

# Outstanding Crystal Performances--Fading Enquiry

## Christchurch Carnival Preparations

# THE RADIO RECORD

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### PART VII.—HETERODYNING.

The cause of the annoying whistle can be easily explained. We have got two transmitting stations, the legitimate one and the oscillator, sending out waves of nearly the same frequency. The effect on a third set can be explained as follows:—

Imagine a bicycle pump fitted with two plungers, as shown in Fig. 1, with little third one midway between them and perpendicular to the tube. Let A be the broadcasting station, B the oscillator, and C some other listener. If A is transmitting, and B is behaving himself, then both A and C will respond to the to-and-fro motion of A. Suppose, now, B uses too much reaction, then he will begin to move to and fro independently of A. To make things easier to explain, suppose A is on the air, but no one is speaking, then A is sending out a high-frequency wave of constant amplitude. B is doing the same, but the frequency is slightly different, say, slightly greater than A. At a certain instant both plungers will move inwards together and cause an increase of current in C's aerial. A little while later B will be moving outwards when A is moving inwards, so that the movement of C is decreased. The effect on C, therefore, is that instead of responding to A alone, and moving in and out a constant distance, he will find that his plunger is first rising, then falling, in amplitude—exactly the same as if someone were playing the flute in A's studio and causing the waves to increase and decrease in amplitude. The number of these increases and decreases in the rectified current of C's set will be seen to be equal to the difference in frequency between A and B. So that B can alter the note by moving his variable condenser, and so altering his tuning.

We have, therefore, an easy way of telling when we are the culprits. If we vary our variable condensers and the note changes in pitch, then we are the offenders, whereas if the note merely weakens, but does not rise and fall, then someone else is to blame.

One method of tuning is to make the set oscillate, and then search about (by moving the dials) for a whistle. The dials are then turned till the note gets lower and lower, till it becomes inaudible. When this state of affairs is reached, then the receiving set is oscillating at the same frequency as the transmitter. Damp-

age is being done, however, because the quality of the reception is very much reduced, and also the B batteries are being run down quickly, because it is from them that all this extra power comes.

This, however, explains many of the freak crystal receptions about which one hears. If a crystal set is being operated close to an oscillator, then the oscillator, in acting like a small transmitter, will re-radiate part of the waves which he is receiving, and the crystal user says he got a station several hundred miles away.

The older types of valve receiver had movable or hinged coils, so that the reaction could be varied by moving them to and fro till oscillation stopped. While quite useful and comparatively harmless in the hands of an experienced user, these sets were a curse when manipulated by a tyro, and any set capable of oscillating is now rigidly illegal in New Zealand. Notice that reaction is not illegal—it is used deliberately in practically all valve sets which have a high-frequency valve; but it must not be pushed to the point of causing the set to oscillate.

### NEUTRALISATION.

The modern set, therefore, differs from the earlier models in having some form of device which prevents reaction from causing oscillations. A set with this construction is said to be neutralised.

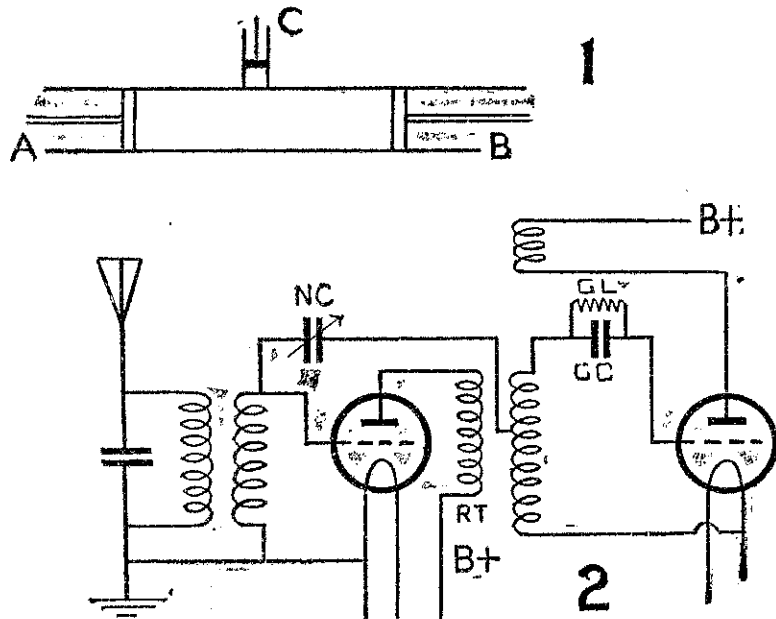
In a neutralised set the first valve has a connection from the plate to its grid, but in such a direction as to prevent oscillation. This is shown in Fig. 2. The first valve is connected in the usual way, but its plate is connected to the primary of a radio frequency transformer. The advantage of the transformer method of coupling two valves together was explained last week, since the voltage of the secondary can be made to be greater than the primary. The second valve is connected up with the secondary across the filament and grid, as be-

