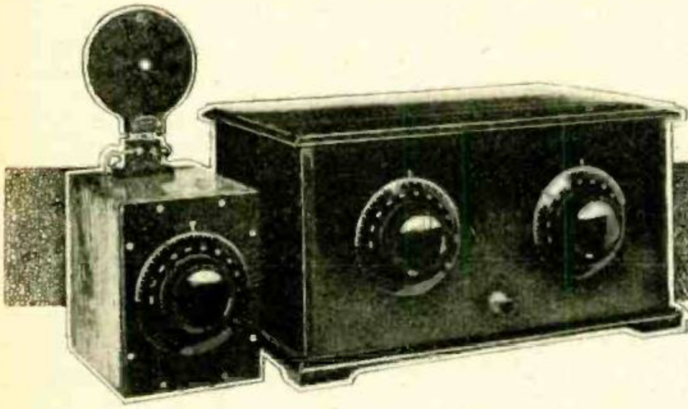

IMPROVING SELECTIVITY

By "RADIOPHARE."

Getting Ready for Brookmans Park.

THERE is, or should be, no mystery about selectivity: broadly speaking, the performance of a given receiver can only be improved in this respect by reducing the H.F. resistance of its tuned circuits, or, alternatively, by increasing their number, and thus adding to the filtering effect imposed on incoming signals. This is a general statement, and is subject to one or two important reservations; for instance, we all know

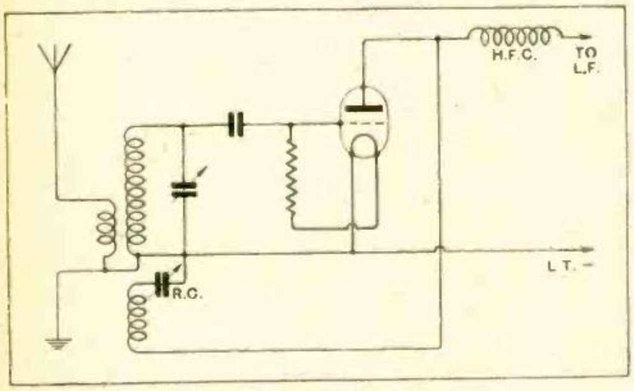

Fig. 1.—A conventional detector circuit with capacity-controlled reaction.

that a set with anode bend rectification is more selective than when the competing system is employed, but as this article is intended to deal only with simple sets without H.F. amplification—which are generally most in need of improvement—it will not be misleading to ignore the exceptions, which, after all, only tend to obscure the main issue.

We are accustomed to say that the selectivity of a receiver may be improved by reducing the number of turns in the aerial winding of an "aperiodic" coupling transformer, or by a reduction of aerial series capacity. This is true enough, up to a point, but when we come to examine matters critically, it is found that selectivity is mainly attained in this way by sacrificing signal strength. On applying the ***reductio ad absurdum*** test, it is seen that the statement is a loose one, for, if we go on cutting down aerial coupling progressively, we come to the point where the aerial is removed altogether, and reach the state of affairs cynically advocated by the old-time wireless man, who held that a disconnected aerial was the only perfect cure for interference troubles!

Filter, Wavetrap, or Two-circuit Tuner?

When we try to apply the two main methods of improving selectivity which are laid down in the opening paragraph of this article, we find that the limit to which circuit resistance may profitably be reduced is quickly reached, especially when dealing with detector-L.F. sets having grid rectification. There remains the possibility of increasing the number of tuned circuits, either in the form of pure filters, a wavetrap, or a tuned and variably-coupled aerial transformer. The first plan is hardly practicable, while the second has a limited field of usefulness, is rather difficult to add—

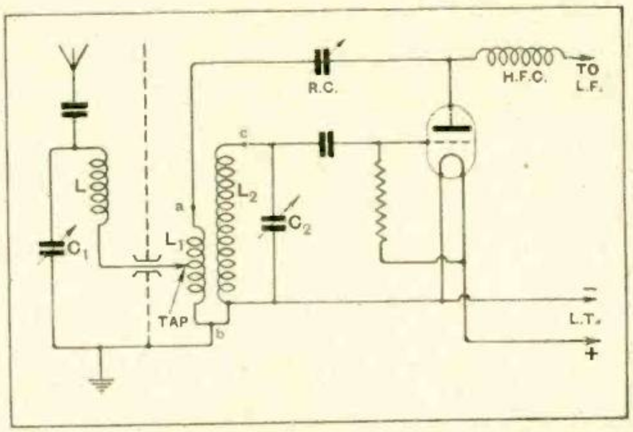

Fig. 2.—Tuned aerial circuit, specially adapted for adding to an existing receiver. C_1, aerial tuning condenser; C_2, secondary tuning condenser; L, loading coil; L_1, coupling-reaction coil; L_2, secondary coil; a, b, c, terminal points of coil, corresponding with Fig. 3.

in its best form—to a completed set, and is at least as difficult to operate as the two-circuit aerial coupler. In this arrangement an extra circuit can be made to serve a really useful purpose, and it is submitted that

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Improving Selectivity.—
in no other practical way can the selectivity of a set be so radically improved.

