RAI, 20 kw.
1320	227		Motala (Sweden), 30 kw. Relays Stockholm.
1250	240		Berlin (Koenigswusterhausen), AFT, 8 kw. Relays Voxhaus.
1111.1	270		Warsaw (Poland), 10 kw.
1060	283		Hilversum (Holland), ANRO, 5 kw.
555.6	540		Budapest (Hungary), 2 kw.
535.7	560		Munich (Germany), 4 kw.
517.2	580		Vienna (Rosenhügel), 5 kw.
508.5	590		Brussels, 1.5 kw.
500	600		Aberdeen (2BD), 1.5 kw.
491.5	610		Daventry Experimental (5GB), 30 kw.
483.9	620		Berlin (Witzleben), 4 kw.
476.2	630		Lyons (France) (La Doua), PTT, 1 kw. Mon., Wed., and Fri.—9.45 p.m., Concert. Sun., Tues., Thurs., and Sat.—Relays Ecole Supérieure.
468.8	640		Langenberg (Germany), 25 kw.
462	649		Barcelona (Spain) (Radio Catalana) EAJ13, 2 kw.
461.5	650		Oslo (Norway), 1.5 kw.
454.5	660		Stockholm, 1.5 kw.
450	666		Rome (1RO), 3 kw.
428.6	700		Frankfurt-on-Main (Germany), 4 kw.
418	708		Bilbao (Spain) Radio Vizcaya, EAJ11, 2 kw.
405.4	740		Glasgow (5SC), 1.5 kw.
400	750		Cork (Irish Free State), 6CK, 1.5.
394.7	760		Hamburg (ha, in Morse), 4 kw.
392	765		Toulouse (France) (Rad. du Midi), 3 kw.
384.6	780		Manchester (2ZY), 1.5 kw.
379.7	790		Stuttgart (Germany), 4 kw.
375	800		Madrid (Union Radio), EAJ7, 3 kw.
370.4	810		Bergen (Norway), 1.5 kw.
370	811		Paris (Radio LL), 0.5 kw.
365.8	820		Leipzig (Germany), 4 kw.
361.4	830		London (2LO), 3 kw.
353	850		Cardiff (5 AW), 1.5 kw.
348.9	860		Prague (Czecho-Slovakia), 5 kw.
344.8	870		Barcelona (Spain), Radio Barcelona, EAJ1, 2 kw.
340.9	880		Paris (Petit Parisien), 0.5 kw.
326.1	920		Bournemouth (6BM), 1.5 kw.
322.6	930		Breslau (Germany), 4 kw.
319.1	940		Dublin 2RN, 1.5 kw.
315.3	950		Milan (1MI), 1.5 kw.
312.5	960		Newcastle (5NO), 1.5 kw.
306.1	980		Belfast (2BE), 1.5 kw.
303	990		Nuremberg (Germany), 4 kw. Relays Munich.
291.3	1030		Lyons (Radio-Lyon), 1.5 kw.
283	1060		Dortmund (Germany), 1.5 kw. Relays Muenster.
275.2	1090		Nottingham (England), 5NG, 0.2 kw.
260	1154		Toulouse (France) PTT, 0.5 kw.

Station Log.

Station	Wavelength	1st Condenser Reading	2nd Condenser Reading	N.C. Reading

The EDDYSTONE
Short Wave Apparatus.

Now that the number of short wave broadcasting stations is increasing, a short wave set offers the experimenter a new field of interest, the long range of this type of receiver enabling stations to be heard consistently over thousands of miles. On the Eddystone Two Valve Short Wave receiver it being possible to receive Canadian, American and Australian transmissions at good strength.

Eddystone short wave apparatus, as the result of three years' practical experience, can be relied upon to give first class results, and has been approved of by users in all parts of the world.

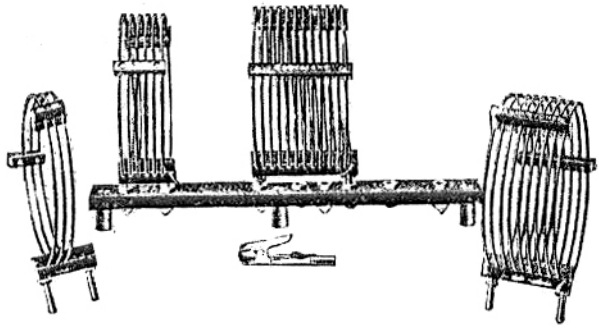


Fig. 7.

		s.	d.
Short Wave inductance Unit as illustrated. 10-150 metres		15	6
SHORT WAVE COILS.			
No. 3	8-30 metres	2	6
No. 4	12-45 ,, ...	2	9
No. 6	14-70 ,, ...	3	0
No. 9	25-100 ,, ...	3	3
No. 12	40-150 ,, ...	3	6
No. 15	60-200 ,, ...	4	0
Short Wave Choke		10	6
Short Wave Condenser .00015		14	0