fore. The new departure is, however, a wire is brought from the transformer secondary through a small variable condenser, and thence to the grid of the first valve.

It was mentioned in the second article of this series that when we had a transformer the induced current always flowed in the opposite direction to the primary current, and so by connecting the grid of the first valve to the transformer secondary, the result will be to put a "brake" on the tendency to oscillate. The reason for the neutralising condenser is to vary the amount of this neutralising feed back until the set just ceases to oscillate. When the adjustment is made the neutralising condenser should then be left severely alone. Reaction is made use of in the second, or detector, valve, but the neutralising

device on the first will effectually prevent any trouble being caused.

Some people, especially those with home-made sets, may have had trouble with oscillation, although they do not use reaction consciously. The reason is that we do not need two coils to have reaction. Two straight wires, one from the grid and one from the plate, if they are allowed to run parallel, and close to each other, will cause trouble. This is especially the case when a small panel is used, consequently the components are cramped for room. If any of the modern sets are examined it will be found that the high-frequency valves are placed alternately with the low-frequency ones, so as to have them as far as possible away from each other. Also, the mounting of the coils themselves is most interesting, as it will



be seen in many to be impossible for the magnetism of any coil from passing through either of the other two.

### DUAL AMPLIFICATION.

The diverse uses of the three electrode tube are not yet complete, as the next intriguing application is to make it do two things at the same time. It is possible for us to receive signals in the aerial, amplify them by means of a valve, then pass them through a crystal to rectify them, and then bring them back and amplify them again by passing them through the same valve. A set arranged in this way is called a reflex set, and can produce great amplification for a single valve.

Two main methods are possible, one with a high frequency transformer and the other with a low frequency transformer. The first is shown in Fig. 3, and should be fairly clear to those who have followed these notes from the beginning. The high frequency currents enter the aerial and operate the grid in the usual way. The little condenser "a" in the aerial will not, of course, affect these high frequency currents in any way. The amplified currents flow from the plate, as before, through the tuning condenser and coil, and on through the condenser "b" through the B battery, and thence back to the filament. These currents induce corresponding currents in the secondary of the transformer. These currents are rectified by the crystal, and from now are low frequency currents unable to flow through condensers, but able to pass round coils. These low frequency currents cannot pass through condenser "a," so have to flow backwards up the aerial coil and into the grid. The corresponding amplified current flows from the plate through the transformer primary, and, being unable to flow through "b," passes round the coils of the phones or loudspeaker. With this explanation the other type should now in its turn be understood.

There is very little trouble from oscillation with these sets, as the crystal has a stabilising tendency. The saving in cost is not so great as might appear at first glance, since the components are practically those necessary for a two-valve set, with the exception of the second valve, and its fittings, and the grid leak and condenser, but still, the set is a very useful one, and exceedingly easy to use.

### BROADCASTING IN U.S.A.

### AN AUSTRALIAN'S IMPRESSIONS

#### WONDERFUL PROGRAMMES.

On his return from a trip through the United States, a Mr. George Sutherland, of Melbourne, was interviewed by a representative of the "Listener In" on his impressions of broadcasting in America. He said:—

"My general impression of America—and by that I mean, of course, the U.S.A.—is that broadcasting has made enormous strides in the public favour since I made my previous trip to the States in 1924.

"This great increase in the popularity of broadcasting is due to the development of land lines for the transmission of better programmes. These land lines now link up the whole of the United States, enabling people everywhere to listen in to a New York programme.

#### Best U.S.A. Programmes.

"The best programmes in America are broadcast from New York, but until quite lately the New York man was not very particular whether he got distance. But to the man—say, in New Orleans, distance was the all-important feature of the radio, simply because it enabled him to hear New York. These land lines have changed all that.