It is admitted that regenerative detector-L.F. sets, which stand most in need of improvement in this respect, are the most difficult to modify, but, provided reaction control is smooth and fairly constant, it is by no means impossible to devise a satisfactory scheme; indeed, a receiver on these lines has recently been described in *The Wireless World*,[1] but as this arrangement was somewhat specialised, it is considered that a description of another method, readily adaptable to existing sets, may be of interest.

Altering the Aerial Circuit.

A typical detector circuit with "untuned" aerial coupling is given in Fig. 1: the same arrangement, modified by the addition in question, is shown in Fig. 2, from which it will be seen that the tuned aerial circuit is connected to a tapping on the reaction coil L_1; the portion of this winding between the tap and its earthed end acts as the primary of a transformer, of which L_2 (the grid coil) is the secondary. It is necessary that the reaction condenser (R.C.) should be transferred to the high-potential end of the circuit; this is admittedly a disadvantage, but hand capacity effects need give no trouble if an earthed shield is interposed between panel and condenser, particularly if the control dial is of such a size that the operator's hand is not in close proximity to the "live" shaft.

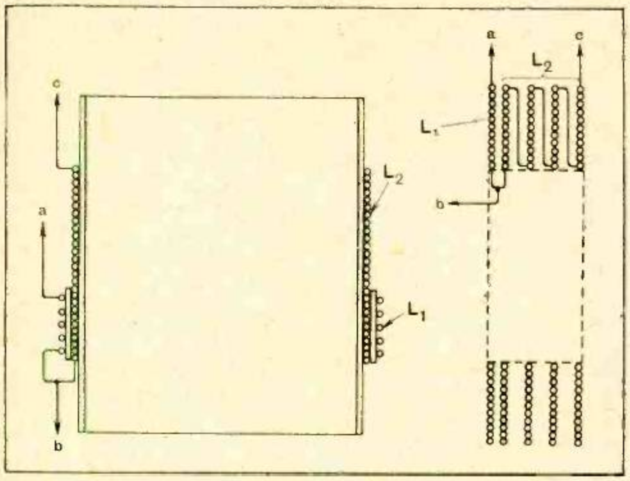

Fig. 3.—Sectional drawing showing construction of coils for medium and long wavebands.

If existing coils are well designed and reaction control is really good, it is quite possible that they will not need serious modification; all that will be necessary is to join together the points at present connected to R.C., and to make a tapping for connection of the aerial circuit. This junction will generally be at the second turn from the earthed end of the winding, but its exact position is best determined by trial: coupling is tightened by moving the tap away from the earthed end, and *vice versa*.

[1] "The Two-Circuit Two," February 6th.

Unless promising results are at once attained it is well worth while to build special coils on the lines shown in Fig. 3; these may be fitted with plug-in bases in any manner convenient to the constructor. The secondary of L_2 (medium wave secondary) may consist of 68 turns of No. 26 D.C.C. wound on a 3in. cylindrical former. The combined aerial-reaction winding L_1 has 12 turns of fine wire (about No. 30) spaced 20 turns to the inch and about $\frac{1}{16}$in. from the secondary; it is supported on a series of insulating strips in the manner familiar to the majority of readers. In specifying this reaction winding, it is assumed that a reaction control condenser of about 0.0003 mfd. will be used; a maximum capacity of this order is recommended, and the substitution of a lower value will call for an increase in the number of reaction turns.

Some Practical Details.

A good deal of latitude is permissible in the construction of the long-wave coil: what is needed here is a reasonably efficient secondary winding having an inductance suitable for covering the waveband desired in conjunction with the tuning condenser available, and, tightly coupled to its earthed end, a combined reaction-aerial winding of about 40 turns of fine wire, tapped at approximately the fifth turn. As in the case of the short-wave transformer, the exact position of this tap should be determined by trial. A satisfactory form of winding is shown in the diagram: L_2 is in four sections, each with 50 turns of No. 32 D.S.C. wire and having an outside diameter of $3\frac{1}{4}$in. The reaction winding, as given above, is of the same wire, in the form of a single-layer helix, spaced $\frac{1}{32}$in. from the other coil.

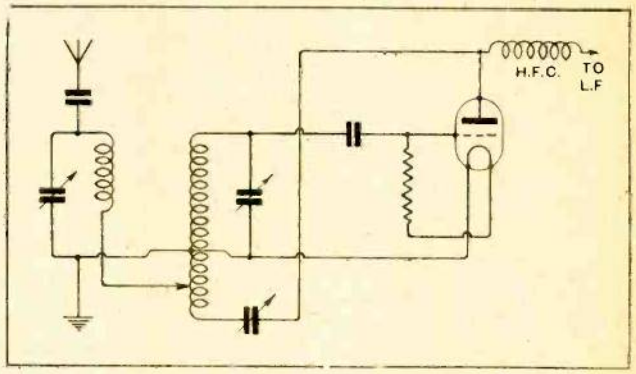

Fig. 4.—The same method of coupling applied to a "single-coil Reinartz" circuit.

As there is seldom enough room inside the cabinet to allow of the addition of an extra tuning condenser and coil, it will often be convenient to mount the former component in a small wooden box, to which the loading coil may be attached, either in the manner shown in the illustration at the head of this article or at the side of the box. Whatever method is adopted, the axes of the two coils should be at right angles, in order to minimise stray couplings between them, and the interposition of an earthed metal shield, as shown in dotted lines in Fig. 2, is to be recommended.

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