# Musical Director's Policy--Improved Service at Dunedin
# Fading Investigation on September 26th and 27th


# THE RADIO RECORD

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# The Why of Wireless

## Interesting Series Setting Out Scientific Facts Simply

(By Electron.)

PART III.

It has been pointed out that the quantity of electricity stored in a condenser depends on the pressure between the plates. It also obviously depends on the area of the plates in close proximity to one another since the crowding or condensing effect is due entirely to this proximity. We can vary the capacity, therefore, by moving the plates towards or away from each other.

The action of a condenser is very similar to a spring. If a pull is applied to a spring it will stretch, and the amount of stretch (within limits, of course, just like the space between the plates of a condenser), is proportional to the force.

The interesting thing about a spring is that in every way its effect is quite opposite to that of a heavy truck. When a pressure is applied the spring moves instantly—in fact, it must be stretched before any resistance is felt—and then slows down, whereas that of the weight is to gradually increase in speed. Also, if an oscillating force is applied the spring will stretch and compress with ease.

### INDUCTANCE AND CAPACITY COMBINED.

If then we fasten a truck to a spring we should expect some interesting results, and if we do we will not be disappointed, because the two effects are opposite and will neutralise each other. If you can, perform the following experiment, as it will give an excellent illustration of what takes place in every receiving set.

Take a fairly flexible spring or piece of elastic rubber band, and fasten to it a weight which will cause it to stretch perceptibly. Hold the spring by its upper end and move it up and down slowly. Nothing much will happen—the movement of the weight will be the same as that of your hand. Increase the frequency gradually and eventually you will find that the movement of the weight is many times greater than that of your hand. At this frequency the effect of the spring is completely neutralised by that of the weight, and the only resistance to be overcome is that of friction. If friction could be eliminated entirely the movement theoretically would be infinite.

This is the state of affairs which exists in motor-cars at what is called the "critical speed," when the speed of the engine is such that the "springiness" of the frame and its weight together have a natural frequency equal to this engine speed. At this point any out of balance of the engine will cause a pronounced vibration. The same thing occurs in swing bridges, and frequently a broken vase in a room will "respond" to the vibrations set up by a particular note on the piano.

Coming back to the experiment. If the frequency is now still further increased it will be found that the movement of the weight is greatly decreased. This is because the effect of the weight at the higher speeds predominates over that of the spring, and acts like a "choke."

### GET THE RIGHT FREQUENCY.

We see, therefore, that there is one frequency at which the arrangement will vibrate with ease, or, in other words, to which it will "respond." To all other frequencies it will respond feebly if at all. We say that it is "tuned" to this frequency, and we can alter this frequency by altering either the weight or the stiffness of the spring. If the weight is increased the natural or fundamental frequency is lowered, that is, the arrangement will respond to frequencies below that of the original. If the spring is made stiffer (smaller) the natural frequency is raised.

In the same way, therefore, if we increase the size of the coil or increase the capacity of a wireless set, the wave-length of the station to which our set will respond must increase, whereas if we put in a smaller coil or decrease the capacity we will be able to hear shorter waves.

In the mechanical model had there been friction in the spring there would have been movement at all frequencies, and also, at the natural frequency, owing to the fact that the spring is highly stretched and then compressed the effect of friction is to decrease the extent of swing or "amplitude."

So also in the wireless receiver. If there is resistance anywhere of appreciable amount the effect will be to make the tuning "flat" so that as we turn the condenser dials the signals will become gradually louder instead of suddenly, as should be the case in a sharply-tuned set. From this it will be seen that "flat tuning" is a fault of the receiving set and not of the transmitter. A poor quality condenser is a frequent source of flat tuning.

### THE TRANSMITTER.

It has been stated that all wireless sets consist of a coil and a condenser. Some readers will wonder at this, as it is possible to have a crystal set with no variable condenser. This is so, but then in this case we have to consider the whole set and not merely the "box of tricks." If this is done, it will be realised that the aerial wire and the "earth" can and do form a condenser, and this type of condenser and coil is used on practically all sets.

The transmitting station has also got an aerial like this, and very powerful currents produced in a way which need not concern us at present are "induced" into the coil in the way described in a previous article. These powerful oscillating currents rush up into the aerial and down again just as they do in all receiving sets, and, as has been mentioned, these currents have a strong magnetic effect like all electric currents. This magnetism rising and falling rapidly round about the aerial causes waves to be produced which radiate in all directions

Now it must be understood that the "waves" we speak about in wireless are magnetic waves. They themselves are not electrical because no electricity can pass through ordinary air, which is a perfect insulator. This will perhaps clear up a difficulty which many people experience. They say, "How is it that the wireless can get through the insulation on my aerial wire?" They do not seem to think that if the "wireless" can get through several miles of air it will not stop at a coating of varnish one-thousandth of an inch thick.