"Some of the programmes broadcast

would cost anything from £1000 to £2000 for a single performance. For instance, there may be opera with Metropolitan stars; concerts with artists like John McCormack, Lena Cavalleri, Kreisler, and the Flonzaley Quartet on the one programme. A programme like that is broadcast all over the U.S.A. on particular nights—say, once a week.

#### Nearly 500 Stations.

"There were, until three or four months ago, 488 stations in America broadcasting, with the result that the air was overcrowded, and there was a state of chaos as far as the listener was concerned. Then Herbert Hoover, Secretary of State, took the matter in hand. The Government drew up stringent regulations under which each State was allowed time only in accordance with the quality of the programme given to the public. The serious effect of this will be grasped when it is realised that 80 per cent. of the stations exist only by selling their time for advertising purposes, and that the musical items broadcast are solely for the purpose of luring listeners to listen to advertisements.

"To illustrate the incidence of this: Station A might have contracted with an advertiser for 500 hours for the year. Under the new regulations Station A would find itself restricted to 200 hours only on the air for the year. The immediate result is that all the stations are striving frantically to show that they are giving the best service to the public, and are entitled, therefore, to more time than they are getting.

#### Journalists and Playwrights Combine.

"The advertising matter for broadcasting is very skilfully arranged, and

the very best journalists, and occasionally playwrights, are employed in preparing the material. Usually the advertising firm occupies a quarter to half an hour. This is the method: An announcer begins, 'Ladies and Gentlemen, — The Cornflake Corporation take this opportunity of presenting Signor Sappari, who will sing Donna e Mobile,' and so on through a good programme by front rank artists. Then the announcer finishes up: 'The Cornflake

### APPLAUSE CARDS

The Stratford Radio Society has had printed an applause card for the use of members desiring to express to stations and artists their appreciation of the broadcastings received. The idea is excellent and is largely used in the States. The Stratford Society is very wisely designing the card to be of "return" value, for two views of Stratford are incorporated together with items of interest concerning the town and district and its attractiveness to the tourist.

Corporation thanks you for your attentive appreciation, and wishes to remind housewives that the revised book of recipes, for which no charge is made, is more comprehensive than any previous edition. Send for a copy."

### The Dempsey-Sharkey Fight.

"I listened to the broadcasting of the Dempsey-Sharkey fight. For days before the stations had been reminding listeners to have their batteries in good order for the great event. The excitement was intense. The feature of the event was the amazing broadcasting of the fight by Major White, who is considered to be the best announcer of sporting events in America.

"And that reminds me, He is English, and so are the majority of wireless speakers in America.

"I never heard a more wonderful description of a fight. He detailed every move of the pugilists with lightning rapidity. Like this:—

"Sharkey - is - crouching down - with - his - head - between - his - arms. Dempsey - uppercuts - him - the - blow - glancing - off - the - chin. Sharkey - comes - in with - a short - left - jab. Followed by - a - right - straight - from - the - shoulder. Dempsey - retaliates - with - a - short - right - jab - and - a - swing - with - a - left - which - just - misses."

"Details of this description were clearly given with incredible speed during each round. About the fourth round another voice explained that the Major was momentarily exhausted and must have half a minute's spell. It is remarkable to convey an idea of this remarkable feat of broadcasting.

"As to the quality of the broadcasting in America, it is no better than we are getting; but the programmes are naturally much more interesting on occasion than ours, because they are able to employ world-famed artists."

### A GIANT STATION

#### ONE HUNDRED THOUSAND WATTS

Comparative nightly radio tests on the thirty and 100 kilowatt transmitters of WGY, at Schenectady, which are being conducted by the engineers of the General Electric Company, have brought letters from all over the country, according to Martin P. Rice, Manager of Broadcasting. "No attempt has yet been made to effect a complete analysis of the reports received," said Mr. Rice recently, "but the replies indicate that the 100 kilowatt transmitter delivers a more reliable, clean-cut signal to receivers. The thirty and fifty kilowatt broadcasts from WGY are often considerably marred by static and ground noises. While many listeners report less fading, approximately an equal number report that no change is noticeable in regard to fading." The outstanding comment, however, he said, "is that the 100 kilowatt transmitter delivers a programme very free from static and local electrical interference."

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