The action of the supersonic principle itself, then, is to multiply the separation between stations. To take advantage of this, we must still have a selective intermediate amplifier. But if it is too selective, it will cut the higher notes which form the extreme edges of the band of wanted signals. Thus, taking the case mentioned above —300 metres—but modulated at 5000 frequency and "converted" to 100 kilocycles by the first detector, we find that the amplifier should have the same overall performance for all frequencies between 95 kilocycles and 105 kilocycles, but should not work outside these limits. We want a resonance curve like Fig. 1.

Actually, such a curve can be approximated only. Later, in connection with the more advanced design to be presented, the matter of obtaining the required selectivity without cutting side-bands will be considered in some detail.

quencies. Practically 30 kilocycles is getting near the limit.

The second detector and audio system operate precisely as in a more normal receiver—except, perhaps, that the input to the second detector is larger.

Designing the Shortwave Super.

IN entering upon the process of design of the first and simpler set, every effort was made to make its circuit and construction free from elaboration and expense. It was realised that many constructors would at once see the advisability of experimenting with this receiver before embarking on the construction of its more elaborate fellow.

A large part of the apparatus used may be rescued from the junk-box, or from firms which specialise in cheap second-hand and disposal parts.

As the receiver is intended primarily for shortwave reception, it was considered permissible to dispense with a separate oscillator valve and make the first detector perform this service. The objection to this practice on broadcast wavelengths is that the tuned circuit controlling the frequency of the local oscillations is too far off tune so far as the incoming signals are concerned. If a low intermediate frequency is chosen, however, the tuned circuit need only be a comparatively small percentage off tune for the very high frequencies being received. The gain in simplicity is considerable.

So far, then, we have the circuit shown in fig. 2. This is obviously identical with an ordinary shortwave receiving circuit except that no control of regeneration is provided, the reaction coil being arranged so as to cause the valve to oscillate steadily at all settings of the tuning condenser.

It will probably occur to readers possessing shortwave receivers of the regenerative type, without our pointing it out, that they can quite well use the detector portion of their existing receivers for their experiments with supersonic reception, and thus save the necessity for building up this part of the apparatus specially.

Intermediate Amplifier.

THE next part of the receiver to be considered is the intermediate amplifier. Again with simplicity as our object, we suggest tuned plate coupling, using straightforward single coils of 20 to 40 turns tuned with semi-variable condensers of the "Formodenser" type.

A two-stage amplifier will be ample, preferably using screen-grid valves; ordinary three-electrode valves may be used, however, if they are stabilised by series grid resistances. So far, then, we have something like fig. 3.

The Second Detector.

THE next step is to add the second detector and a single audio amplifier to the rig. If it is desired to receive Morse it will be necessary to provide reaction on the second detector so that it may be made to oscillate. Normally, however, this would not be done and the complete circuit diagram would be similar to that shown in skeleton form in fig. 4.

The choke and by-pass condenser in the plate circuit of the second detector are very necessary to prevent I.F. from feeding into the audio amplifier, where it would probably be amplified and cause instability. The choke must be a radio-frequency one of very high inductance (i.e., having a great number of turns), and if a choke of this type is not available one may be improvised by winding 1500 or 2000 turns of very fine wire on a slotted former of the type previously described in this journal.

The detailed specifications and layout of this receiver will be given in the next article.

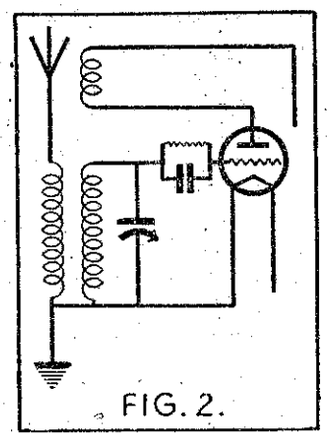

FIG. 2.

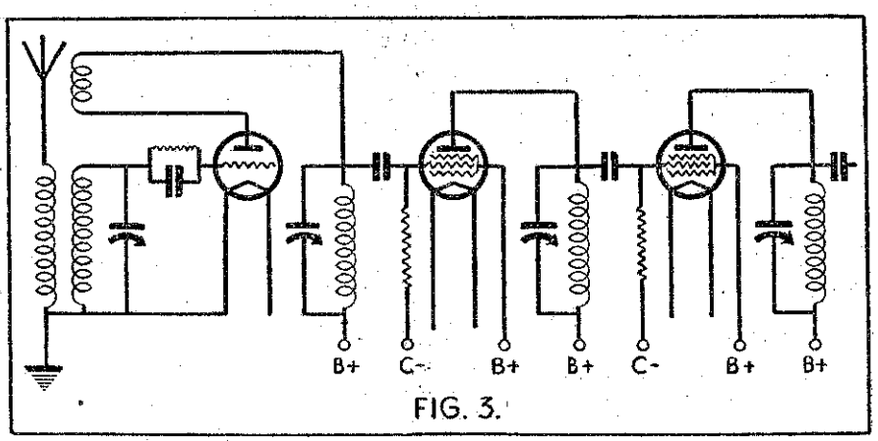

FIG. 3.

Conflicting Requirements.

AS to the actual frequency to be chosen for the intermediate amplifier, there are conflicting requirements which lead to a compromise. In order to obtain maximum selectivity, the frequency should be low; but this is not very important for the total selectivity is limited, as just pointed out; the limit can easily be reached with quite a high intermediate frequency.

The frequency should, however, be considerably lower than the lowest frequency to be received. On the other hand, if the frequency is too low, there are increasing difficulties due to the I.F. being too near the modulation fre-

Trade Jottings

New Lyratone

MESSRS. CRAWFORD AND FINDLAYSON announce that they are importing a new line of Lyratone A.C. Receivers.

The new set, which is of approximately the same dimensions as the former model, employs the super-heterodyne circuit, combining screen-grid, multi-mu and pentode valves. There are nine tuned circuits for selectivity, and, with the variable-mu and pentode combination, a far greater undistorted output is possible.

The set is equipped with tone and volume controls, full vision dial calibrated in metres and kilocycles and gramophone attachment.

It is anticipated that the "Radio Record" will have a full test report on this little set in the very near future.