### THE RECEIVER.

These magnetic waves travel through space at a speed of 186,000 miles per second, and since the distance between two successive waves is, in the case of 2YA, 420 metres (a metre being about 39 inches) it can be calculated that the frequency, that is the number of waves passing any point per second, is approximately 750,000.

These magnetic waves when they strike the metal of the aerial produce a current in it in exactly the same way as any other kind of magnetism would induce a current in a coil through which it passes. These currents flow up and down the aerial in exactly the same way as the original currents flowed in the transmitting station's aerial. If the receiving aerial is tuned to the frequency of the transmitter the currents will flow up and down with little hindrance.

Even when the receiving station is close to the transmitter the amount of power received is almost inconceivably small, and we must take care that none of it escapes due to faulty insulators or a high resistance in the earth connection. But when we are situated several hundred miles from the transmitter it is impossible to hear distinctly, if at all, so that some method of magnifying or amplifying the received signal becomes necessary. At present, however, we will assume that the current in the aerial is big enough to operate the telephones directly.

### MODULATION.

There is one main difference between (a) the ordinary domestic telephone, and (b) the wireless telephone, and that is (a) when no speech is being transmitted there is a steady though small current flowing through the microphone and receiver, and when speech is being transmitted this current is increased or decreased according to the air waves hitting the miscrophone diaphragm. (b) In the wireless transmitter when no speech is being broadcast there is this high-frequency current always flowing in the aerial, and when speech is being transmitted this current is increased or decreased, or as the technical expert says it is "modulated."

This modulation is a difficult thing to explain to the lay reader, but perhaps an analogy may make the matter clearer. A visit to the sea shore will enable anyone to see that more than one kind of wave may be on the surface of the sea at one time. We may have, for example, a heavy swell on the surface of which there may be other waves of smaller wave-length, and it will be noticed that both kinds can exist separately without one interfering with the other. If you could imagine that the little waves are "carried" on the back of the big wave, as it were, then you will understand what is meant by the carrier wave, that is, the wave whose function is to provide the means for the audio or audible wave to travel.

Another analogy more near the truth may be demonstrated quite easily. Lay a piece of rope or heavy cord about 15 feet long on the ground in a straight line, take hold of one end in one hand and jerk the hand up and then down quickly. A wave will be seen to run along the rope. Try the same experiment, but moving the hand slowly. A wave will not be propagated. If we now wish to send a slow rise and fall along the rope, the only way we can do it is to emit a series of quick waves gradually increasing then decreasing in "amplitude," the short, quick waves are the carrier waves and the long slow rise and fall which is sent or carried by them is the audio

## "WELL PLEASED"

### AUSTRALIA ON 2YA

LITTLE FADING OR DISTORTION.

Late mails from Australia bring flattering comments on 2YA.

A writer at Cooranbong says: "The splendid programmes received from 2YA on my five-valve neutrodyne set compel me to write my entire satisfaction and praise for your transmission. I get you on dial settings 60, 60, 62, and you fairly roar in. In fact, it is impossible to hear one speak in the house when I put you on full with a band item. I do not wish to flatter you, but I prefer your programmes to any Aussie ones. How you do it I don't know, but you always satisfy us, and we have never heard a better range of artists than at 2YA. Only three things annoy us: First, static, which makes you sometimes impossible; second, fading, which is not so bad as 3LO, Melbourne; and lastly, you close down too soon."

A New South Wales correspondent says: "To-night you have been on the loud-speaker continuously for over an hour without a suspicion of a fade, a thing we have never noticed with any station outside Sydney before, and we hold one of the first broadcast licenses here. The whole time there was no trace of distortion—even 3LO usually goes "off" two or three times a night for a few minutes. The volume of sound was terrific; we got all we wanted without pushing the reaction, but what stood out was the beautiful clarity of the transmission the whole evening, and the perfect steadiness."

A correspondent in Victoria writes: "Unlike most of the mainland A class stations 2YA showed no signs of fading or distortion. The modulation and clarity were perfect."

And from Tasmania comes this: "Your station is received here (Hobart) every time you are on the air, and your programmes are very much appreciated. You must be a very powerful station, as we can bring you in as loud as a good many Australian A class stations, although we are only 500 yards away from our own 3000 watt station (7ZL). Our set is a five-valve neutrodyne. Your modulation is exceptionally good, and there is very little fading."

Thomas A. Edison celebrated the golden anniversary of the invention of the phonograph on August 12 at West Orange, N.J., U.S.A., by repeating over the radio, "Mary had a Little Lamb," the nursery jingle he recorded on the first talking machine fifty years ago.

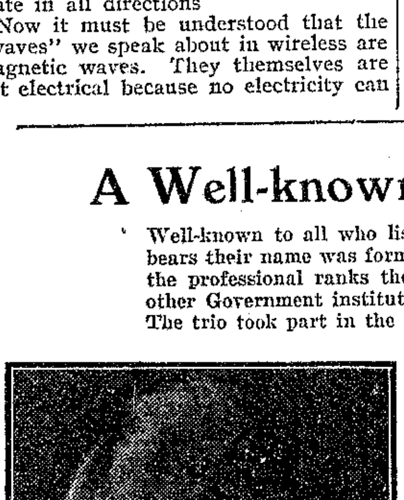
The electrical wizard appeared nervous and ill at ease as he stepped before the microphone for the second time, and in a low voice: "This is Edison speaking. This is Edison speaking. The first words I said to the original model phonograph was a little poem that went:

Mary had a little lamb,
Its fleece was white as snow,
And everywhere that Mary went
The lamb was sure to go."

A few minutes later Mr. Edison was asked if he liked talking over the radio. His response was "No."

## A Well-known and Popular Trio from 3YA

Well-known to all who listen-in to 3YA are the Carter Sisters. The instrumental trio which bears their name was formed, and is under the direction of Miss Eileen Carter. Before joining the professional ranks the trio did a great work for the sanatoriums, hospitals, prisons and other Government institutions in and about Christchurch, as well as for the returned soldiers. The trio took part in the opening programme at 3YA in February last. All the members play solos as well as concerted numbers.



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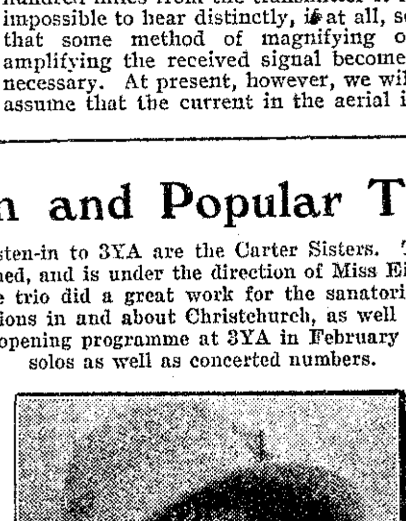

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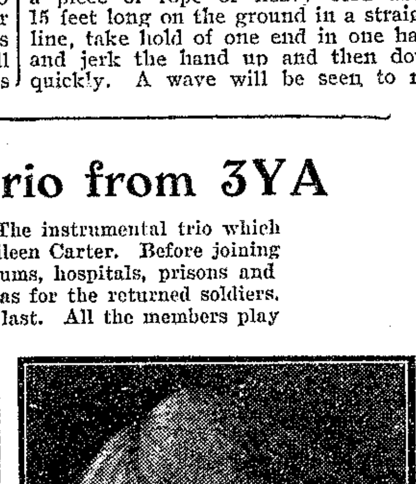

—Alva Studio.

MISS CHARLOTTE CARTER.

The 'cellist of the trio, Miss Charlotte Carter, first studied the pianoforte, gaining honours at the Trinity College Examinations. She is a member of the Christchurch Orchestral Society. For two years she assisted the orchestra of the Christchurch Royal Musical Society. She is greatly interested in mime and craft work.

MISS JOAN CARTER.

Principal of the second violin in the Christchurch Orchestral Society, Miss Joan Carter is a violinist of great merit. She gained honours at Trinity College examinations for both violin and piano, and she was also a first prize winner for the same instruments at the Christchurch competitions. Miss Carter also shows great ability in craft work and art.

MISS EILEEN CARTER.

Miss Eileen Carter gained a Trinity College (London) Exhibition for pianoforte playing (with 99 marks). She was also local centre medallist. For four years she also studied the violin. She is a member of the Christchurch Orchestral Society. Besides being an accomplished musician, she is keenly interested in dramatic art, taking several prizes at the Christchurch competitions.


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